Journal of Industrial and Systems Engineering
Vol. 17, No. 2, pp. 1-13
Spring (April) 2025

JISE

The Impact of Enterprise Risk Management on the Financial Performance of Banks with Emphasis on Four Performance Metrics

Kourosh Zarinjooei [1], Hasan Ghodrati [2,*], Hossein Panahian [3], Hossein Jabbari [4]

[1] *Department of Financial Engineering, Kashan Branch, Islamic Azad University, Kashan, Iran*

[2] *Department of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran*

[3] *Department of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran*

[4] *Department of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran*

Abstract

This research examines the impact of enterprise risk management on the financial performance of banks, focusing on four performance metrics: economic value added, net profit, average cost of capital, and return on investments. To this end, linear regression analyses were conducted using data from 24 banks listed on the Tehran Stock Exchange over 10 years. The findings indicate that enterprise risk management has a positive and significant effect on the financial performance of banks, as this impact has been confirmed across the four different performance metrics, including economic value added, net profit, average cost of capital, and return on investments. Specifically, the positive coefficient of enterprise risk management in the linear regression analyses indicates its positive impact on economic value added (t-statistic 0.069), net profit (t-statistic 1.122), average cost of capital (t-statistic 0.359), and return on investments (t-statistic 0.584). Additionally, sustainability reporting has been identified as a moderating factor in these relationships, suggesting that it can enhance the positive impact of enterprise risk management on financial performance. These results emphasize the importance of effectively implementing risk management and sustainability reporting to improve the financial performance of banks listed on the Tehran Stock Exchange.

Keywords: Risk management, sustainability reporting, financial performance, prioritization.

1- Introduction

In the present era, banks, as key financial institutions in the economy of any country, face numerous challenges, with risk management being one of the most important factors for their success. Given the

* Corresponding Author

complexity and uncertainties in the economic environment, banks are compelled to adopt effective strategies for identifying and managing various risks (Abu-Rumman, 2021). Enterprise risk management, as a comprehensive approach, helps banks identify and control credit, market, operational, and legal risks, thereby improving their financial performance. It serves as a key process in banks for identifying, assessing, and controlling various risks that can impact their financial performance (Maulana et al., 2024).

In today's complex and dynamic world, banks encounter multiple challenges, including credit, market, operational, and legal risks. These risks can directly affect profitability, liquidity, and ultimately the financial performance of banks. The financial performance of banks is not only measured by financial metrics but is also influenced by non-financial factors (Jaelani, 2024). Performance metrics allow banks to evaluate their performance more comprehensively. In this context, examining the impact of risk management on these metrics can help clarify the relationships between risk and performance, assisting bank managers in making strategic decisions (Bogonko, 2023).

Given the above points, research in this area is of high importance due to the direct impact of risk management on the financial performance of banks. Considering the vital role of banks in the economy, improving their financial performance can lead to increased economic stability and reduced systemic risks. Additionally, identifying and analyzing the impact of risk management on various performance metrics can help bank managers adopt better strategies for risk management and enhance their financial performance.

Despite numerous studies on risk management and financial performance, there are still gaps in the existing literature. Many studies have examined the impact of risk management on financial performance in general, with less attention paid to the detailed analysis of its impact on the four performance metrics. Furthermore, the lack of comprehensive studies that simultaneously investigate these two areas indicates a need for further research in this field. This research can serve as a credible resource for decision-makers and researchers in the financial and banking sectors. Therefore, considering the importance and necessity of this topic, the present study aims to examine the impact of enterprise risk management on the financial performance of banks, emphasizing the four performance metrics. This research not only helps identify the challenges and opportunities in risk management but can also act as a credible resource for researchers and decision-makers in the financial and banking sectors.

The main question of this research is, "How does enterprise risk management affect the financial performance of banks, and how is this impact observable on the four performance metrics?" This question can help clarify the relationships between risk management and the financial performance of banks, paving the way for future research in this area.

2- Literature Review

2-1-Risk Management in Banks

Risk management is inherently part of the business model of banks, unlike non-financial companies. Banks create value for shareholders through their commitments as part of their business model, and their success depends on their ability to generate liquidity claims. The risk-taking behavior of banks can expose the economy to negative factors, especially in situations where materialistic CEOs influence the risk control environment (Stulz, 2016; D'Agnolo & Stulz, 2015; Nozari et al., 2024). These managers may weaken risk controls, leading to opportunistic behaviors among employees, which can increase risk and harm the economy.

