Modeling and Rating Financial Soundness Indicators of Commercial Banks Using Confirmatory Factor Analysis and TOPSIS method

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Abstract

Several financial soundness frameworks, such as CAMELS, are currently present in the banking industry, but some evidence suggests that the present frameworks have inefficiencies in an Islamic banking environment. This study is aimed at identifying and prioritizing the adjusted financial soundness indicators in Iranian banks.

In this paper, the factors affecting financial soundness in banking industry were investigated and rated based on the viewpoints of 382 banking experts. Data gathering is done by designing a questionnaire. The research method is descriptive-correlation. For data analysis and the testing of the hypotheses, R-test software and confirmatory factor analysis have been used. TOPSIS method is used to rate the indicators from the points of view of senior banking managers. The findings showed capital adequacy, asset quality, profitability, liquidity, management quality, sensitivity to market risk, Islamic banking, corporate governance, and facilities with technical and economic backing affect the financial soundness of banks, while the liquidity and profitability indexes have the most impact.

Introduction

Banks play a decisive role in the circulation of money and a community's wealth in an economy. Therefore, efficient banking activities can have significant effects on the growth of different sectors in the economy and the improvement of the quality and quantity of products (Fattahi et al., 2017).

The need to maintain financial soundness and stability in the economy is not a new issue. This issue, especially after the financial crisis of 2008, was renewed in both theoretical and operational aspects of the banking literature, and the world's leading experts talked about the importance of establishing stability in every financial system. This issue is so significant that it has been mentioned as one of the elements of the national principles of resistance in the economy. Article 19 of these policies explicitly refers to "the transparency of the economy and its maintenance and the prevention of corrupt activities and grounds in monetary, commercial and foreign exchange". Obviously, the lack of soundness of the competence of the financial system does not mean anything except the fragility, rigidity and non-resilience of the national economy, and therefore it can be admitted that, undoubtedly, the course of realizing a resistance economy passes through the path of transparency, soundness and financial stability (Khansari and Gulich, 2015).

Among the objectives of the study of financial soundness indicators of banks, we can mention issues such as evaluating efficiency, profitability, stock valuation, prediction of the probability of a crisis, and so on. In the economy, various quantitative and qualitative indicators are used to assess the degree of financial soundness of banks, some of which are the quality of assets, capital adequacy, and profitability of branches, the efficiency, effectiveness and productivity of employees.

Although there is no doubt about the usefulness and applicability of the above indicators in measuring the soundness of the banking industry, in the Islamic banking, it is necessary to address some specific issues, in addition to the standard financial soundness indicators of banks. In the other words, in the Islamic framework, a healthy bank is an institution that not only observes the standard financial soundness indicators of banks, but also pays attention to the key indicators of Sharia principles.

Some of the most important indicators of the assessment of banking soundness in the Islamic framework are the prohibition of usury, the prohibition dishonesty (misappropriation of property), prohibition of harm, prohibition of aleatory contract (lack of transparency in text) and the prohibition of gambling. Therefore, if a particular bank meets all the standard of financial soundness based on Islamic banking regulations (such as the key issue of capital adequacy), but conducts acts such as semi-usury in its operation, it cannot be regarded as a healthy bank (Khansari, 2014).

There is a dominant model, which is used to evaluate the financial soundness in the banking industry, named CAMELS. The model has frequent applications in traditional banking systems. However there is some evidence (Sarker, 2006, Muljawan, 2007, Lackman, 2014, and Bitar et al, 2017) that CAMEL can be adjusted to apply in Islamic banking. Some evidence also suggested that corporate governance mechanisms should be considered in addition to CAMELS' six aspects to promote the evaluation of banks and financial institutions (e.g. Anginer, et al. 2018, and Mayes et al. 2001). In some countries (such as India, Kuwait, Malaysia and U.A.E) CAMELS indicators has been modified and dual indicators are implemented to assess the Islamic versus traditional banks.

We argue that the presence of some rules (such as rule no. 16, 34, 36 promulgated by Iranian ministry of finance) has been shaped based on the way banks act. Therefore, measuring soundness should be adjusted by rules established in each economic environment. We have provided a conceptual framework to promote the dominant soundness indicators in the following section.

Conceptual Framework and literature review

1. Conceptual Framework

The Basel Committee, composed of a number of senior central bank representatives from the top ten major economies, known as the G10, was formed in 1974 following the bankruptcy of several large international banks. The goal is to create a committee, to improve the quality and standardization of the banking system of member countries. Today, the rules and recommendations of this committee have influenced the world in such a way that it is regarded as one of the criteria for transparency in assessing the performance of the banking system of the countries. Therefore, banks have to comply with these regulations and recommendations for the development of their international relations. The first comprehensive statement by the Basel Committee in 1998, entitled Ball, focused on compliance with the capital

adequacy ratio of eight percent for banks (Masoodet al., 2016).

Financial soundness indicators in the banking sector provide useful information on the stability or volatility of the banking system. These indicators are presented in terms of six main sections known as the CAMELS model: capital adequacy (C), asset quality (A), management (M), profitability (E), liquidity (L), and Sensitivity to market risk (S)(Basel Committee on Banking Supervision, 2012).

Each of the six sub-groups of these indicators has different components in the assessment of stability. Capital adequacy indicators show the capacity of that sector to absorb losses.

This is mainly due the risks involved in the ability to pay commitments of financial institutions resulting from banks' receivables; the second part of these indicators is devoted to asset quality. The quality of facilities and portfolios of bank assets are assessed to insure that the amounts have lent to customers could be collected reliably. Management efficiency indicators are used to measure the importance of proper management in order to ensure the soundness of banks. To measure the profitability index, several indicators are used, such as the profit margin, net income and expenses, because the profitability can be an indicator of the ability to maintain capital. However, the rapid growth of profitability can be a sign of excessive risk. Liquidity measurement indicates the ability of the banking system to withstand cash flow shocks. The liquidity criteria represent the ability of banks when expose to loan loss circumstances or withdrawal of bank deposits.

These indicators can also be used to monitor the liquidity of financial instruments of banks. Banks are also exposed to market risks due to their diverse operations. Sensitivity to market risks (such as changes in market prices, interest rates, exchange rates, and stock prices) are measured using information on open positions, biases and stress tests (Tabaeezadehet al., 2018).

