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Original Research Article

Relationship between Corporate Governance and Risk Management

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Corporate governance of banks is one of the most important structures required by banks to maintain the health and stability of banks, which can play an important role in managing banks' risk. This paper examines the effect of corporate governance on liquidity risk management, credit risk management, and total bank risk management. We used board structure effectiveness, transparency, and responsibility as corporate governance indicators. The financial ratio approach is also used to measure risk management. The period under review was 2006-2018. In addition to corporate governance criteria, other explanatory variables affecting banks' risk management have also been used. This paper used the performing unit root, cointegration, and F-Limmer tests to ensure panel estimation. Given the impact of past banks' risk management on current risk management, this variable has also been modeled as an explanatory variable. For this reason, the GMM method has been used to estimate the models in question. Given the importance of bank size in corporate governance on bank risk management, Banks are divided into large and small groups, so the effect of corporate governance in large and small banks has also been investigated on bank risk management. The results show that compliance with corporate governance criteria positively affects banks' risk management. However, due to weak corporate governance in large banks, corporate governance in large banks hurts bank risk management.

Keywords: Corporate Governance, Risk Management, Bank Size, GMM**.**
JEL Classification*:* C23, G21, G32

1 Introduction

Corporate governance of banks seems to be more important than other industries because the banking sector plays a crucial financial intermediary role in any economy, particularly in developing countries. Poor corporate

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governance of the banks can drive the market to lose confidence in the ability of a bank to properly manage its assets and liabilities, including deposits, which could, in turn, trigger a liquidity crisis and then it might lead to an economic crisis in a country and pose a systemic risk to the society at large (Cebenoyan & Strahan, 2001; Basel Committee on banking supervision, 2005; Alexander, 2006; Garcia-Marco & Robles-Fernandez, 2008). Therefore, it is important to examine the effect of corporate governance mechanisms in the banking sector. Research on corporate governance has tried to examine its impact on the financial performance of business entities (Rebeiz and Salameh, 2006; Mak and Kusnadi, 2004; Fosberg and Nelson, 1999).

The global financial crisis has shown that the board's role is very important in risk management. So good corporate governance can have good risk management. Different corporate governance codes indicate that risk management is one of the board of directors' responsibilities, so success in risk management requires good corporate governance.

On the one hand, in Iran, corporate governance is a new issue that has been considered, and measures have been taken to implement its various dimensions incoherently in Iran's money and capital markets. In 2017, the Banking Guidelines on Corporate Governance in Iranian non-governmental credit institutions were issued to the banks. Since that time, non-state banks have been required to adhere to corporate governance principles. But no instructions have been issued to state-owned banks.

On the other hand, one of the main challenges in Iranian's banking network is the weakness in risk management. This weakness has put Iranian banks at risk of bankruptcy.

The most important question in this paper is, can corporate governance improve risk management?

Significant risks of the Iranian banking network are liquidity risk and credit risk. For this purpose, this article to answer the main question examines the effect of corporate governance on liquidity risk and credit risk. Due to the lack of access to micro data in credit and liquidity risk, this paper uses the financial ratios approach to calculate the credit and liquidity risk.

This article takes note of points that distinguish it from other studies. In this paper, a good measure of corporate governance is designed. Given the importance of bank size in improving corporate governance and risk management performance, banks are divided into two groups of large and small banks, and the effect of corporate governance on risk management has been investigated in terms of size.

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The framework of the article is as follows. The second section highlights the importance of corporate governance in banks and the role of corporate governance on bank risk management. The third section survey the literature review about the relationship between corporate governance and bank risk management. In the fourth section, sampling and the evaluating tests are presented, and in the fifth section, the summary is presented.

2 Theoretical Background

2.1 Corporate Governance in Banks

A review of the literature on the relationship between corporate governance and the performance of banks indicates that there are few studies in this area (Levin 2004, Caprio et al. 2007). Corporate governance in banks is more complex in many respects than in non-financial corporations. Given the size of the banks, it is necessary to establish effective corporate governance in the banks. The role of banks in economic development and growth, deposit collection and financing of investments, external financing for non-financial corporations (Levin 1997) has made it necessary to examine the relationship between corporate governance and the performance of banks.

Therefore, the principles of good corporate governance must be established in banks. Failure to establish good corporate governance in banks can create systemic risks for them and the economy (OECD, 2006). Governments are sensitive to the bankruptcy of banks. Therefore, they pay special attention to their corporate governance. Many governments have restricted the concentration of bank ownership (Levin 2004). Failure in corporate governance of banks can affect the performance of banks and the economies of countries and even the world economy. Examples of this event are the Asian financial crisis in 1997 (Pathan et al., 20088) and the US financial crisis in 2008 (Peni and Vahamaa, 2012). Kirkpatrick (2009) considers the failure of corporate governance of banks, inadequate regulatory requirements and poor accounting standards as important factors in creating a financial crisis. Existence of regulatory regulations and lack of transparency in banks distinguish them from non-financial companies. Morgan (2002) states that the problem of information asymmetry in banks is more serious. Lack of more transparency in banks increases the problem of representation. As depositors and shareholders are not able to supervise bank managers.

In addition, the purchase of a large portion of the banks' shares is restricted to foreigners. The Basel Committee on Banking Supervision (BCBS) also regulates the number of independent directors on the board. In addition, the

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Sarbanes-Oxley Act of 2002 requires that audit committee boards have only independent external directors.

2.2 Corporate Governance and Risk Management in Financial Institutions

- Meanwhile, risk management is one of the key aspects of corporate governance and corporate governance affects corporate risk management. The OECD (2009) describes the common risk management problems associated with corporate governance:
- "Risks were frequently not linked to strategy by aligning risks to the strategy, which is a key issue to ensuring that risk management has a focus on the business context
- Risk definitions are often poorly expressed: Better risk definitions (context, event, consequence) are contrary to a lot of current thinking in risk management, which has shortened risk descriptions to the smallest number of words possible.
- Organizations were not always able to develop intelligent responses to risks.
- Boards did not consider stakeholders and guardians in detailing responses to risk.
- Important parts of the value chain were outsourced to others."

Corporate governance literature indicates the importance of good risk management in good corporate governance. According to the principles of corporate governance, effective risk management is one of the main responsibilities of the board. There has been much less discussion of corporate governance institutions in emerging capital markets (El-Masry, 2016). One of the underlying questions in this regard is the appropriateness of western concepts and systems, such as codes of corporate governance, in developing countries. The expression corporate governance carries different interpretations, and its analysis also involves diverse disciplines and approaches (Keasey et al., 2005). Corporate governance is the system by which business organizations are directed and controlled. The corporate governance structure identifies the rights and responsibilities of corporate participants and specifies the rules and procedures for making decisions on corporate affairs. Corporate governance ensures that all major stakeholders receive reliable information about the firm's value and motivates managers to maximize firm value instead of pursuing personal objectives (Luo and Salterio, 2014). In the banking industry, due to the complexity of operations,

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risk management is one of the key aspects of corporate governance and the board of directors has the ultimate responsibility for effective risk management. Without direct support and involvement from the board, it is impossible to make risk management effective (Abdul Rahman et al. (2006), Al-Janadi et al (2013)). The boards of several banks were blamed for inefficient risk management practices before and during the financial crises (Ingley and Walt, 2008).