Research indicates that banks with friendly governance with shareholders perform worse during crises compared to other banks and have a higher risk of bankruptcy (Beltratti & Stulz, 2012; Erkens et al., 2012; Movahed et al., 2023). Additionally, inconsistent and weak controls can benefit the personal interests of employees, ultimately harming the bank and its shareholders. For example, Ellul and Yaramilli (2013) showed that banks with high-risk Management Index (RMI) perform better than those with low RMI, which is related to the low demand for RMI by shareholders of certain banks.

Misguided corporate cultures have also been recognized as significant factors in financial crises. If materialistic CEOs negatively influence organizational values, employees may exhibit a greater tendency toward opportunistic behaviors. This paper examines the relationship between the internal

business activities of senior bank managers and future abnormal returns over various periods, seeking to identify the impacts of managerial materialism on opportunistic behaviors.

Risk management should not only help reduce cost risks but also create an incentive to focus on downside risks. If materialistic CEOs weaken risk management structures, this can lead to increased exposure of banks to risk (Akaria et al., 2017; Nozari et al., 2024). The paper investigates whether banks with materialistic CEOs are significantly more exposed to downside risk compared to those with non-materialistic CEOs and whether these differences have increased during recent crises.

Ultimately, accepting downside risk may be an optimal strategy for balancing risks and rewards from the shareholders' perspective. However, if employees in banks run by materialistic CEOs benefit from their risky options, this can lead to negative outcomes for the bank and its shareholders. The paper examines the relationship between CEO materialism and higher returns and expected excess margins, emphasizing that opportunistic behaviors can lead to higher risks and harm the economy.

2-2-Financial Performance of Banks

A review of the financial and management literature shows that measuring organizational performance has received significant attention and is effective in ensuring the achievement of organizational goals in the continuity, cessation, or development of banks. Organizational performance can be measured using various metrics, and finding the appropriate method provides a competitive advantage (Richard et al., 2009). Organizational performance can be measured based on perceived (primary resources) and objective (secondary resources) metrics. Perceived metrics are also considered subjective measures and are assessed through surveys and questionnaires (Selvarajan et al., 2007). Richard et al. (2009) classified secondary resources or objective metrics for measuring organizational performance into three categories: 1) accounting and financial metrics (percentage of sales from new products, profit, invested capital, return on assets, return on investment, return on equity, earnings per share, and net profit), 2) market (sales, market share), and 3) integrated (shareholder returns, economic value added.

Chakravarty (1986) concluded from his research findings that financial and accounting metrics are not capable of detecting performance differences among various organizations. Kaplan and Norton (1996) stated that financial or accounting metrics can provide misleading results regarding the continuous improvement and innovation of an organization and are not suitable for measuring organizational performance, while value-based metrics, such as economic value added, have gained increasing importance. Economic value added is defined as the "additional return" generated from an investment and the capital invested in that investment (Kovach & Ilina, 2013). Based on the theoretical foundations presented, the following empirical foundations related to the research are reviewed:

In a study conducted by Gordon et al. (2009), the relationship between comprehensive enterprise risk management and organizational performance was examined from a contingency approach. The results showed a direct relationship between risk management and financial performance, indicating that the use of comprehensive risk management techniques can improve organizational performance. Factors affecting organizational performance, including environmental uncertainty, industry competition, company size, organizational complexity, and board attitude, were identified. This research is considered an innovative study in the field of enterprise risk management and has laid the groundwork for many subsequent studies in this area.

In another study by Height and Lineberg (2011), the Q-Tobin metric was used to evaluate the performance of insurance companies. The results showed a positive relationship between risk management and organizational performance, indicating that the implementation of risk management systems leads to improved performance in the capital market. This research emphasizes the positive impact of risk management on the financial performance of organizations.

Leoni and Florio (2017) examined the relationship between risk management execution systems and the performance of Italian companies. They found that companies utilizing advanced risk management levels perform better in terms of financial and market evaluation. This research indicates that an effective risk management system can help reduce risk and thus improve performance.