The review of banking literature also suggests that the aim of measuring financial soundness of banks is to prevent a banking crisis, and to ensure the stability of the entire economy. In this regard, the CAMELS method can greatly show how healthy the banks are. Indeed, the empirical evidence suggest that CAMELS rating methodology can measure the banks soundness significantly, but the analysis of the Iranian banking industry shows that, this method does not have a comprehensive model in the Islamic banking. It seems that Iranian banks have confronted some issues that should be considered in the soundness evaluations. On the other hand, it is needed to get use some

parameters with CAMELS indicators to provide and all-inconclusive soundness in Iranian banking industry. The following four new indicators are suggested based on the previous literature:

A. Islamic Banking

Islamic banking scholars have explicitly or implicitly provided different definitions of Islamic banking. As Mousavian (1999) argues, Islamic banking must have features such as apparent adaptation to Islamic jurisprudence, the elimination of usury and interest, efficiency in banking activities such as the provision of capital for various economic sectors, the ability to implement monetary policies and help achieve the goals of the Islamic economic system.

Islamic Banking Dimensions; in developing the Islamic Banking measure, extracting the dimensions of the concept of Islamic banking is useful for providing its definition. In the proposed definition, two basic dimensions of considering of the religious rules and realization of the Islamic goals of the banking system have been considered.

1) Consideration of the religious rules

Observing the religious rules in the field of banking activities is the one of the most important aspects of Islamic banking. In its general sense, religious rules include things such as the elimination of usury, and prohibition of obscure and harmful contracts.

2) Realization of the goals of the Islamic banking system

The success rate of an Islamic bank depends on the extent of achievement of Islamic economic and financial goals. On the other hand, adherence to sharia principles is a success criterion of economic and financial system in Islamic countries.

Taskhiri (2009) argued that according to Sadr's opinion evaluation, Islamic economic systems require some inferences of school propositions as the foundation of religious ordinance.

Among the religious rules of Islamic banking, some standards such as the prohibition of usury, transaction risk and gambling are general rules, and some regulations, such as the observance of future transaction rules, are specific rules (Mousavian, 2012). Financial stability and soundness is one of the important and prudent indicators in financial and credit institutions. Financial stability and soundness is said to a situation where the systematic financial crises do not threaten the stability of macroeconomics. The financial crisis is a sudden and quick change in all or most of the financial indicators, including

short-term interest rates and asset prices (securities, stocks, real estates), and the bankruptcy of financial institutions (Mirbagheri Hir, et al., 2017).

B. Corporate Governance

There is a gap between the expected optimal level of corporate governance mechanisms and their actual effectiveness on the financial soundness in banking industry. Therefore it is necessary to provide a more accurate assessment of the level of bank soundness by designing an indicator in assessing banks' compliance with corporate governance principles. It is necessary to implement these principles.

In order to rate banks using CAMELS method, accessibility to accurate and precise indicators by financial statements based on International Financial Reporting Standards (IFRS) is emphasized. Also, in order to adapt CAMELS method, in assessing the financial soundness of banks, it is necessary to consider other indicators such as bank's corporate governance mechanisms. It seems that a combination of the indicators constitute better understandings of financial soundness in banking industry (Ahmadyan, 2014).

C. Investment Banking

The excessive entry of banks into business, the accusation of subordinate companies, the granting of cross-border facilities to each other, the entry into the real estate sector, etc., are among the problems that the Iranian banks confront. Therefore, design of an indicator to help assess this variable among banks can help to measure more precisely the financial soundness of banks.

D. The Power of Technical and Economic Evaluation of Projects in Banks

Usually most of the investments made in the Iranian banking industry are not evaluated economically and their technical dimensions are not addressed. This could lead to negative outcomes for repayment of customer loans, as a result of increased bank lending and increased risk of loan loss. Therefore considering the amount of facilities with technical and economic backing, can partly reflect the future status of bank cash inflows and loan loss provisions.

We have provided a conceptual matrix that supports our hypotheses, and is show in table 1. The table shows that recent studies consider additional aspects to evaluate the soundness of banks and financial institutions.

Table 1. Conceptual matrix of related financial soundness aspects

NO.	Authors	CAMELS	Islamic	Rules	Corporate Governance
1	Shaddady&Moore (2019)	*			
2	Trivedi & Elahi (2015)	*			
3	Ifeacho & Ngalawa (2014)	*			
4	Roman & Sargu(2013)	*			
5	Sarker (2006)	*	*		
6	Lackman (2014)	*	*		
7	Muljawan (2007)	*	*		
8	Anginer et al. (2018)	*			*
9	Bodellini (2018)	*			*
10	Mayes et al. (2001)	*			*
11	Muhmad & Hashim (2017)	*			*
12	Noman et al. (2018)			*	
13	Barth et al. (2001, 2006, 2008, 2013)			*	
14	Beck et al. (2013)			*	
15	Laeven & Levine (2009)			*	
16	Abdul Karim et al. (2019)		*		

Literature Review

Abdul Karim et al. (2019) reviewed Bank Stability Measures in Selected Countries with Dual Banking System. They noted that there is no standardized acceptable definition and framework of financial and banking stability. Nevertheless, few researches state that financial stability is a by-products of stability in other sectors of financial system, namely, banking system, equity, debt and other. In the academic researches, researchers tend to use z-score as a measure of bank stability, which measures the distance from insolvency relative to volatility, profitability and leverage. This is due to simple and accurate measurement of bank stability. In linking banking stability in practice, a study of report produced by central banks of dual banking system reveals that only some central banks monitor the stability of Islamic banking while most focus on overall system, that is, conventional banks.

Ullah (2019) used Z-score and compared it with large and small conventional banks operating in Pakistan. Financial statements for the last eight years (2007-2014) of fifteen banks were obtained and the ratios were calculated for each bank. During the analysis, five large conventional banks, five Islamic banks and five small conventional banks were selected from Pakistan. Based on the average values of ratios and empirical analysis using statistical tools, it was found that Islamic banks were more stable financially compared to both large and small conventional banks, but their return on assets was comparatively smaller than large conventional banks, however, it was

larger than small conventional banks.

Lawal (2018) investigated the influence of banks' financial soundness on the operational efficiency of deposit money banks in Nigeria. Quantitative research was employed with data collected from 15deposit money banks, making a sample size of (70.1%) from 21 banks for 2007-2016 for 10 years. Balanced panel data sourced from audited annual financial reports of the bank sand Central Bank of Nigeria (CBN) statistical bulletins were employed. Descriptive and inferential statistics were employed with the use of panel least regression model and appropriate model diagnostic tests carried out on the panel data.Findings from the study indicate that the null hypothesis, no significant influence of bank financial soundness on the operational efficiency of banks, was rejected and conclude that bank financial soundness has significant influence on the efficiency of the listed banks.