Managers' incentives may conflict with the interests of shareholders or creditors in banks. Agency problems can occur as a result of both resource transfer and risk management practices. How to resolve these conflicts by banks is complex despite various regulations such as capital regulations, corporate governance and protectionist policies to prevent banks from going bankrupt

The simplest category of agency problems is related to the transfer of resources to the bank's internal persons. Such as overpaying managers or accessing facilities. Classens et al (2002) in a study of East Asian companies found that ownership increases management value of the company when ownership and cash flow rights are aligned, otherwise the value of the company decreases sharply. In general, managers who have large stakes in their banks may prefer to take less risk to maintain their company-specific financial wealth or human capital (see the discussion in Demsetz, et al. (1997); Laeven and Levine. (2009). In some cases, outsiders who hold significant stakes in banks encourage banks to take more risks (see Laeven and Levine 2009; Bai and Elyasiani (2013).

Anginer et al. (2013) found that banks with stronger corporate governance have lower capital ratios and managers with larger shareholding banks opt for higher bank capital ratios. Holderness et al (1999) found that the more management shares owned by the bank, the less risk they take. One of the problems of representation is due to the difference in risk preferences between shareholders of equity and debt, which in the presence of limited liability leads to moral problems.

In some states of the world bankers with substantial equity stakes and control rights will prefer to increase asset risk at the expense of debt holders (this problem – modeled by Jensen and Meckling 1976, Myers 1977, and Merton 1977 – is known as "risk shifting" or "asset substitution"). Moral-hazard issues can be mitigated through various measures, including short-term debt contracting, a first-come, first-served rule for bank liquidation, and actions by bankers that credibly signal good risk management, including the maintenance of a minimum amount of cash assets (Calomiris and Kahn 1991). Suppose bank debt holders are protected by deposit insurance or other guarantees. In that case, however, moral hazard can be exacerbated because bank debt holders lose their incentive to monitor and control banks' risk-taking. Gorton and Rosen (1995) argue that managers may boost profits to hide poor prospects from shareholders when faced with a declining industry.

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These agency issues have received additional attention after the recent financial crisis. Many studies, in addition to those cited above, have debated the extent to which corporate governance and manager incentive schemes influenced how banks fared during the crisis (Acharya et al. 2009; Berger et al. 2012; Ellul and Vijay 2010; and Fahlenbrach et al. 2012; Senior Supervisors Group 2008; Mehran et al. 2011)).

Although the nature of conflicts of interest between bankers and their funding sources differ between outside equity and debt, there is also considerable overlap in the usefulness of corporate governance tools for addressing many aspects of conflicts of interest that are common to both types of outside funding sources. For example, the presence of outside directors, or the "bonding" of management, should mitigate the risk of defalcation, which benefits both outside stockholders and debt holders. Banks' corporate governance policies should arise endogenously, in part to reduce the costs related to the two sets of conflicts of interest in risk taking – the conflict between shareholders and debt holders and the conflict between managers and shareholders. Understanding how government policies respond to such conflicts and what effects ownership structure and governance policies have on risk-taking is highly challenging in the current regulatory environment, where policies such as deposit insurance, too-big-to-fail (TBTF) bailouts, and legal restrictions on controlling ownership interests in banks, which remove the disciplinary incentives of debt holders and limit the ability of equity holders to concentrate ownership (on the effects of TBTF, for example, see Acharya et al. 2009).

3 Literature Review

The main objective of Bunea et al. (2018) is constituted by the study of the corporate governance influence at the banking system level in Romania on the risks management area and of banking financial performances. The used research methodology is predominantly quantitative. This methodology is based on descriptive statistics, having as objective the analysis of corporate governance characteristics, the appreciation of the risks management level, and the performances recorded at the level of the Romanian banking system.

Lestari et al. (2018) objectives are 1) to describe exogenous, endogenous, and mediation variables, 2) to examine the effect of exogenous variables, endogenous variables, and mediation variables. The analysis technique used descriptive statistics and Partial Least Square (PLS) analysis. The result of PLS analysis represents that the percentage of public ownership contributes 100% to the structure of public ownership and affects company's

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performance, especially on Return on Equity. Credit Risk can contribute to Risk Management by 90.8% and affect the Company's performance, especially on Return on Equity. Corporate Governance on Measurement Management Efficiency can contribute 57.8% to Company Performance, especially on Return on Equity. The contribution of this research finding to the Indonesian economy is the achievement of sharia banking performance illustrates the strong emphasis on efforts to revive the real sectors in the collection and channeling of customer funds. The fundraising pattern with Mudharabah and Wadi'ah schemes indicates that savings returns and customer deposits are derived from developing customer funds in the real sector. The pattern of fund distribution in the Murabahah, Mudharabah, and Musyarakah schemes is closely related to the real sectors.

El-Masry et al. (2016) examines the relationship between corporate governance and risk management in GCC banks. The findings show that the duality of board role and size is negatively related to risk management. The findings also indicate a significant positive relationship between government ownership and risk management. The results show that Islamic banks have a positive and significant relationship with risk management measured by the capital adequacy ratio.

A study by Pearl et al (2014) on the relationship between risk management and corporate governance in Ghana indicates a positive relationship between the two.

A study by Stulz (2014) also confirms this and states that a bank with good risk management may not have low risk.

Brezeanu et al. (2011) analyze the importance of risk management strategies within the corporate environment by intermediary profitability and leverage as eloquent variables. Results indicate the correlation between financing and investment process encompasses in the context of the mix between firm growth perspectives and capital market/ banking system constraints. Statistic output reveals important findings in terms of corporate management strategies. The empirical test highlights that a liquid company is receptive to indebtedness, confirming that good liquidity creates incentives to attract external financial resources. Risk management strategies imply a real challenge from the agency problems perspective, conflicts of interest, and informational asymmetries. CEO ownership dummy variable is associated with compensation

Benefits. Leverage becomes the corporate governance device by which informational asymmetry degree decreases.

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Tsorhe et al. (2011) have investigated the impact of stakeholders of Ghanaian banks on the management of bank capital risk, credit risk, and liquidity risk. They emphasized the impact of the strength of the board of directors and constructed an indicator of board strength in a manner. Banks with board strength values higher than the industry median are labeled strong boards, and those below are labeled weak boards. Statistical tests indicate no difference between means and medians of bank capital, credit risk, and liquidity risk indicators of banks with strong boards and banks with weak boards.

Regarding capital risk management, the following explanatory variables were significant and positive at the 5% level: management efficiency and the logarithm of total assets and inflation. The central bank lending rate was also significant but negative. Only bank-specific dummies and management efficiency variables were significant at the 1% level for credit risk. Bank reserves and inflation do so at the 10% significance level. For liquidity risk, reserves and loan-to-deposit ratio significantly impact liquidity risk (1%). The impact of the board index was moderately significant (10%).

Depositor behavior appears to impact only liquidity management, while shareholders do not appear to act in a manner that reduces the credit risk-taking by banks. We also conclude that the more efficient the management, the less capital the bank is likely to hold, while bank total assets are important only in capital risk management. Bank-specific approaches to credit risk management are significant.

In support of these results, Vassileios (2011) state that the failure of corporate governance to anticipate the risks facing banks exposes them to systemic risk.

4 Sample, Variables and Model Specification

4.1 Sample

This study examines the impact of corporate governance (Directors' Effectiveness, Transparency, and the Disclosure, Responsibility) on Iranian bank Risk Management. A limited number of studies have focused on the effect of corporate governance on risk management in developed countries(Bunea et al., 2018) and in developing countries(El-Masry et al., 2016, and Stulz, 2014), but has not been any study about Iran. For this reason, we decided to choose a sample of Iranian banks as a developing country and examine the effect of corporate governance on bank Risk Management. Otherwise, in the literature review asset size of banks has been neglected. So

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we surveyed the effect of corporate governance on risk management in terms of asset size in 2006-2018. Our research uses secondary data for corporate governance indicators and financial statements for other indicators. Our sample is focused on private and state banks.