Movahed et al. (2024) also investigated the relationship between the effectiveness of risk management and the improvement of financial performance in non-financial Brazilian companies. The

results showed that risk plays a significant role in the core activities of organizations, and performance improvement depends on the maturity level of risk management and stakeholder participation. This study emphasizes the importance of risk management in enhancing organizational performance.

In a study by Khazari (2023) titled "Risk Management in Smart Banking Businesses," the importance of quality relationships with customers and the efficiency of banking processes was emphasized. This research indicates that banks are seeking tools to analyze data collected from their IT systems and are using business intelligence (BI) and machine learning technology to understand customer behavior and gain a competitive advantage. Given the increasing importance of risk management after the global financial crisis, this research addresses banking transformations and risk management challenges, emphasizing the need to identify, measure, and manage risks.

Feyz Arefi and Hafezian (2023) in a study titled "Assessing Risk Management in Iranian Banking Based on IFSB Guidelines" examined the state of risk management in banks. This study, using a validated questionnaire, analyzed data and showed that 9 out of 42 components of risk management are not in a favorable state. The findings indicate weaknesses and opportunities for improvement in market, investment, and liquidity risk management.

Fallah et al. (2023) also identified factors affecting risk management in the tax administration organization. This research, using a field method and a sample of 157 individuals employed in the tax organization and university, showed that risk management is influenced by factors such as tax laws, tax litigation, and human resources. Additionally, Ghabishi et al. (2022) examined risk and its management in Islamic banking, providing suggestions for enhancing Islamic banking, including diversification in credit products and designing financial instruments aligned with Islamic rules. These studies emphasize the importance of risk management in improving the performance and efficiency of financial systems.

3- Methodology

In this study, the model presented in the research by Zarrin Jooyi et al. (2024) is utilized as follows:

$$Y_{it} = a_0 + a_1 \mathrm{ERM}_{it} + a_2 SR_{it} + a_3 SR \times ERM_{it} + a_4 FSI_{it} + a_5 FRI_{it} + a_6 CFO_{it} + a_7 GOP_{it} + a_8 GOV_{it} + a_9 ALI_{it} + \varepsilon_{it} \quad (1)$$

In this equation, YY is the dependent variable, representing the financial performance of banks, which includes four metrics: profitability, asset quality, liquidity, and financial stability. Each of these metrics impacts the efficiency and success of banks in managing risk and improving their financial performance. Accordingly, four regression models are estimated. The independent variables of the research include ERM (Enterprise Risk Management), SR (Sustainability Reporting), FSI (Firm Size), FRI (Financial Leverage), CFO (Cash Flow from Operations), GOP (Growth Opportunities), GOV (Governance), and ALI (Asset Liquidity). In the above relationship, t denotes the period, and i represents the cross-sections (banks).

The statistical population of this research includes all Iranian banks that have operated within a specified time frame. To select the sample, a systematic elimination method was used to ensure that the chosen sample is a suitable representation of the statistical population. In this regard, five specific criteria were established that banks must meet to be selected as part of the research sample. The selection criteria include: banks must operate under the supervision of the Central Bank, engage in banking operations such as attracting deposits and granting loans as specialized or commercial banks, either state-owned or private, and have their performance data available for the ten years ending on 20/03/2023. Additionally, the banks must be distributed across Tehran province or other provinces in the country. Ultimately, 24 banks were selected as the statistical sample and studied.

After identifying and refining the influencing factors, 24 banks were systematically selected, and their performance data over the ten years ending on 20/03/2023 was analyzed as 240 bank-years. Following the analysis of assumptions, the relationships between the variables were evaluated using multiple linear regression based on fixed effects panel data analysis. In this research, a panel data approach was employed to analyze the impact of enterprise risk management on the financial performance of banks. This method allows for the examination of data related to multiple banks over time, facilitating the analysis of changes and patterns in their financial performance. By utilizing

combined data from various banks over a specified period, a better understanding of the impacts of risk management on various financial performance metrics such as profitability, asset quality, liquidity, and financial stability can be achieved.