Goetz (2018) argued that increasing market competition improve bank stability significantly. He also showed that more competition will reduce the likelihood of bank failures and increase profitability.

Kocisova & Stavarek (2018) discussed some of the existing efforts to evaluate stability in the financial or banking system, taking into account indicators of the financial strengths of banks and major risks affecting banks in the banking system. The outcome of the study showed a decline in the average banking stability in EU countries during the period of 2005-2008 and the improvement since 2009.

Bouheni and Hasnaoui (2017) found that there is a negative relationship between business cycle and bank risk-taking while rising capital requirements boost financial stability. Moreover their findings suggest positive co-movements between the business cycle and lending, compared to banks capital, where by the procyclicality of lending and bank capital have negative effects on the financial stability of commercial banks in the Eurozone.

Fattahi, et al. (2017) investigated and evaluated the effect of banking soundness on the profitability of commercial banks using the panel threshold regression approach. The results of this study indicate that capital adequacy at appropriate threshold (above 10.23%) has positive and significant effect on the profitability of commercial banks in Iran. Also, the results imply a significant effect of other banking soundness criteria such as the quality of banks assets, management quality, quality of liquidity and sensitivity to market risks on the profitability of studied banks.

Ahsan et al. (2016) analyzed the financial performance of three selected

Islamic banks over a period of 2007-2014 in Bangladeshi banking sector. He used CAMEL rating analysis approach and concluded that all the selected Islamic banks are in strong position on their composite rating system.

Ahmadyan (2016) investigated the design of early warnings system to predict the bankruptcy of banks. The results show that private banks have the lowest survival time, and cost, credit risk and liquidity risk are the most important factors influencing bankruptcy of banks.

Heidari and Ahmadyan (2016), used a probability panel to study the effect of macro-economic variables and bank size on the possibility of the bank financial soundness. The results showed that due to the efficiency of the banking system and its reliance on monetary base, the single-digit inflation targeting have endangered the financial soundness.

Khoshnoud and Esfandiari (2015) examined the mechanism of capital adequacy ratio of adjustment to achieve financial stability in Iranian banks. Although the goal of implementing the Basel I framework in Iran is to achieve financial stability through banking soundness, the results of this study indicated the relative coverage of this goal only during the recent recession.

Nadali (2015) examined the financial stability and the necessity of its monitoring in the context of the resilient economy governing the Iranian economy. The findings of this study showed that since the stability of economy is one of the pillars of the resistance economy, it is necessary that financial stability be systematically calculated and monitored in Iran's economy.

Ahmadyan (2014) examined banking soundness indicators in Iranian banks. This report, based on CAMELS pattern, as an early warning system, seeks to assess the soundness status of the banking industry.

Bhanadri and Nakarmi (2014) explore the determinants of performance exposed by the financial ratios and determine the financial performance of commercial banks in Nepal through analytical hierarchy process (AHP) based on their characteristics. The performance evaluation was done for 13 commercial banks from 2008 to 2011. They emphasized that financial decision problems to have strong multi criteria character and established priorities for performance parameters of commercial banks among financial indicators.

Tabak et al. (2013) addressed the issue on how bank size and market concentration effect performance and risks in 17 Latin American countries between 2001 and 2008. Their results showed that systematically important financial institution appears to outperform others in terms of both cost and profit without the need of taking more risks.

Roman & Sargu (2013) analyzed the financial soundness of commercial banks in Romania based on the CAMELS Framework. The results have analyzed the strengths and vulnerabilities of banks and stressed the need to strengthen the concern of the maker from banks to improve their financial soundness.

Kouser & Saba (2012) compare performance of pure Islamic banks, mixed banks (all the banks have their as well conventional branches) and conventional banks using CAMEL model. They found that Islamic banks have adequate capital and have good asset quality when compared to Islamic branches of conventional banks and conventional banks.

Kumar et al. (2012) Analyzed the performance of 12 public and private sector banks over a period of 11 years (2000-2011) in the Indian banking sector. They use CAMEL approach and found that private sector banks are at the top of the list, with their performance in terms of soundness being the best.

Saghafy and Seif (2005) showed that seven factors of capital adequacy, asset quality and financial structure of the bank, management stability and consistence, profitability, liquidity, sensitivity of operations to market risk and other fundamental criteria in the Iranian banking, are effective in assessing the soundness and stability of banks.

Research questions and hypotheses

We argue that CAMELS framework can provide a basis for banking evaluation based on the literatures (e.g. Shaddy and Moore, 2019, Trivedi and Elahi, 2015, Roman and Sargu, 2013 and Ahmadyan, 2017). Therefore, we are interested in answering the following questions:

1. How should the factors included in CAMEL be ranked (including capital sufficiency, assets quality, profitability, liquidity, management quality and sensitivity to market risk)?

However, we argue that CAMELS framework can be adjusted by Islamic factors, corporate governance aspects and regulations. Abdul karim et al. (2019), Lackman (2014), Maljawan (2007) and Sarker (2006) argue that by adding some factors based on sharia the evaluation of Islamic banks is improved. So the following questions are presented:

1. How will the ranking of Islamic banking factors enhance the measurement of financial soundness?

2. How will the ranking of corporate governance aspects enhance the measurements of financial soundness?

Anginer et al. (2018), Muhamad and Hashim (2017), Mayes et al. (2001) and Tabaeezadeh et al. (2017) suggest that adding some corporate governance aspects to traditional CAMELS measures can improve the financial evaluation of banks:

1. How will the ranking of rules and regulations aspects enhance the measurement of financial soundness?

In this section, in order to achieve research goals, based on theoretical foundations and the literature review, the research hypotheses are designed and developed as follows:

H1: According to banking experts' viewpoints CAMELS factors (including capital adequacy, asset quality, profitability, liquidity, management quality and sensitivity to market risk) are effective in assessing the financial soundness.

H2: According to banking experts' viewpoints Islamic banking factors are effective in assessing the financial soundness.

H3: According to banking experts' viewpoints corporate governance factors are effective in assessing the financial soundness.

H4: According to banking experts' viewpoints regulatory factors (including technical and economic banking, investment banking, etc.)

Research Methodology

The research is descriptive and correlational in terms of its methodology. The statistical population includes senior, middle and operational managers of banks. The sample size of the statistical community that has been obtained using R software is minimum 319 and maximum 391 managers. According to the sample size, 700 questionnaires were sent. A total of 447 questionnaires were completed by senior, middle and operational managers of banks, from which 382 questionnaires were applicable and usable.