Regarding asset size, banks are divided into two groups: small and large banks. Besides, to measure Risk management, we use two important risks: Liquidity risk management and Credit risk management. So, to measure liquidity risk and credit risk, we use the financial ratio method because we do not have access to the data needed to calculate credit risk and liquidity in standard methods.

4.2 Variables

4.2.1 Dependent Variable

Liquidity risk management, Credit risk management, and Overall risk management are dependent variables. According to the literature review, we use liquidity risk management and credit risk management indicators.

To measure liquidity risk, we use the following ratio as liquidity risk—liquid asset to total asset, which measures the ability of a bank to absorb liquidity shocks. A high ratio means a high ability to absorb shocks. Liquid assets to short-term liabilities measure a bank's ability to cope with a high demand for short-term liquidity. A high ratio means that the bank is liquid in the short term. Liquid assets to deposits are used to measure the bank's liquidity if the bank cannot borrow from other banks. A high ratio means that the bank can cope with long-term liquidity risk. Loan to total assets measures the share of loans in total assets. It points to the percentage of the bank's assets related to illiquid loans. When this ratio is high, the bank is less liquid. Loans to deposit+ short-term liabilities indicate the relationship between illiquid assets and liquid liabilities. When this ratio is high, the bank is less liquid. (Bank's loans –customer deposits) to total assets, which measures liquidity risk exposure. Define the difference between a bank's loans and customer deposits; the financing gap is divided by total assets.

To measure credit risk, four financial ratios have been used: Nonperforming loan to total loan, Loan loss reserve on total nonperforming loan, net charge off to total loans, and Loan Loss provision over the total loan.

The following steps are performed to create risk management indicators:

1) We make liquidity and credit risk indicators.
2) We normalized liquidity and credit risk indicators:

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$$I_{ti} = \frac{X_i - \min(X_i)}{\max(X_i) - \min(X_i)} \quad (1)$$

I_{ti} is Normalized indicators, X_i is every liquidity and credit risk indicator, $\min(X_i)$ is Min every indicator, $\max(X_i)$ is Max every indicator.

3) We make liquidity risk management and credit risk management:

$$LRM\ or\ CRM = \frac{\sum_{t=0}^{t=t} I_{ti}}{n} \quad (2)$$

LRM is Liquidity risk management, CRM is credit risk management, n is the number of indicators in every category. LRM and CRM are between 0 and1. The closer LRM and CRM to one, the better the liquidity and credit risk management.

4) We make good overall risk management (GORM). GORM is an ordinary variable. It takes 1,2, and 3. GORM is 1, and banks have high-quality risk management if LRM and CRM are >0.5. GORM is 2, and banks have medium quality risk management if LRM or CRM are >0.5. GORM is 3, and banks have low-quality risk management if LRM and CRM are <0.5.

4.2.2 Explanatory Variables

The explanatory variables in this study such as Ahmadyan and Ghasemi Ali Abadi (2021) and Ghasemi Aliabadi et al. (2017),are related to Directors' Effectiveness, Transparency, and the Disclosure, Responsibility and total corporate governance indicator. Also we designed dassetcor indicator. Thus, it is the multiple of corporate governance indicators to asset size dummy variable. Asset size dummy variable is one of the bank's assets size is more than 5% and zero otherwise.

4.2.3 Control Variables

Besides these two types of measures (dependent and independent variables), Table (1) introduces control variables.

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Table 1
Definition of the variables

Variables	Indicators	Definition
Asset combination	Liquid asset to total asset Due from Central bank to total asset Due from other banks to total asset Investments to total asset Fixed assets to total asset	
Liability Combination	Due to Central Bank to total liability Due to other banks to total liability Deposit Escape to total liability Investment Total deposit to total liability Capital to total liability	
Combination of Income	Interest income to total income Non-Interest income to total income	
Combination of Expense	Interest expenditure to total expense Non Interest expenditure to total expense	
Banking Industry	Zscore Bank size Bank age ownership Cost to Income Interest Margin Loan to deposit Equity to loan	Bank size is the logarithm of an asset. Ownership is a dummy variable; the dummy variable is one for private banks and zero otherwise. Interest margin is the loan interest rate – deposit interest rate.
Capital adequacy	Capital adequacy	Capital to Weighted assets
Macro economics	Inflation GDP Growth Deposit interest	

Z score is:

$$\text{Zscore}_{ti} = \frac{\text{capital adequacy}_{\text{ti}} + \mu_{\text{roati}}}{\sigma_{\text{roai}}} \quad (3)$$

Which Zscore_{ti} is banking stability, μ_{roati} is mean of ROA, and is the standard deviation of ROA.

4.3 Model Specification

Since in the research model (eq. 2), the dependent variable appears as a lag on the right side of the equation, we are faced with a dynamic panel data model. The general form of a dynamic pattern in panel data is as follows:

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$$Y_{it} = \alpha Y_{it-1} + \beta X_{it} + \mu_i + \varepsilon_{it} \quad (4)$$

Which Y_{it} is dependence variable, X_{it} are independence variables, μ_i is cross-section error factors and ε_{it} is cross-section error term ith factor in t. When the dependent variable appears on the right side in the panel data model, OLS estimators are not compatible (Arellano and Bond, 1991). Then we must use 2SLS (Anderson and Hsiao, 1982) and Generalized Method of Moments (Arellano and Bond, 1991). The 2SLS estimation may yield large variances for the coefficients due to the difficulty in selecting tools, and the estimates are not statistically significant. Therefore, the two-step GMM method proposed by Arellano and Bond has been proposed to solve this problem.

$$Y_{it} - Y_{it-1} = \alpha(Y_{it-1} - Y_{it-2}) + \beta(X_{it} - X_{it-1}) + (\epsilon_{it} - \varepsilon_{it-1}) \quad (5)$$

That is, the first is differentiated to eliminate the effects of the cross-sections or μ_i respectively, from the model and in the second step, the residuals in the first step are used to balance the variance-covariance matrix. In other words, this method creates variables called instrument variables to have consistent and unbiased estimates (Baltagi, 2005).

GMM estimator compatibility depends on the validity of the assumption of serial correlation of error and tools. We use Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) tests. Arellano and Bond (1991) is a Sargan (J-Statistic) test that tests the validity of the tools. J-Statistic has χ^2 distribution. Arellano and Bover (1995) is a Serial Correlation Test that tests Second-Order Serial Correlation in First-Order Differential Error term.

In this test, the GMM estimator is consistent when there is no second-order serial correlation in the error terms from the first-order differential equation. Non-rejection of the null hypothesis of both tests provides evidence for the assumption of serial correlation and validity of the instruments. The GMM estimator is consistent if there is no second-order serial correlation in the error terms from the first-order differential equation.

5 Empirical Results

5.1 Unit Root Test and Co-integration Test

To check our data's stationarity, we use two types of Panel Unit Root tests: Common unit root test and Individual unit root test. As a common unit root process, we use Levin, Lin, and Chu Panel Unit root test, and for individual unit root processes, we use three types of panel unit root tests. The first is Im

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et al. (2013) Panel unit root test, the second is the Fisher type test, the ADF-Fisher Chi-square test, and the last is a Fisher type test, the PP-Fisher Chi-square Panel unit root test. At 5%, all variables except bank size, loan to deposit, Inflation, GDP growth, Deposit interest are stationary in Level and Individual Intercept. These variables are stationary after 1st difference and Individual Intercept. Deposit interest is stationary after 2nd difference and Individual Intercept.