4- Results

To determine the relationship between the variables, the proposed model of the research utilized multiple linear regression based on panel data analysis with a fixed effects model. Accordingly, before applying the regression method, the assumptions for using this method were evaluated. These assumptions were categorized into two groups: classical assumptions of multiple linear regression and assumptions for determining the type of panel data analysis. The classical assumptions included the normality of the distribution of dependent and independent variables, the normality of the residuals of the estimated model, homoscedasticity, linear independence of the independent variables, and the magnitude or tendency of the estimated coefficient of determination towards one. The assumptions for using panel data included determining whether the data is cross-sectional or pooled and whether the effects are fixed or random. This section of the findings describes the results related to the evaluation of these assumptions.

4-1-Linear Independence of Independent Variables

In this section, the Pearson correlation coefficient was used to examine the linear independence between the explanatory variables of the study. The correlation coefficient matrix among the variables is presented in Table 1. The output results of these tests, using EViews 9 software, are provided in the appendix. The correlation coefficient is a primary criterion for identifying the existence or absence of a relationship between two or more variables and indicates the strength and weakness of this relationship. The highest positive correlation was found to be 0.393 between the return on assets and the price-to-earnings ratio. The highest negative correlation was between the long-term debt ratio and the price-to-earnings ratio, which was -0.162. It can be concluded that there is no strong correlation among the variables.

Table 1. Correlation Coefficient Matrix between Explanatory Variables

Asset Liquidity	Growth Opportunities	Operating Cash Flow	Financial Leverage	Bank Size	Sustainability Reporting	Variable
					1	Sustainability Reporting
				1	0.393	Bank Size
			1	-0.031	0.052	Financial Leverage
		1	0.008	0.044	0.024	Operating Cash Flow
	1	0.004	-0.083	-0.162	-0.073	Growth Opportunities
1	-0.076	0.011	0.031	0.079	0.071	Asset Liquidity

4-2-Normality of the Dependent Variable

The subsequent assumption for using multiple linear regression based on panel data analysis in determining the relationships between variables is the normality of the distribution of the dependent variable. In similar or related research, tests for normality of variables have utilized the Chi-square test, the Kolmogorov-Smirnov test, the Jarque-Bera test, or comparisons of the histogram of errors with the normal curve. In this study, the Kolmogorov-Smirnov test was employed, and the statistical hypotheses for this test are summarized in Table 2:

Table 2. Hypotheses of Normality of the Distribution of Dependent Variables

Hypothesis	Hypothesis Description	Acceptance criterion for the null hypothesis
Null	The distribution of the dependent variable is normal	Greater than 5% significance level
Alternative	The distribution of the dependent variable is not normal.	Less than or equal to 5% significance level

In this research, the dependent variable is financial stability. The Kolmogorov-Smirnov test was used to test for normality, and the results are summarized in Table 3:

Table 3. Results of the K-S Test for Dependent Variables

variable	Mathematical Symbol	Statistic	Probability	Result
Economic Value Added	EVA	0.551	0.540	Normal Distribution
Net Profit	ROA	1.906	0.114	Normal Distribution
Weighted Average Cost of Capital	CC	1.147	0.185	Normal Distribution
Return on Investments	ROE	1.842	0.152	Normal Distribution

Based on the results of the K-S test summarized in Table 3, the test statistics for the variables of economic value added, net profit, average cost of capital, and return on investments were 0.551, 1.906, 1.147, and 1.842, respectively. The corresponding significance levels were 0.540, 0.114, 0.185, and 0.152. Since the significance level was less than 5%, the null hypothesis of normality for the distribution of the dependent variables was rejected as the second classical assumption for using multiple linear regression in determining the relationships between variables.

Therefore, by applying a logarithmic transformation to the dependent variable and repeating the test, the dependent variable, which is the financial stability of companies, was converted to a variable with a normal distribution.