The tool for measuring information in this research is a questionnaire designed by researchers. Considering that this research was done for the first time, for preparing and designing questions after extracting various indicators and axes and categorizing them and designing multiple questions in the fields under study, a preliminary questionnaire was prepared and distributed among a number of banking and academic experts. According to their opinions, 105 questions were selected. The Likert scale has been used with 5 ratings scales including very high, high, moderate, low and very low for model estimation. The questionnaire consists of 11 factors and 94 variables that show the indicators affecting the financial soundness of banks. 11 indicators of this

questionnaire include capital adequacy (13 questions), asset quality (9 questions), profitability (14 questions), liquidity (16 questions), management quality (14 questions), Sensitivity to market risk (6 questions), Islamic banking (6 questions), corporate governance (9 questions), the amount of facilities with technical and economic backing (2 questions), investment banking (4 questions) and other regulatory factors (1 question).

Confirmatory Factor Analysis (CFA) is a special form of factor analysis, most commonly used in social research (Kline, 2010). It is used to test whether the measures of a construct are consistent with a researcher's understanding of the nature of that construct (or factor). As such, the objective of the confirmatory factor analysis is to test whether the data fit a hypothesized measurement model. This hypothesized model is based on theory and/or previous analytic research (Preedy & Watson, 2009).

Considering that CFA is a modeling approach for the study of substructures, it can be observed using different indicators and can be confirmed. When the structure of relationships between variables is already available, the confirmatory factor analysis method is used. Therefore, on contrary to the exploratory factor analysis, the confirmatory factor analysis does not deal with the discovery of the factor structure, but rather with the confirmation and verification of the details of the hypothesized factor structure. Therefore, this study intends to present the proposed model of financial soundness indicators using the views of senior, middle and operational managers of banks and the confirmatory factor analysis method.

In confirmatory factor analysis, the researcher first develops a hypothesis about what factors they believe are underlying the measures used and may impose constraints on the model based on these a priori hypotheses. By imposing these constraints, the researcher is forcing the model to be consistent with their theory.

In confirmatory factor analysis, researchers are typically interested in studying the degree to which responses on a p x 1 vector of observable random variables can be used to one or more unobserved variables(s). The investigation is largely accomplished by estimating and evaluating the loading of each item used to tap aspects of the unobserved latent variable. That is, the vector of observed responses predicted by the unobserved latent variable, which is defined as:

1) The location of the vector observed in random variables, is the unobserved latent variables or variables in the multidimensional case, and is a matrix with an equal number of latent variables.

2) Where the variable-covariance matrix is implied by the proposed factor analysis model and is the observed variance-covariance matrix. That is, values are found for freed parameters that minimizes the difference between the model-implied variance-covariance matrix and observed variance-covariance matrix.

TOPSIS is a method of compensatory aggregation that compares a set of alternatives by identifying weights for each criterion, normalizing scores for each criterion and calculating the geometric distance between each alternative and the ideal alternative, which is the best score in each criterion. An assumption of TOPSIS is that the criteria are monotonically increasing or decreasing. Normalization is usually required as the parameters or criteria are often of incongruous dimensions in multi-criteria problems (Yoon, & Hwang, 1995; Zavadskas et al., 2006). Compensatory methods such as TOPSIS allow trade-offs between criteria, where a poor result in one criterion can be negated by a good result in another criterion. This provides a more realistic form of modelling than non-compensatory methods, which include or exclude alternative solutions based on hard cut-offs (Greene et al., 2011).The TOPSIS process is carried out as follows:

1) Create an evaluation matrix consisting of m alternatives and n criteria, with the intersection of each alternative and criteria given as follows.

2) The matrix, using the normalization method.

3) Calculate the weighted normalized decision matrix.

4) Determine the worst alternative and the best alternative, where one is associated with the criteria having a positive impact, and the other associated with the criteria having a negative impact.

5) calculate the distance between the target alternative and the worst condition, and the distance between the alternative and the worst condition; where and are -norm distances from the target alternative to the worst and best conditions, respectively.

6) Calculate the similarity to the worst condition:

 If and only if the alternative solution has the condition; and

 If and only if the alternative solution has the worst condition.

7) Rank the alternatives accordingly

Findings

The demographic information of the questionnaires is shown in Table 2.

Almost 70% of respondents have more than 10 years of experience and all respondents have a bachelor's degree and above. Therefore, respondents have been aware that they are capable of providing informed answers. As a result, their responses, with the assumption that other variables are kept constant, increased the validity of the research.

A) **Fitting measurement models:** The measurement model is fitted to each of the proposed structures and is examined. In the fit of measurement models, we consider the following objectives:

B) **Assessing the suitability of factor loads:** Basically, factor loadings with a standardized estimate of more than 0.3 are appropriate. This state indicates that the studied item has a significant and meaningful effect on the related structure.

C) **Structural Meaning Analysis:** The significance of each structure is studied according to statistical values.

D) **Reliability and Validity of Structure:** To evaluate the validity and reliability of each structure, the AVE (Average Variance Extracted) and CR (Construct Reliability) indices are calculated respectively as follows:

$$AVE = \frac{\sum \lambda^2}{n} \tag{1}$$

$$CR = \frac{(\sum \lambda)^2}{(\sum \lambda)^2 + (\sum \delta)} \tag{2}$$

Where:

λ: denotes to factors loadings,

n: denotes to numbers of factors, and

δ: denoted to error variances.

The AVE value for each construct should be greater than 0.4 and the CR value should be more than 0.7, so that the construct is valid in terms of validity and reliability. Subsequently, for each of the studied structures, the measurement model were fitted and factor loads, the significance of indices, and AVE and CR numbers have been reported.

Table 2. Descriptive Statistics

Gender				Degree		
	frequency	Frequency distribution			frequency	Frequency distribution

Male	351	%91.90		BSc	195	%51
Female	31	%8.10		MSc	171	%44.80
Total	382	%100		PhD	16	%4.20
Age				Total	382	%100
30-40	136	%35.60		Management Level		
41-50	208	%54.50		Senior Manager	29	%7.60
51-60	34	%8.90		Operational Manager	240	%62.80
61-70	2	%0.50		Middle-level Manager	113	%29.60
Above 70	2	%0.50		Total	382	%100
Total	382	%100				

E) Fitting the second-order confirmatory factor analysis model

The purpose of the confirmatory factor analysis is to understand whether the number of factors and variables measured related to them confirms what is expected from the theoretical framework? In other words, does the proposed model fit into the data?