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Table 2
Unit rate test

Variables	Levin, Lin, Chu	Im, Pesaran, Shin	Fisher-PP	Fisher- ADF
Liquid asset to total asset	-6.13594 (0.0000)	-5.76034 (0.0000)	77.3015 (0.0000)	82.3974 (0.0000)
Due from Central bank to total asset	-7.35595 (0.0000)	-6.56044 (0.0000)	92.3719 (0.0000)	90.8991 (0.0000)
Due from other banks to total asset	-6.98582 (0.0000)	-7.54524 (0.0000)	93.5028 (0.0000)	112.646 (0.0000)
Investments to total asset	-1.10546 (0.1345)	-2.08532 (0.0185)	33.2865 (0.0068)	32.3076 (0.0091)
Fixed assets to total asset	-4.14452 (0.0000)	-5.32695 (0.0000)	66.0312 (0.0000)	62.4045 (0.0000)
Due to Central bank to total liability	-5.37401 (0.0000)	-4.56023 (0.0000)	57.8228 (0.0000)	70.0473 (0.0000)
Due to other banks to total liability	-3.27299 (0.0005)	-3.07240 (0.0011)	44.2792 (0.0002)	117.320 (0.0000)
Deposit Escape to total liability	-4.24031 (0.0000)	-4.80910 (0.0000)	85.0539 (0.0000)	71.8863 (0.0000)
Investment	-1.60866 (0.0538)	-1.70473 (0.0441)	30.7143 (0.0146)	52.9941 (0.0000)
Total deposit to total liability	-2.44477 (0.0072)	-2.74525 (0.0030)	37.6582 (0.0017)	47.0493 (0.0001)
Capital to total liability	-10.8601 (0.0000)	-14.5049 (0.0000)	334.276 (0.0000)	389.372 (0.0000)
Interest income to total income	-3.92546 (0.0000)	-4.55403 (0.0000)	56.9446 (0.0000)	47.0546 (0.0001)
Non-Interest income to total income	-3.92546 (0.0000)	-4.55403 (0.0000)	56.9446 (0.0000)	47.0546 (0.0001)
Interest expenditure to total expense	-5.63048 (0.0000)	-5.17233 (0.0000)	73.4513 (0.0000)	74.7833 (0.0000)
Non Interest expenditure to total expense	-14.2134 (0.0000)	-13.2977 (0.0000)	167.702 (0.0000)	204.170 (0.0000)
Zscore	-11.3410 (0.0000)	-9.72482 (0.0000)	123.002 (0.0000)	123.801 (0.0000)
Bank size	-7.11570 (0.0000)	-6.81424 (0.0000)	98.0571 (0.0000)	162.201 (0.0000)
Cost to Income	-3.17095 (0.0008)	-3.98745 (0.0000)	61.7401 (0.0000)	62.6079 (0.0000)
Interest Margin	-4.46632 (0.0000)	-4.15966 (0.0000)	55.6154 (0.0000)	54.6344 (0.0000)
Capital adequacy	6.08686 (0.0000)	-7.73269 (0.0000)	90.6268 (0.0000)	108.252 (0.0000)
Loan to deposit	-2.71980 (0.0033)	.....	252.549 (0.0000)	385.083 (0.0000)
Inflation	-2.16420 (0.0152)	.....	5.22871 (0.0732)	5.22871 (0.0732)
GDP growth	-2.97424 (0.0015)	.....	6.90373 (0.0317)	6.90373 (0.0317)
Deposit interest	-0.76864 (0.0000)	.....	6.66812 (0.0356)	7.11977 (0.0284)
Equity to loan	-34.6141 (0.0000)	-29.8938 (0.0000)	369.984 (0.0000)	612.548 (0.0000)

Note:
Null: Unit root

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Levin, Lin & Chu Test: Assumes Common Unit root Process
Im, Pesran and Shin: Assumes individual unit root process
ADF-Fisher chi-square: Assumes individual unit root process
PP- Fisher Chi-square: Assumes individual unit root process
Probbilities fo Fisher tests are computed using and asymptotic chi- Square distribution. Automatic Lag Length selection based on SIC
Source: Research Findings

Because of non-stationary variables, we use three types of Panel Cointegration tests. Pedroni (1999) introduced one type of test, and a second type was introduced by Kao (1999). The third is combined Individual Tests (Fisher(1932/Johansen(1988)) Panel Cointegration. At a 5% level of significance, the Pedroni residual cointegration test, Johnsen Fisher and Kao residual cointegration test reject the null hypothesis, which means variables have a long-run relationship. Details results are given in Table 3, Table 4, and Table 5.

From table 3 -5 in every case of opportunity cost except in Panel V-Statistics long term and difference between long term and short term at 5% level of significance, accept the null hypothesis; otherwise, in all cases at 5% level of significance, we reject the null hypothesis of no cointegration. It means the Variables (dependence and independence) have a long-run relationship.

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Table 3
Pedroni Residual cointegration test

Variables							**within-dimension**					
Dependent variable	LRM	CRM	GORM	LRM	CRM	GORM	LRM	CRM	GORM	LRM	CRM	GORM
	V-Statistic			Rho- Statistic			PP – Statistic			ADF- Statistic		
Bank size	-0.122662 (0.0488)	0.191635 (0.0240)	-6.00543 (0.0259)	-5.185030 (0.0000)	-6.167100 (0.0000)	8.959366 (0.0000)	-4.720034 (0.0000)	-5.958020 (0.0000)	6.931204 (0.0000)	-3.834891 (0.0001)	-8.458064 (0.0000)	-4.445496 (0.0000)
Loan to deposit	-0.567213 (0.0147)	0.047661 (0.0410)	0.467486 (0.0201)	-5.369658 (0.0000)	-5.697753 (0.0000)	9.512966 (0.0000)	-4.693034 (0.0000)	-5.545623 (0.0000)	6.934373 (0.0000)	-3.275972 (0.0005)	-7.574624 (0.0000)	-5.529507 (0.0000)
Inflation	3.869731 (0.0001)	1.299782 (0.0068)	1.368271 (0.0568)	-10.35972 (0.0000)	-6.474977 (0.0000)	10.39606 (0.0000)	-7.696477 (0.0000)	-6.476084 (0.0000)	7.890143 (0.0000)	-5.677552 (0.0000)	-8.172108 (0.0000)	-4.964402 (0.0000)
GDP growth	1.566169 (0.0587)	0.504600 (0.0069)	0.440921 (0.0296)	-100.16793 (0.0000)	-6.118109 (0.0000)	9.335660 (0.0000)	-8.178112 (0.0000)	-6.129315 (0.0000)	7.790750 (0.0000)	-6.497568 (0.0000)	-7.994332 (0.0000)	-6.911510 (0.0000)
Deposit interest	4.000808 (0.0000)	0.479125 (0.0159)	1.114086 (0.0328)	-11.51933 (0.0000)	-7.565539 (0.0000)	9.788230 (0.0000)	-8.184826 (0.0000)	-6.669922 (0.0000)	7.143309 (0.0000)	-5.621668 (0.0000)	-7.542740 (0.0000)	-5.730278 (0.0000)