4-3-Normality of the Residuals

The next assumption for using multiple linear regression in estimating the relationships between variables is the normality of the distribution of the residuals from the estimated model. The statistical hypotheses for this assumption are defined similarly to the evaluation of the normality of the distribution of the dependent variable and are summarized in Table 4:

Table 4. Hypotheses of Normality of the Distribution of Residuals

Hypothesis	Hypothesis Description	Acceptance criterion for the null hypothesis
Null	The distribution of the residuals is normal	Greater than 5% significance level
Alternative	The distribution of the residuals is not normal	Less than or equal to 5% significance level

Based on the output from the statistical software and the calculations conducted in this regard, the K-S statistic and the corresponding significance level are summarized in Table 5:

Table 5. Summary of K-S Test Results for Standardized Residuals

Description of the relationship	Statistic	Probability	Results
Economic Value Added	0.630	0.762	Normal Distribution
Net Profit	0.651	0.747	Normal Distribution
Average Cost of Capital	0.692	0.713	Normal Distribution
Return on Investments	0.558	0.868	Normal Distribution

The results of the research regarding the evaluation of the normality of the residuals of the estimated model, using the K-S statistic, are summarized in Table 5. The test statistics for the estimated relationships were 0.630, 0.651, 0.692, 0.558, and 0.539, with corresponding significance levels of 0.762, 0.747, 0.713, 0.868, and 0.893. Since these significance levels are greater than 5%, the null hypothesis was not rejected, and at the 95% confidence level, the normality of the distribution of the residuals in determining the relationships between the variables was accepted.

4-4-Examination of Multicollinearity Among Research Variables

To assess multicollinearity among the research variables, the Variance Inflation Factor (VIF) test was employed, and the results are presented in Table 6.

Table 6. Results of Multicollinearity Examination Among Explanatory Variables

Variable Name	Vif	Vif1/
Sustainability Reporting	2.46	0.406
Company Size	2.24	0.446
Financial Leverage	1.71	0.585
Operating Cash Flow	1.23	0.812
Growth Opportunities	1.14	0.877
Asset Liquidity	1.11	0.904
Average	1.648	

According to the results in Table 6, the VIF test statistic for all variables is less than 10 and even 5, indicating that there is no multicollinearity among the variables.

4-5-Examination of Homogeneity of Variances and Autocorrelation

In this study, the modified Wald test was used to examine the homogeneity of variances. Given the significance level of this test (0.000), which is less than 0.05, the null hypothesis of homogeneity of variances is rejected, indicating that the model suffers from heteroscedasticity. To address the issue of heteroscedasticity in the model estimation, the Generalized Least Squares (GLS) method was employed.

To assess the assumption of no autocorrelation, the Wooldridge test was conducted. In the Wooldridge test, if the significance level is less than 0.05, it indicates the presence of autocorrelation among the residuals. Based on the results of the Wooldridge test, no autocorrelation was found; therefore, the assumption of no autocorrelation holds true. A summary of the above results is presented in Table 7.

Table 7. Results of Adjusted Wald Tests and Durbin-Watson Autocorrelation Tests

$$EVA_{it} = \alpha_0 + \alpha_1 ERM_{it} + \alpha_2 SR_{it} + \alpha_3 SR*ERM_{it} + \alpha_4 FSI_{it} + \alpha_5 FRI_{it} + \alpha_6 CFO_{it} + \alpha_7 GOP_{it} + \alpha_8 GOV_{it} + \alpha_9 ALI_{it} + \varepsilon_{i,t}$$

Result	Probability	Statistic	Test Description
Existence of Inconsistency	(0.000)	1.7 e5	Variance Homogeneity Test (Adjusted Wald)
Lack of Autocorrelation	(0.652)	0.204	Durbin-Watson Autocorrelation Test

$ROA_{it} = \alpha_0 + \alpha_1 ERM_{it} + \alpha_2 SR_{it} + \alpha_3 SR*ERM_{it} + \alpha_4 FSI_{it} + \alpha_5 FRI_{it} + \alpha_6 CFO_{it} + \alpha_7 GOP_{it} + \alpha_8 GOV_{it} + \alpha_9 ALI_{it} + \varepsilon_{i,t}$

Result	Probability	Statistic	Test Description
Existence of Inconsistency	(0.000)	1.6 e5	Variance Homogeneity Test (Adjusted Wald)
Lack of Autocorrelation	(0.617)	0.294	Durbin-Watson Autocorrelation Test

$CC_{it} = \alpha_0 + \alpha_1 ERM_{it} + \alpha_2 SR_{it} + \alpha_3 SR*ERM_{it} + \alpha_4 FSI_{it} + \alpha_5 FRI_{it} + \alpha_6 CFO_{it} + \alpha_7 GOP_{it} + \alpha_8 GOV_{it} + \alpha_9 ALI_{it} + \varepsilon_{i,t}$