Table 3. Description of financial soundness indicators presented in questionnaire

Constructs	Factors	
Financial Soundness of banks	Capital Adequacy (CA)	Stockholders' equity to total assets (CA1), Allowance for doubtful accounts(CA2),Capital tie 1 and 2 to total assets and weighted memorandum accounts(CA3), Legal capital to risk weighted assets(CA4),Net loss provision to capital(CA5),Capital to risk-weighted assets(CA6),Capital tier 1 to total assets(CA7),Capital to total assets(CA8),CA7 minus fixed assets(CA9), Sum of regulatory capital to total deposits(CA10),Paid capital to total stock holders' equity(CA11), Total stock holders' equity to total debits(CA12),Stock holders' equity to loans(CA13)
	Asset Quality (AQ)	Total assets to total stock holders' equity(AQ1), Evaluation of finding resources(AQ2), Loss provision to total loans(AQ3), Non-current loans to basic capital(AQ4), Non-current loans to total loans(AQ5), Loans allocation to different economic sectors(AQ6), Non-current assets to total assets(AQ7), Loans to total assets(AQ8), Allowance for doubtful accounts to total loans(AQ9)
	Earnings (Ear)	Interest revenue to total revenues(Ear1), Pretax income to total average total assets(Ear2), Net income to total average total assets(Ear3), Net income to average stock holders' equity(Ear4), Bank service fee revenues(Ear5), General and administrative expenses to total expenses(Ear6), Interest revenue to total loans(Ear7), Return on total assets(Ear8), Return on equity(Ear9), Spread to total revenues(Ear10), Non-interest expenses to net revenues(Ear11), Marginal operating income(Ear12), Profit margin(Ear13), Expenses to revenues(Ear14)

	Liquidity (Li)	Loans to deposits(Li1), Cash to total assets(Li2), Long-term deposits to total assets(Li3), (current assets minus current liabilities) to total assets(Li4), Cash and cash equivalences to liabilities and short–term deposits(Li5), Cash to total deposits(Li6), Deposits to total deposits(Li7), Non-permanent deposits to total deposits(Li8), Volatility coverage(Li9), Short-term liability coverage(Li10), Volatile liability(Li11), Liquid assets to total assets(Li12), Liquid assets to total short-term liabilities(Li13), Current ratio(Li14), Cash ratio(Li15), Deposits to stock holders equity(Li16)
	Management Quality (MQ)	Operating income to operating expenses(MQ1), Total expenses to total revenues(MQ2), Net income per employees(MQ3), Sum of total interest and operating revenues to average assets(MQ4), Branch expenses per employees(MQ5), Branch income per employees(MQ6), Loans to deposits(MQ7), Branch deposits per employees(MQ8), Branch loans per employees(MQ9), Income per employees(MQ10), Branch number growth(MQ11), Expenses per branches(MQ12), Net revenues per employees(MQ13), Net revenues per branches(MQ14)
	Sensitivity to market risk (SMR)	Duration matching of foreign assets and liabilities(SMR1), Net open position of foreign currencies to equity(SMR2), sensitivity to foreign exchange rate(SMR3), sensitivity to interest rate(SMR4), sensitivity to stock price(SMR5), Net open position of foreign currencies to equity(SMR6)
	Islamic banking (IB)	Prohibition of usury(IB1), Prohibition of consuming property wrongfully(IB2), Prohibition of loss(IB3), Prohibition of Gharar(IB4), Prohibition of gambling(IB5),Setting contract based on Islamic rules(IB6)
	Corporate governance (CG)	Ownership concentration(CG1), Institutional ownership(CG2), Liability dependency(CG3), Audit tenure(CG4), Quality control rating of auditing firms(CG5), Number of managers of audit firms(CG6), The in fluency degree of CEO(CG7), Duality function of CEO and chairman(CG8), Number of board directors(CG9)
	Facilities with technical and economic supporting (FTES)	Economic justification evaluation of the projects(FTES1), Technical aspects evaluation of the projects(FTES2)
	Investment banking (IB)	Over investment banking(IB1), Accusation of subordinate companies(IB2), Granting of cross-border facilities to each other(IB3), Entry into the real estate sector(IB4)
	Other regulatory factors (ORF)	Auditor and legal inspector opinion type(ORF1)

To this end, the model is fitted and its standardized load factors are estimated. Basically, the factor loads that have a standardized estimate of more than 0.3 are appropriate. This state indicates that the studied item has a significant and meaningful effect on the structure concerned. Therefore, items

whose factor load is less than 0.3 are excluded from the analysis process.

The estimation of the model parameters and their significance were investigated and it was observed that the factor loads for all the items is greater than 0.3 and is in the optimum level. Given that the p-values of all variables is less than the error level of 0.05, then all the variables have a significant effect on the financial soundness of banks. In other words, it is concluded that the studied items have a significant and meaningful effect on the measurement of each structure.

Then, in this stage after removing the investment banking index and adding the proposed relationships to improve the model and its indices, the data are re-fitted, and their standardized load factors are estimated. The results of which are shown in Table 4.

After re-fitting, the factor load for all items is greater than 0.3 and is in the optimum level. Considering that the p-value of all variables is less than the error level of 0.05, all variables has a significant effect on the financial soundness of the banks.

Table 4. Results of the second-order factor analysis of the modified model

Constructs	Factors	UnStd. Estimate	Std.Err	Z-Value	P-Value	Std. Estimate
Capital Adequacy	CA1	0.378	0.032	11.867	<0.001	0.629
	CA2	-0.395	0.032	-12.45	<0.001	-0.658
	CA3	0.403	0.032	12.696	<0.001	0.67
	CA4	0.403	0.032	12.477	<0.001	0.67
	CA5	-0.326	0.032	-10.18	<0.001	-0.543
	CA6	0.358	0.032	11.128	<0.001	0.596
	CA7	0.305	0.032	9.478	<0.001	0.508
	CA8	0.331	0.032	10.303	<0.001	0.551
	CA9	0.346	0.032	10.732	<0.001	0.576
	CA10	0.368	0.032	11.521	<0.001	0.612
	CA11	0.363	0.033	11.136	<0.001	0.604
	CA12	0.417	0.032	12.875	<0.001	0.693
	CA13	0.333	0.032	10.333	<0.001	0.555
Asset Quality	AQ1	0.248	0.032	7.818	<0.001	0.428
	AQ2	0.37	0.033	11.214	<0.001	0.639
	AQ3	-0.387	0.034	-11.52	<0.001	-0.669
	AQ4	0.36	0.033	10.799	<0.001	0.622
	AQ5	-0.371	0.034	-10.82	<0.001	-0.64
	AQ6	0.315	0.033	9.635	<0.001	0.544
	AQ7	0.348	0.033	10.531	<0.001	0.602