Note:
Null Hypothesis: No cointegration
Trend Assumption: No deterministic intercept or trend
Automatic lag length selection based on SIC

	between-dimension											
Bank size				-4.705933 (0.0000)	-3.208209 (0.0007)	-6.251858 (0.0000)	-5.337676 (0.0000)	-5.744836 (0.0000)	6.674839 (0.0000)	-5.300090 (0.0000)	-6.449841 (0.0000)	-3.524824 (0.0002)
Loan to deposit				-5.064554 (0.0000)	-3.403831 (0.0003)	-4.342569 (0.0000)	-5.601697 (0.0000)	-6.007341 (0.0000)	10.91574 (0.0000)	-2.286287 (0.0111)	-5.719640 (0.0000)	-4.317506 (0.0000)
Inflation				-7.114274 (0.0000)	-4.235631 (0.0000)	-8.259263 (0.0000)	-8.675355 (0.0000)	-6.332331 (0.0000)	8.246674 (0.0000)	-4.684080 (0.0000)	-7.123969 (0.0000)	-4.908227 (0.0000)
GDP growth				-6.523562 (0.0000)	-4.082285 (0.0000)	-6.149862 (0.0000)	-7.040996 (0.0000)	-6.041263 (0.0000)	7.576249 (0.0000)	-5.006428 (0.0000)	-7.292127 (0.0000)	-5.606796 (0.0000)
Deposit interest				-7.243530 (0.0000)	-4.644128 (0.0000)	-6.983464 (0.0000)	-6.752065 (0.0000)	-7.082158 (0.0000)	7.039520 (0.0000)	-5.239836 (0.0000)	-7.200456 (0.0000)	-5.223879 (0.0000)

Note:
Null Hypothesis: No cointegration
Trend Assumption: No deterministic intercept or trend
Automatic lag length selection based on SIC

Source: Research Findings

Table 4 presents Kao (1999) test. Kao's residual cointegration test also points us that for every case of opportunity cost at a 5% level of significance, we reject the null hypothesis of no cointegration and every case P-Value 0.0000, which is highly significant. It gives strong evidence that the variables have a long-run relationship. Number in Table 4 is T-Statistic, and the number in () is Prob.

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Table 4
Kao Co-integration test

Dependent variable	LRM	CRM	GORM
Bank size	1.326049	-3.080144	3.855220
	(0.0294)	(0.0010)	(0.0001)
Loan to deposit	1.972489	-3.531707	1.807301
	(0.0243)	(0.0002)	(0.0354)
Inflation	4.194593	1.961722	5.774419
	(0.0000)	(0.0249)	0.00000
GDP growth	5.366810	3.306062	4.422639
	(0.0000)	(0.0005)	(0.0000)
Deposit interest	-2.464593	-5.056894	-2.367662
	(0.0069	(0.0000)	(0.0090)

Source: Research Findings

In Table 5, we see different opportunity costs in both cases of Fisher trace test, and Fisher Max-Eigen test at most one variable has a long run relationship.

Table 5
Johansen Fisher Panel Co-integration Test

Dependent variable		LRM	CRM	GORM	LRM	CRM	GORM
	Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)			Fisher Stat.* (from Max-Eigen test)		
Bank size	None	48.30	87.62	55.71	33.86	70.36	40.58
		(0.0000)	(0.0000)	(0.0000)	(0.0022)	(0.0000)	(0.0002)
	At Most 1	41.28	45.99	41.89	41.28	45.99	41.89
		(0.0002)	(0.0000)	(0.0001)	(0.0002)	(0.0000)	(0.0001)
Loan to deposit	None	56.61	93.33	83.85	32.45	60.73	58.54
		(0.0000)	(0.0000)	(0.0000)	(0.0035)	(0.0000)	(0.0000)
	At Most 1	59.16	69.61	58.90	59.16	69.61	58.90
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Inflation	None	209.6	224.3	203.4	177.7	197	164.9
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	At Most 1	91.82	111.9	95.52	91.82	111.9	95.52
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GDP growth	None	186.2	218	188.5	144.9	173.3	143.8
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	At Most 1	92.21	125.3	104.5	92.21	125.3	104.5
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Deposit interest	None	109.5	142.1	116.7	61.53	77.48	62.85
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	At Most 1	91.70	116.4	100.3	91.70	116.4	100.3
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

* Probabilities are computed using asymptotic Chi-square distribution.
Source: Research Findings

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5.2 Empirical Results

Before estimating the model using GMM, we used the F- Limmer test to select between Panel data methods and Pooled method. The null hypothesis is a pooled model. According to the calculations of this study, the null hypothesis is rejected, and these models need to be estimated using panel data.

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Table 6
F- Limer Test

Models	Dependent Variable	Independent Variable (Corporate Governance Indicators)	Cross-section F	Cross-section Chi-square
1	LRM	board's structure effectiveness	3.493704 (0.0014)	24.956785 (0.0008)
2		transparency and disclosure	3.613764 (0.0010)	25.771338) (0.0006)
3		Responsibility	3.591139 (0.0011)	25.618038 (0.0006)
4		Total Corporate governance	3.444334 (0.0016)	24.621051 (0.0009)
5		board's structure effectiveness*asset size	3.745779 (0.0007)	26.663918 (0.0004)
6		transparency and disclosure*asset size	3.709155 (0.0008)	26.416616 (0.0004)
7		Responsibility*asset size	3.733969 (0.0008)	26.584199 (0.0004)
8		Total Corporate governance*asset size	3.655578 (0.0009)	26.054396 (0.0005)
9	CRM	board's structure effectiveness	1.753605 (0.0077)	12.840384 (0.0061)
10		transparency and disclosure	1.906054 (0.0695)	13.925876 (0.0525)
11		Responsibility	1.891976 (0.0717)	13.825831 (0.0544)
12		Total Corporate governance	1.994238 (0.0568)	14.551611 (0.0422)
13		board's structure effectiveness*asset size	1.905329 (0.0496)	013.920727 (0.0526)
14		transparency and disclosure*asset size	1.867007 (0.0559)	13.648299 (0.0578)
15		Responsibility*asset size	1.907213 (0.0493)	13.934106 (0.0524)
16		Total Corporate governance*asset size	1.850169 (0.0488)	13.528505 (0.0502)
17	GORM	board's structure effectiveness	2.049699 (0.0500)	14.952019 (0.0366)
18		transparency and disclosure	2.358902 (0.0241)	17.130409 (0.0166)
19		Responsibility	2.311425 (0.0270)	16.797184 (0.0188)
20		Total Corporate governance	2.217318 (0.0338)	16.135330 (0.0239)
21		board's structure effectiveness*asset size	2.166758 (0.0381)	15.779001 (0.0272)
22		transparency and disclosure*asset size	2.284932 (0.0288)	16.611040 (0.0201)
23		Responsibility*asset size	2.319475 (0.0265)	16.853712 (0.0184)
24		Total Corporate governance*asset size	2.180708 (0.0368)	15.877367 (0.0263)

Source: Research Findings

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We investigate whether the state of corporate governance in the Iranian banking industry impacts three measures of bank risks management: credit risk management, liquidity risk management, and overall risk management. Table 7 indicates the results. The number in () is t-Test and the number in [] is significant.

Ghasemi Aliabadi et al.'s (2017) paper has been used to design the corporate governance indicators, and other indicators have been selected in terms of significance. Therefore, the indicators that are rejected at the 5% level are not included in the model.

The board of directors is responsible for adopting and regulating the strategic goals, strategic framework, and organizational culture. So the board is ultimately responsible for business strategy and financial soundness of the bank, internal structure and executive approach, risk management, and law compliance (Basel Committee, 2015).

Corporate governance assessment is done to determine how much the board is committed to the principle of "professional ethics is the priority," and how much does it insist on creating and maintaining the principles of corporate governance and risk culture?

One of the main goals of this assessment method is to determine the level of the board's abilities in a financial institution with regard to conducting risks in that business.

According to representation theory, the ability of the board of directors is an effective regulatory mechanism that depends on the board's independence from chief management, the number of its members, and the relationship between the roles of chief of the board and chief executive manager. So it is argued that the larger boards are probably more alert and sensitive to the representation problems (Dechow et al., 1995).