	AQ8	0.347	0.033	10.434	<0.001	0.6
	AQ9	-0.354	0.033	-10.58	<0.001	-0.612
Earnings	Ear1	0.292	0.029	10.145	<0.001	0.62
	Ear2	0.267	0.029	9.328	<0.001	0.568
	Ear3	0.27	0.028	9.569	<0.001	0.574
	Ear4	0.243	0.028	8.768	<0.001	0.516
	Ear5	0.293	0.028	10.364	<0.001	0.623
	Ear6	-0.263	0.028	-9.316	<0.001	-0.56
	Ear7	0.27	0.028	9.461	<0.001	0.573
	Ear8	0.285	0.029	9.97	<0.001	0.606
	Ear9	0.286	0.028	10.044	<0.001	0.608
	Ear10	-0.282	0.029	-9.862	<0.001	-0.599
	Ear11	-0.251	0.028	-8.97	<0.001	-0.533
	Ear12	0.285	0.029	9.835	<0.001	0.605
	Ear13	0.298	0.029	10.27	<0.001	0.633
	Ear14	-0.299	0.029	-10.35	<0.001	-0.636
Liquidity	Li1	0.253	0.026	9.785	<0.001	0.605
	Li2	0.249	0.026	9.572	<0.001	0.595
	Li3	0.262	0.027	9.669	<0.001	0.625
	Li4	0.239	0.026	9.221	<0.001	0.571
	Li5	0.257	0.027	9.598	<0.001	0.613
	Li6	0.279	0.027	10.179	<0.001	0.666
	Li7	0.265	0.026	10.044	<0.001	0.632
	Li8	0.249	0.026	9.417	<0.001	0.595
	Li9	0.243	0.026	9.495	<0.001	0.581
	Li10	0.229	0.025	8.981	<0.001	0.547
	Li11	-0.229	0.026	-8.948	<0.001	-0.546
	Li12	0.241	0.026	9.159	<0.001	0.575
	Li13	0.26	0.027	9.712	<0.001	0.62
	Li14	0.291	0.028	10.459	<0.001	0.696
	Li15	0.254	0.026	9.606	<0.001	0.606
	Li16	0.241	0.026	9.21	<0.001	0.574
Management Quality	MQ1	0.349	0.031	11.195	<0.001	0.568
	MQ2	-0.328	0.032	-10.37	<0.001	-0.533
	MQ3	0.336	0.032	10.602	<0.001	0.547
	MQ4	0.389	0.032	12.307	<0.001	0.633
	MQ5	0.414	0.033	12.72	<0.001	0.673
	MQ6	0.429	0.033	13.091	<0.001	0.698
	MQ7	0.395	0.032	12.238	<0.001	0.642
	MQ8	0.398	0.033	12.031	<0.001	0.648
	MQ9	0.394	0.033	11.989	<0.001	0.641
	MQ10	0.371	0.033	11.336	<0.001	0.604
	MQ11	0.35	0.033	10.603	<0.001	0.569
	MQ12	0.382	0.033	11.592	<0.001	0.621

	MQ13	0.421	0.033	12.795	<0.001	0.684
	MQ14	0.433	0.032	13.376	<0.001	0.705
Sensitivity to market risk	SMR1	0.306	0.032	9.627	<0.001	0.553
	SMR2	0.374	0.034	11.006	<0.001	0.675
	SMR3	0.374	0.035	10.62	<0.001	0.675
	SMR4	0.361	0.034	10.712	<0.001	0.653
	SMR5	0.368	0.035	10.571	<0.001	0.665
	SMR6	0.376	0.034	11.017	<0.001	0.679
Islamic banking	IB1	0.547	0.041	13.27	<0.001	0.65
	IB2	0.615	0.04	15.36	<0.001	0.732
	IB3	0.633	0.04	15.841	<0.001	0.753
	IB4	0.695	0.039	17.634	<0.001	0.827
	IB5	0.649	0.04	16.297	<0.001	0.773
	IB6	0.575	0.041	14.085	<0.001	0.684
Corporate governance	CG1	0.359	0.037	9.67	<0.001	0.528
	CG2	0.402	0.037	10.822	<0.001	0.591
	CG3	-0.441	0.036	-12.4	<0.001	-0.648
	CG4	0.364	0.038	9.553	<0.001	0.535
	CG5	0.444	0.037	11.882	<0.001	0.652
	CG6	0.372	0.037	9.921	<0.001	0.546
	CG7	-0.456	0.037	-12.37	<0.001	-0.67
	CG8	0.449	0.037	12.023	<0.001	0.659
	CG9	0.394	0.038	10.503	<0.001	0.579
Facilities with technical and economic supporting	FTES1	0.629	0.051	12.431	<0.001	0.806
	FTES2	0.571	0.046	12.533	<0.001	0.732
Other regulatoryfactors	ORF1	0.899	0.033	27.075	<0.001	0.999

In table 5, the factor loadings associated with the second-order variable were re-fitted after the removal of the investment banking index. It was observed that all factor loadings for all indices were greater than 0.3 and p-values of all variables were less than the error level 0.05. Therefore, all variables have a significant effect on financial soundness of banks. As a result, hypotheses 1 to 3 are confirmed and hypothesis 4 is rejected.

Table 5. Results of the second-order factors analysis of the modified model

Constructs	Factors	UnStd. Estimate	Std.Err	Z-Value	P-Value
Capital Adequacy	1.33	0.114	11.655	<0.001	0.799

Asset Quality	1.409	0.132	10.678	<0.001	0.815
Earnings	1.875	0.18	10.446	<0.001	0.882
Liquidity	2.167	0.214	10.143	<0.001	0.908
Management Quality	1.282	0.11	11.633	<0.001	0.789
Sensitivity to market risk	1.504	0.149	10.09	<0.001	0.833
Islamic banking	0.645	0.072	8.996	<0.001	0.542
Corporate governance	1.076	0.102	10.516	<0.001	0.733
Facilities with technical and economic supporting	0.8	0.091	8.794	<0.001	0.625
Other regulatory factors	0.483	0.06	8.06	<0.001	0.435

In order to fully evaluate the fitted hypothesis model, the observed data from good fit indicators are used (Table 6). The most commonly used index is the Chi2 statistic index, which describes the significance of the difference between the covariance matrixes of the fitted model with the observed covariance matrix. In fact, the zero hypotheses here imply that there is no difference between the fitted model and the covariance matrix. The important note is that this index is influenced by the sample size. So when the sample size is large it will show a small difference, indicating good fit. Therefore, its adjusted index, Chi2, is based on degrees of freedom along with other indicators of goodness of fit, which included:

1-Goodness of Fitness Index (GFI),

2-Adjusted Fitness Index (AGFI),

3-Confirmatory Adjustment Index (CFI),

4-Toker-Lewis index (TLI),

5- Standardized Root Mean Squared Residual (SRMR), and

6-Root Mean Square Error of Approximation (RMSEA)

Therefore, in this study, the ten factor model of financial soundness indicators of banks, considering the suitability of various indicators such as the root mean square error estimation (RMSEA), in which the value of less than 0.05 represents reasonable errors for approximation in the population. Because RMSEA is 0.047 and it is less than 0.05, it is acceptable and represents the suitability of the research model. Other indicators, namely CFI, GFI, AGFI and TLI, all of which are above 0.9, confirm the appropriateness of the research model. Therefore, it can be said that questions have the ability to construct an appropriate structure for measuring the quality.

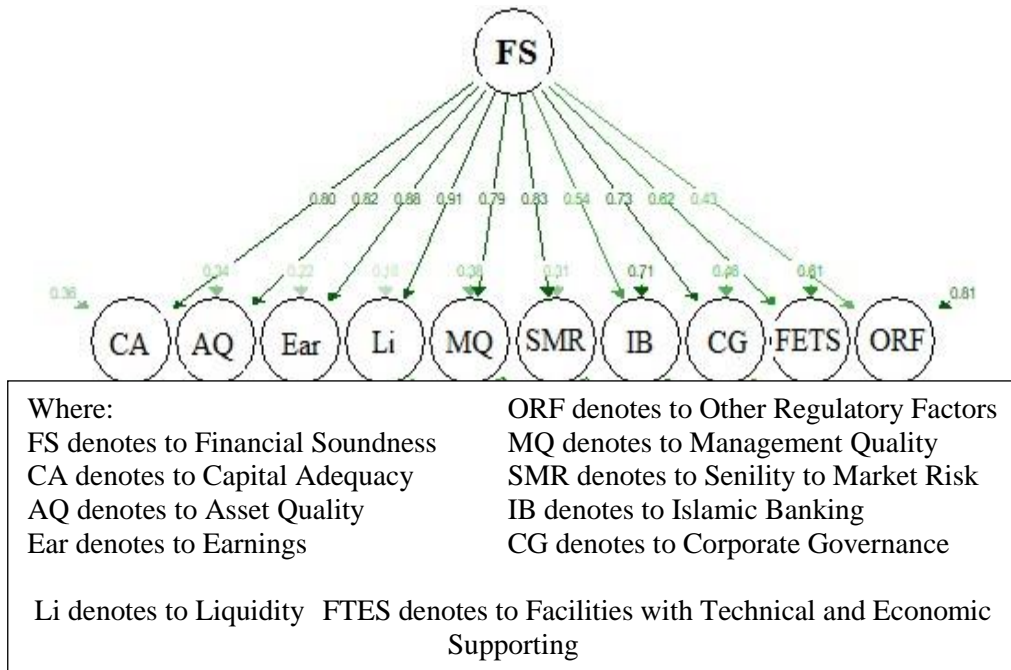Figure 1. Ten-factor model of financial soundness indicators of banks

Where:

FS denotes to Financial Soundness

CA denotes to Capital Adequacy

AQ denotes to Asset Quality

Ear denotes to Earnings

ORF denotes to Other Regulatory Factors

MQ denotes to Management Quality

SMR denotes to Senility to Market Risk

IB denotes to Islamic Banking

CG denotes to Corporate Governance

Li denotes to Liquidity FTES denotes to Facilities with Technical and Economic Supporting

Figure 1 shows the relationship between financial soundness of banks and its indicators. Here, liquidity and profitability indicators have the highest correlation with the financial soundness of banks.

Table 6. Characteristics of goodness of fit of model

RMSEA	SRMR	TLI	CFI	AGFI	GFI	
0.047	0.058	0.901	0.911	0.974	0.976	1.856
Less than 0.05	Less than 0.1	Greater than 90%	Greater than 90%	Greater than 90%	Greater than 90%	Less than 2

Given the fact that the validity criterion is more than 0.4and the reliability criterion for this structure is 0.97, it can be said that in terms of criteria, the validity and reliability of this structure are in a good position.

Additional Findings Using TOPSIS

As the previous section shows, we can consider some aspects such as Islamic dimensions, corporate mechanism and national regulations and rules to improve the traditional indicators such as CAMELS. However, there is an

additional interesting subject that can help us formulate a comprehensive model of evaluating banking soundness. We argue that by rating the mentioned factors one can determine the importance of each criteria and weighting can help formulate an operating model to assess the banks financial soundness. To do this we asked some senior managers of central bank of Iran (CBI) to prioritize the factors. We have collected the compared scores of 12 managers in each criterion and then normalized and ranked the results. Table 9 shows the ranking results.

Table 9. Ranking the financial soundness indicators

	Indicator	Index	weight	Normalized weight
Financial Soundness	Capital Adequacy	CA	0.254	1
	Asset Quality	AQ	0.131	0.516
	Earnings	Ear	0.156	0.613
	Liquidity	Li	0.108	0.427
	Management Quality	MQ	0.087	0.342
	Sensitivity to market risk	SMR	0.084	0.332
	Islamic banking	IB	0.044	0.172
	Corporate governance	CG	0.061	0.241
	Facilities with technical and economic supporting	FTES	0.039	0.155
	Investment banking	IB	0.037	0.147

The results indicate that capital adequacy (weight score 0.254), profitability (weight score 0.156) and asset quality (weight score 0.131) are the most weighted indicators as is TOPSIS.

Also the results emphasize the low ranks of Islamic banking, corporate governance and regulations scores according to senior banking managers. When we asked the respondents to weight the factors in each financial soundness categories. We report that based on the results of Table 10, some factors have more meaningful weights than others.