Board's structure effectiveness has a significant positive effect on liquidity risk management, credit risk management, and total risk management. So that more independent boards will exercise more effective regulation for managers. Otherwise, the existence of independent and nonexecutive members in the board of directors helps to control the risks and, through better information disclosure, decreases the informational asymmetry between the management and shareholders (See Table (7)).

The governance must be sufficiently transparent for shareholders, depositors, other stakeholders, and market actors. Transparency is the necessary condition for effective and sound corporate governance. With inadequate transparency, market actors cannot effectively and fully monitor the board and chief management's performance and cannot see them as

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accountable representatives of banks. The philosophy of transparency in corporate governance debates is to provide necessary information for related parties to assess the effectiveness of the bank's board and chief management's performance (Basel, 2015).

According to Basel guidelines, banks must comply with the transparency and disclosure principles section that the OECD explains. So the disclosure must include the minimum requirements about the goals, governance structure, policies regarding the contents of corporate governance, the criteria for bonus or exercising corporate governance, main shareholders, voting rights, and exchange with persons (Ghasemi Aliabadi et al. (2017)).

Furthermore, banks should disclose the main points about the resources in danger and their risk management strategies without disclosing confidential information. When a bank involves in complex or ambiguous activities, it must disclose enough information about the goal, strategy, structure, and risk controls related to those activities (Ghasemi Aliabadi et al. (2017)).

Transparency and disclosure in corporate governance are related to disclosure of financial statements' information, risk management information, corporate governance and internal control information, and important events' information (Ghassemi Aliabadi et al. (2017)).

Transparency has a positive and significant effect on improving liquidity risk management, credit risk management, and total risk management. Because the requirement of transparency in liquidity risk management strategies, such as the amount of cash available to meet customer needs and the outflow of deposits, can help timely manage liquidity risk. On the other hand, transparency about the bank's strategy in identifying customers and providing micro and macro facilities helps the bank's governance identify and control credit risk (See Table (7)).

Carrol (1991) introduced the fourfold following principles with the title of "responsibility pyramid of corporates." We, such as (Ghasemi Aliabadi et al. (2017)) have used those principles as the base for determining responsibility measures in the corporate governance framework:

Economic Responsibilities: all things a firm must do to maximize its profit and create value-added for its stakeholders.

Legal Responsibilities: all things the firm is obliged to do according to laws and regulations.

Ethical Responsibilities: It is better to be done along the improvement path and reach the goals.

Philanthropic Responsibilities: include acts that are aligned with the social mission and the firm wants to perform them.

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Besides that, in this paper, we, such as (Ghasemi Aliabadi et al. (2017)) use the "Corporate Governance Guidelines for Islamic Service Providers" to explain the indices of banks' religious responsibility.

As can be seen, there is a positive relationship between accountability and liquidity risk management, credit risk management, and total bank risk management. Because according to this indicator, the Board of Directors is required to account for the liquidity risk management strategy, including the determination of the bank's interest rate on the range defined by the central bank, the amount of cash held, the ratio of investment deposit to volatile deposit, as well as credit risk management strategies such as customer identification, the ratio of large facilities to small facilities, compliance with the law of the ratio of facilities to fixed capital and the total risk of the bank. Consequently, with this responsibility in mind, they will choose strategies that will cover the risk and ensure the bank's profitability and value added. On the other hand, according to the findings of this paper and based on t statistics, the board structure is the main factor that affects risk management.

In this paper, to investigate the effect of corporate governance on bank size, the corporate governance indicators and bank size are multiplied. As shown in Table 7, corporate governance in large banks hurts liquidity, credit risk management, and overall bank risk management. The big banks of Iran have a government structure or are first government-owned and then privatized. The government structure of this group of banks has caused them not to pay enough attention to corporate governance principles. The Corporate Governance Requirements Directive in Non-Governmental Banks and Credit Institutions has also exempted state-owned banks from complying with the corporate governance principles. Therefore, the lack of compliance with corporate governance principles in this group of banks has made the risk management of this group of banks.

The loan to deposit ratio indicates the proportion of facilities against the deposit. Due to the mismatch of facility and deposit maturity, it is necessary to maintain a less than 100% ratio in banks. If the ratio is greater than 100, the bank will face more liquidity risk, increasing the bank's credit risk. Therefore, Table 7 indicates that it negatively affects liquidity and credit risk management. This criterion had no significant effect on total bank risk management and was excluded from the model.

Interest margin has a significant negative impact on liquidity risk management and credit risk management. The interest rate margin is the difference between the interest rate on the facility and the interest rate on the deposit. As this indicator rises, the gap between the interest rate on the facility

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and the deposit rate is increasing. It may increase the interest rate on the facility but not the interest rate on the deposit. The result will be an increase in bank deposits and an increase in moral hazards and bad choices, which can undermine the management of liquidity and credit risk.

Ownership is a dummy variable that has adopted one for private banks and zero for state-owned banks. As can be seen, private banks have been more successful in managing liquidity, credit risk, and overall risk management than government banks. This indicator has a significant positive effect on banks' risk management. Since private banks need to safeguard shareholder interests, improving risk management is greater than state-owned banks.

Cost to income has a significant negative impact on bank risk management. The higher the ratio, the lower the bank's risk management.

Equity to loan is another ratio that affects risk management. The higher this ratio, the greater the bank's ability to cover the risk associated with the facility's supply. Therefore, this indicator has a significant and positive effect on banks' risk management.

Capital adequacy is one of the bank health benchmarks that the Basel committee introduced. The higher this criterion indicates that the bank will be more successful in covering the bank's risks, both liquidity and credit risk. As shown in Table 7, the relationship between this criterion and banks' risk management is positive. Inflation as a measure of macroeconomic instability indicates a negative relationship between inflation and banks' risk management. As inflation increases, liquidity and credit risk increase, and credit risk management performance weakens.

In inflationary conditions, banks are faced with a decrease in the absorption of resources and an increase in the withdrawal of deposits, thus increasing the risk of liquidity. On the other hand, as inflation increases, the real interest rate on the facility decreases. Therefore, customers who are not able to repay the debt also apply for the facility, and with the inflationary conditions and the lower repayment capacity of the customers, banks' credit risk also increases. As the results of Table 7 represent, banks' overall risk management is also weakened.

Bank size is negatively correlated with bank risk management. Because the big banks in Iran are state banks, and because of government support, they do not pay enough attention to risk management and appropriate tools.

Table 7
Results- Effect of Corporate governance on Banking Risk Management

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Dependent Variable: LRM								
Independent Variable	**Model(1)**	**Model(2)**	**Model(3)**	**Model(4)**	**Model(5)**	**Model(6)**	**Model(7)**	**Model(8)**
board's structure effectiveness	0.519628 (2.540373) [0.0495]	…….	…….	…….	…….	…….	…….	…….
Transparency and disclosure	…….	0.354845 (2.496971) [0.0197]	…….	…….	…….	…….	…….	…….
Responsibility	…….	…….	0.571558 (1.622537) [0.0342]	…….	…….	…….	…….	…….
Total Corporate governance	…….	…….	…….	0.097037 (1.823694) [0.0353]	…….	…….	…….	…….
Board's structure effectiveness*asset size	…….	…….	…….	…….	-0.082296 (-1.764428) [0.0790]	…….	…….	…….
Transparency and disclosure*asset size	…….	…….	…….	…….	…….	-0.133970 (-1.692450) [0.0920]	…….	…….
Responsibility*asset size	…….	…….	…….	…….	…….	…….	-0.169504 (-1.917997) [0.0564]	…….
Total Corporate governance*asset size	…….	…….	…….	…….	…….	…….	…….	-0.047658 (-1.919541) [0.0562]
Loan to Deposit	-0.111624 (-3.249872) [0.0229]	-0.597781 (-1.75071) [0.0506]	-0.126968 (-2.172224) [0.0534]	-0.117225 (-1.730045) [0.0192]	-0.214731 (-2.679843) [0.0473]	-0.796325 (-2.244685) [0.0698]	-0.182531 (-2.582126) [0.0511]	-0.487318 (-2.146708) [0.0335]
Interest margin	-0.024005 (-2.286059) [0.0551]	-0.032723 (-1.831686) [0.0312]	-0.024774 (-2.346613) [0.0292]	-0.500914 (-1.764050) [0.0457]	-0.012354 (-2.370479) [0.0114]	-0.060213 (-3.183610) [0.0455]	-0.752633 (-0.226119) [0213]	-0.018416 (-3.575088) [0.0158]
ownership	0.104811 (2.378522) [0.0540]	0.279573 (2.325207) [0.0453]	0.112144 (3.116483) [0.0374]	0.273642 (2.256119) [0.0481]	0.036850 (1.928552) [0.0541]	0.426503 (1.875521) [0.0723]	0.0298130 (1.774282) [0.0396]	0.344634 (1.921894) [0.0297]
Cost to income	-0.129840 (-3.484940) [0.0282]	-0.600648 (-2.382083) [0.0228]	-0.235862 (-2.243918) [0.0575]	-0.257558 (-2.569531) [0.0110]	-0.709541 (1.728354) [0.0672]	-0.570493 (-1.612873) [0.0746]	0.696395 (1.726002) [0.0686]	-0.039320 (-2.408387) [0.0384]
Equity to loan	0.231310 (1.916403) [0.0605]	0.260008 (1.903688) [0.0367]	0.271327 (2.206660) [0.0289]	9.350005 (2.057665) [0.0541]	0.369166 (2.225532) [0.0271]	0.411169 (2.430448) [0.0159]	0.388165 (2.346432) [0.0198]	0.420170 (2.466565) [0.0144]
Capital adequacy	0.005492 (2.323594) [0.0466]	0.260075 1.910351) [0.0492]	0.010553 (2.355192) [0.0228]	0.028771 (2.707139) [0.0402]	0.149486 (1.721118) [0.0635]	0.322864 (2.037205] 0.05704]	0.992857) [0.0281]	0.214542 (3.237225) [0.0127]
Inflation	0.001710 (2.222174) [0.0244]	0.544123 (2.112518) [0.0105]	0.352272 (3.488112) [0.0260]	0.005097 (2.443441) [0.0579]	0.133632 (2.405361) [0.0568]	0.520309 (2.167772) [0.0669]	0.866321 (2.26967) [0.0477]	-0.104331 (-3.237225) [0.0127]
Bank size	-0.207535 (-1.911369) [0.0631]	0.107065- (-2.105561) [1.9023]	-0.206552 (-2.110945) [0.0589]	-0.257558 (-2.569531) [0.0469]	…….	…….	…….	…….
LRM(-1)	0.419162 (2.152318) [0.0491]	0.268985 (2.122867) [0.0239]	0.566676 (4.307266) [0.0060]	2.018212 (2.265228) [0.0311]	0.123714 (2.115896) [0.0587]	0.395097 (2.372718) [0.0097]	0.194271 (2.184059) [0.0541]	0.510923 (2.469375) [0.0393]
R-square	0.823071	0.699079	0.580512	0.953289	0.752303	0.608771	0.546620	0.581396
D-W	1.716288	1.821474	1.879655	1.833730	1.921832	1.804679	1.851157	1.826962
J-statistic	16.030695	11.342281	16.980375	11.027076	13.70795	12.41609	13.28721	13.00363
Prob(J-statistic)	0.050922	0.058515	0.053789	0.049300	0.046979	0.046435	0.058924	0.020888
Dependent Variable: CRM								
	Model(9)	Model(10)	Model(11)	Model(12)	Model(13)	Model(14)	Model(15)	Model(16)
board's structure effectiveness	2.041852 (2.167214) [0.0674]	…….	…….	…….	…….	…….	…….	…….
Transparency and disclosure	…….	2.254121 (2.164184) [0.0569]	…….	…….	…….	…….	…….	…….
Responsibility	…….	…….	0.654636 (2.535743) [0.0279]	…….	…….	…….	…….	…….
Total Corporate governance	…….	…….	…….	0.200385 (1.879641) [0.0615]	…….	…….	…….	…….
Board's structure effectiveness*asset size	…….	…….	…….	…….	-0.262464 (-1.84406) [0.0401]	…….	…….	…….
Transparency and disclosure*asset size	…….	…….	…….	…….	…….	-4.630005 (-2.000548) [0.0426]	…….	…….
Responsibility*asset size	…….	…….	…….	…….	…….	…….	-0.100200 (-2.067542) [0.0462]	…….