Table 10. ranking the most important factors

Indicator	Factor	index	weight	Normalized weight

Capital adequacy	Allowance for doubtful accounts to total receivables and financial assets	CA2	0.16	1
	Capital tie 1 and 2 to total assets and weighted memorandum accounts	CA3	0.148	0.929
	Stock holders' equity to total assets	CA1	0.143	0.86
Assist quality	Total assets to total stock holders' equity	AQ1	0.214	1
	Evaluation of finding resources	AQ2	0.202	0.944
	Loss provision to total loans	AQ3	0.178	0.831
profitability	Interest revenue to total revenues	Ear1	0.135	1
	Pretax income to total average total assets	Ear2	0.112	0.83
	Net income to average stock holders' equity	Ear4	0.103	0.762
Liquidity	Cash to total assets	Li2	0.146	1
	Loans to deposits	Li1	0.136	0.937
	Long-term deposits to total assets	Li3	0.094	0.644
Management quality	Operating income to operating expenses	MQ1	0.149	1
	Net income per employees	MQ3	0.122	0.817
	Total expenses to total revenues	MQ2	0.099	0.644
Sensitivity to market risk	Duration matching of foreign assets and liabilities	SMR1	0.278	1
	Net open position of foreign currencies to equity	SMR2	0.275	0.988
	sensitivity to foreign exchange rate	SMR3	0.212	0.762
Islamic banking	Prohibition of usury	IB1	0.214	1
	Prohibition of consuming property wrongfully	IB2	0.204	0.951
	Prohibition of loss	IB3	0.182	0.872
Corporate governance	Ownership concentration	CG1	0.19	1
	Institutional ownership	CG2	0.163	0.966
	Liability to assets	CG3	0.12	0.632
Facilities with technical and economic supporting	Economic justification evaluation of the projects	FTES1	0.756	1
	Technical aspects evaluation of the projects	FTES2	0.244	0.322

We have provided the first 3 factors in each category. Based on the results, AQ1, AQ2 and AQ3 (with weights 0.241, 0.202 and 0.178 respectively) have the most important factors of assets quality. It seems that the financing resources of bank assets (AQ1 and AQ2) and the quality of receivable (AQ3) can play meaningful role to evaluate the quality of bank

assets.

When we note to capital adequacy measures, we again return to the financing resources (CA1 and CA3, with the weight of 0.143 and 0.148 respectively) and the quality of receivables (AQ2 with the weight 0.16).

The first three factors of profitability factors emphasize the capability of banks to earn more revenue (Ear1 with weight of 0.135) and profits (Ear2 and Ear3 with the weight 0.112 and 0.103, respectively). As much as the banks earn profits the soundness indicators improve.

As the liquidity section show, the capability of banks to merge loans and deposits (Li1 and Li3 with the weights 0.136 and 0.094) and cash (Li2 with the weight 0.146) can promote the banks soundness. The results of management quality section of the Table 10 emphasize the expense management.

As the manager can reduce the expenses it is interpreted that she controls and identifies non-value added activities. The factors MQ1 and MQ2 with the weights 0.149 and 0.099 respectively confirm the subject. Also, the factor MQ3 with the weight 0.122 shows that managers should pay attention to the efficiency of employees.

When we review the results of risk sensitivity, we find that experts emphasize the importance of foreign exchange risk, because the first 3 factors SMR1, SMR2 and SMR3 with the weights 0.278, 0.275 and 0.212 are concentrated to foreign currencies.

As we predicted sharia rules are dominant in assessing the soundness as the first 3 factors of Islamic dimensions emphasize the prohibition of sharia rules (IB1, IB2 and IB3) with the weights 0.214, 0.204, and 0.187 respectively.

The respondents believe that ownership structures (CG1 and CG2 with the weights 0.19 and 0.183) can affect the corporate governance measure. We argue that the institutional owners can play an important role to drive the bank in a good soundness.

Finally, we report that existence of good justification and evaluation of projects by technical staff can improve the soundness of banks. Because the first 2 factors (FTES1 and FTES2 with the weights 0.756 and 0.244) pertain to the factors.

In summary, we argue that good modeling in an Islamic environment needs attention to more affective factors such as Islamic and nation rules and corporate governance mechanisms.

Discussion and Conclusion

In the present paper, based on theoretical and research literature, the indicators related to the soundness and the financial soundness and stability of banks were extracted and then examined from viewpoints of banking and academic experts. These 11 factors include capital adequacy index, asset quality, profitability, liquidity, and management quality, Sensitivity to market risk, Islamic banking, corporate governance, and facilities with technical and economic backing, investment banking and other regulatory factors. Totally 94 items are determined. Then, the final questionnaire was distributed according to the sample size among banking experts (senior managers, middle-level managers and operational managers).

The purpose of this research is to investigate the mentioned indices and its impact on financial soundness of banks from the viewpoint of banking experts. For this purpose, a confirmatory factor analysis method has been used. The results indicate that according to banking experts, the viewpoint index of investment banking has no effect on the financial soundness of banks and has been eliminated from the model, but other indicators are effective on the financial soundness of banks. The indicators of liquidity and profitability have the highest impact and other factors have a less effects on the financial soundness of banks. We have indicated the rankings of each factor by using TOPSIS. We think the ranking can provide a good basis for modeling an optimal procedure to evaluate national banks.

The results of this research are in accordance with the results of Ahmadyan (2014) which assesses the adequacy of capital, asset quality, liquidity, profitability and Sensitivity to market risk as a criterion for banking soundness, as well as the results of the study done by Saghafy and Saif (2005), in which the seven factors of capital adequacy, asset quality, the financial structure of the bank, stability and sustainability of management, profitability, liquidity, sensitivity of operations to market risk and other essential criteria are considered effective in assessing the financial soundness and stability of banks. According to the results of this study, Islamic banking, corporate governance, and the amount of facilities based on technical and economic backing are effective on financial soundness of banks.

As indicated in the literature review, considering the environmental factors and the issue of sharia in non-usury banking, in addition to the international indicators of financial soundness of banks, according to banking experts, Islamic banking standards, corporate governance, and the amount of facilities with technical and economic backing also affect the financial

soundness of banks. This suggests that the Central Bank of the Islamic Republic of Iran, in addition to international indicators, should consider other factors in order to achieve the evaluation of financial soundness of banks.

Therefore, the results of the research are to suggest a proposed model which emphasizes ten factors including capital adequacy index, asset quality, profitability, liquidity, management quality, Sensitivity to market risk, Islamic banking, corporate governance, the amount of facilities with technical and economic backing, and other factors, among which liquidity and profitability indicators are of particular importance.

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