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Total Corporate governance*asset size	…….	…….	…….	…….	…….	…….	…….	-0.264232 (-1.801230) [0.0361]
Loan to Deposit	-0.014662 (-2.137690) [0.0196]	-0.629228 (-3.217821) [0.0278]	-0.775874 (-2.088618) [0.0295]	-0.122930 (-2.399121) [0.0602]	-0.104123 (-2.448882) [0.0540]	-0.109822 (-2.481476) [0.0307]	-0.965270 (-2.356490) [0.218]	-0.124926 (-1.744711) [0.0355]
Interest margin	-0.134840 (-3.152209) [0.0297]	-0.153844 (-4.153777) [0.0434]	-0.027526 (-2.305645) [0.0305]	-0.025224 (-1.603719) [0.0466]	-0.109847 (-1.789045) [0.0309]	-0.196086 (-1.724072) [0.0271]	-0.020248 (-1.771503) [0.0612]	-0.019483 (-1.780672) [0.0358]
ownership	0.455316 (2.165267) [0.0689]	0.629086 (2.163784) [0.0401]	0.440058 (3.336887) [0.0365]	0.172468 (1.861940) [0.0397]	0.308849 (2.129766) [0.0298]	0.037997 (2.068371) [0.0286]	0.039353 (2.163542) [0.0459]	0.350572 (1.879391) [0.0301]
Cost to income	-0.011968 (-2.127110) [0.0415]	-0.411590 (-2.163378) [0.0407]	-0.020023 (-4.484873) [0.0000]	-0.716614 (-2.508799) [0.0114]	0.666735 (1.872825) [0.0624]	-0.670234 (-1.918195) [0.0564]	-0.662736 (-1.824772) [0.0694]	-0.677035 (-1.899504) [0.0588]
Equity to loan	0.125231 (3.053857) [0.0175]	0.241126 (2.190087) [0.0494]	0.196362 (1.876540) [0.0519]	0.239247 (1.968867) [0.0337]	0.104151 (1.688273) [0.0420]	0.107152 (1.703198) [0.0482]	0.979005 (2.592543) [0.0541]	0.115162 (1.70935) [0.0478]
Capital adequacy	0.104898 (2.123013) [0.0229]	0.048246 (2.178235) [0.0587]	0.134910 (2.389113) [0.0566]	0.352711 (2.315009) [0.0531]	0.632551 (2.232213) [0.0192]	0.646544 (1.824639) [0.0435]	0.616858 (2.061916) [0.0289]	0.678054 (1.947985) [0.0134]
Inflation	0.429339 (2.108785) [0.0135]	0.382236 (2.105904) [0.0158]	0.425184 (2.502510) [0.0158]	0.382549 (1.773232) [0.0402]	0.543241 (2.225167) [0.0221]	0.517234 (2.220310) [0.0258]	0.535234 (1.818722) [0.0197]	0.519232 (1.932230) [0.0237]
Bank size	0.786713 (2.144385) [0.0538]	0.729683 (3.828448) [0.0190]	0.239531 (1.739179) [0.0460]	0.801419 (2.040415) [0.0478]	…….	…….	…….	…….
CRM(-1)	2.231062 (2.164688) [0.0396]	2.590168 (6.319126) [0.0000]	0.189100 (5.198727) [0.0427]	0.500060 (2.597235) [0.0510]	0.431684 (2.227889) [0.0208]	0.420186 (1.875582) [0.0205]	0.445544 (2.037073) [0.0308]	0.398008 (1.857572) [0.0483]
R-square	0.750431	0.448865	0.442633	0.511259	0.601448	0.611752	0.571347	0.591095
D-W	1.988556	1.700322	1.754792	1.972014	1.956011	1.943178	1.859471	1.944172
J-statistic	13.371737	17.610101	19.163805	24.69651	14.62318	14.632170	14.60339	14.611094
Prob(J-statistic)	0.003118	0.012673	0.035677	0.045408	0.049097	0.048659	0.000189	0.059704
	Dependent Variable: GORM							
	Model(17)	Model(18)	Model(19)	Model(20)	Model(21)	Model(22)	Model(23)	Model(24)
board's structure effectiveness	2.030139 (4.881706) [0.0000]	…….	…….	…….	…….	…….	…….	…….
Transparency and disclosure	…….	0.307540 (2.208505) [0.0350]	…….	…….	…….	…….	…….	…….
Responsibility	…….	…….	3.118392 (2.207977) [0.0354]	…….	…….	…….	…….	…….
Total Corporate governance	…….	…….	…….	0.425535 (2.582341) [0.0509]	…….	…….	…….	…….
Board's structure effectiveness*asset size	…….	…….	…….	…….	-0.113976 (-2.720490) [0.0420]	…….	…….	…….
Transparency and disclosure*asset size	…….	…….	…….	…….	…….	-0.208239 (-1.912459) [0.0625]	…….	…….
Responsibility*asset size	…….	…….	…….	…….	…….	…….	-0.260067 (-1.883823) [0.0578]	…….
Total Corporate governance*asset size	…….	…….	…….	…….	…….	…….	…….	-0.335691 (-2.331247) [0.0408]
ownership	0.513448 (2.216923) [0.0285]	0.821505 (2.162647) [0.0409]	0.961985 (2.165118) [0.0690]	0.356220 (3.528449) [0.0377]	0.100466 (1.734750) [0.0729]	0.990122 (1.939821) [0.0630]	0.844990 (1.628467) [0.602]	0.112329 (1.944185) [0.0663]
Cost to income	-0.205070 (-2.029188) [0.0567]	0.504319 (2.015762) [0.0478]	0.976874 (2.217824) [0.0278]	-0.010841 (-2.272225) [0.0557]	-0.739380 (-1.915877) [0.0607]	-0.735997 (-1.976442) [0.0299]	-0.590285 (-1.692378) [0.0594]	0.560583 (2.669603) [0.0503]
Equity to loan	0.119818 (1.631090) [0.0872]	0.104068 (1.822961) [0.0922]	0.908159 (3.217824) [0.0278]	0.123987 (3.424271) [0.0558]	0.125943 (2.910544) [0.0040]	0.128543 (2.944910) [0.0036]	0.123942 (2.902406) [0.0041]	0.126343 (2.917075) [0.0039]
Capital adequacy	0.248305 (2.464484) [0.0428]	0.190802 (1.846218) [0.0984]	0.980323 (4.264893) [0.0319]	0.118552 (2.405476) [0.0458]	0.297211 (2.476897) [0.0140]	0.307771 (2.542697) [0.0117]	0.280971 (2.339252) [0.0202]	0.292211 (2.428265) [0.0160]
Inflation	0.111243 (2.304445) [0.0511]	0.529899 (2.535001) [0.0593]	0.165323 (2.279640) [0.0513]	0.371155 (2.023891) [0.0509]	0.741687 (1.843390) [0.0399]	0.579664 (2.646324) [0.0187]	0.653787 (2.747397) [0.0556]	0.573689 (1.641298) [0.0822]
Bank size	-0.480686 (-2.187660) [0.0513]	-0.561650 (-2.211770) [0.0325]	-0.498753 (-4.172854) [0.0000]	-0.132613 (-2.040054) [0.0481]	…….	…….	…….	…….
GRM(-1)	0.564875 (2.160254) [0.0428]	0.108986 (2.185480) [0.0530]	0.716613 (2.701351) [0.0510]	0.901347 (4.127766) [0.0000]	0.417371 (1.825322) [0.0286]	0.383187 (2.466864) [0.0439]	0.480822 (10.633676) [0.1038]	0.438265 (1.605872) [0.0709]
R-square	0.763660	0.523320	0.690638	0.450048	0.670310	0.704545	0.460966	0.720208

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D-W	2.416991	1.988038	1.865865	1.943624	1.906687	1.913219	1.924177	1.982888
J-statistic	12.035763	15.658956	12.045419	26.081063	13.074036	13.743099	13.862386	13.594959
Prob(J-statistic)	0.050006	0.016929	0.031236	0.005862	0.022144	0.002875	0.001051	0.009698

Source: Research Findings

6 Conclusion

In the financial literature, corporate governance is a set of rules, structures, and procedures that reassure investors to preserve the value of corporate stocks (e.g., Shleifer and Vishny, 1997). Meanwhile, risk management is one of the key aspects of corporate governance in banks.

This paper examines the effect of corporate governance on bank risk management in Iranian banks. To this end, four indicators have been designed for corporate governance using the model of Ghasemi Aliabadi et al (2017). First, the financial ratios approach was used to measure liquidity and credit risk due to the lack of access to data needed to measure liquidity risk and credit risk.

This article's contribution to other articles is: Besides measuring liquidity and credit risk, the Bank's overall risk management is also designed. Given the importance of bank size in corporate governance performance, a dummy variable for bank size is defined. Then, the corporate governance indicators are multiplied on this dummy variable, and its result as an independent variable is entered into the models under consideration. Finally, 24 models are designed to examine the impact of corporate governance on bank risk management.

Other independent variables were selected based on the literature review and their significance. After performing the unit root and cointegration test, we choose the appropriate Panel or pool model with the F-Limmer test. Since the risk management status in the previous period affects the risk management in the current period, this model was estimated by the GMM method.

The results indicate that corporate governance indicators positively correlate with liquidity risk management, credit risk management, and total risk management. According to the T statistic, the board of directors' structure has a more positive effect than others on banks' risk management.

The effect of good corporate governance in terms of bank size is negatively correlated with bank risk management because large banks in Iran have been government-owned or formerly government-owned and are now private. Therefore, these banks are weaker than private banks in terms of corporate governance.

The ownership variable is positively related to risk management because, according to the existing regulations in Iran, private banks are required to

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comply with corporate governance principles, but there is no regulation for state-owned banks.

The size of banks has an ambiguous relationship with risk management. The larger banks have better liquidity risk management than the smaller ones, but credit risk management decreases with the increasing size of banks. Because large banks are more likely to be affected by government requirements to provide facilities to specific sectors than small ones, they may not be profitable and face greater credit risk due to the provision of large, unsecured facilities.

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