Result	Probability	Statistic	Test Description
Existence of Inconsistency	(0.000)	1.7 e5	Variance Homogeneity Test (Adjusted Wald)
Lack of Autocorrelation	(0.7211)	0.118	Durbin-Watson Autocorrelation Test

$ROE_{it} = \alpha_0 + \alpha_1 ERM_{it} + \alpha_2 SR_{it} + \alpha_3 SR*ERM_{it} + \alpha_4 FSI_{it} + \alpha_5 FRI_{it} + \alpha_6 CFO_{it} + \alpha_7 GOP_{it} + \alpha_8 GOV_{it} + \alpha_9 ALI_{it} + \varepsilon_{i,t}$

Result	Probability	Statistic	Test Description
Existence of Inconsistency	(0.000)	1.5 e5	Variance Homogeneity Test (Adjusted Wald)
Lack of Autocorrelation	(0.640)	0.254	Durbin-Watson Autocorrelation Test

4-6-Model Selection Test for Data Analysis

F-Limer Test: As discussed in Chapter 3, the F-Limer test was employed to choose between a pooled data model and a panel data model for estimating the research model. According to the results of the F-Limer test, if the p-value of the F-Limer statistic is greater than 0.05, pooled data is used; if it is less than 0.05, panel data is utilized. The results of the test conducted for this research model are summarized in Table 8, and the output results of these tests using EViews 9 are provided in the appendix.

Based on Table 8, the results of the F-Limer test show a significance level of 0.000, which indicates that the null hypothesis (H_0) of estimating the model using pooled data is rejected at the 0.05 level. Therefore, the data for the present research is of the panel type.

Hausman Test: Panel data can be estimated using both random effects and fixed effects methods. To determine which method to use, the Hausman test was conducted. If the p-value is less than 0.05, the fixed effects model is used; if it is greater than 0.05, the random effects model is employed. According to the results of the Hausman test, the significance level is less than 0.05, indicating that the fixed effects model is used for estimating the panel data model.

Table 8. F-Limer Test for Selecting the Type of Panel Model

Description of the Estimated Relationship	Test	Statistic	Prob	df	t
Economic Value Added and Its Influencing Factors	Hausman Test	F	0.000	24.765	6.519
	F-Limer Test	x^2	0.000	9	30.263
Net Profit and Its Influencing Factors	Hausman Test	F	0.000	24.765	5.276
	F-Limer Test	x^2	0.001	9	28.494
Average Cost of Capital and Its Influencing Factors	Hausman Test	F	0.000	24.765	7.735
	F-Limer Test	x^2	0.000	9	110.732
Return on Investments and Its Influencing Factors	Hausman Test	F	0.000	24.765	16.174
	F-Limer Test	x^2	0.000	9	88.031

4-7-Correlation Between Variables

To estimate the regression model, it is essential to ensure that there is no multicollinearity among the independent variables. To verify the presence or absence of correlation between the independent and control variables of the research, a correlation analysis was conducted using Pearson's correlation coefficient. This coefficient serves as the primary criterion for identifying the existence or non-existence of relationships between two or more variables and indicates the strength and weakness of these relationships.

The results indicated that the highest positive correlation was 0.29, which pertains to the correlation between asset returns and bank size. Additionally, the strongest negative correlation was found between operating cash flows and bank risk. Given that the absolute values of the calculated correlation coefficients are at most around 0.3 and tend toward zero, it can be concluded that there is no strong correlation among the variables.

The results of the non-parametric test assessing the normality of the residuals of the estimated regression models based on the metrics of economic value added, net profit, average cost of capital, and business investment, for the independent variable of organizational risk management, using the Kolmogorov-Smirnov test, showed that the significance levels ranged from 0.111 to 0.382. Since these significance levels are greater than 0.05, the null hypothesis is not rejected, and at the 95% confidence level, the normality of the distribution of the residuals in determining the relationship between organizational risk management and its influencing factors based on each of the four models is accepted.

Regarding the evaluation of the independence of the residuals in the four regression relationships, the Durbin-Watson statistic was found to be between 2.094 and 2.113. Since this statistic falls within the standard range of 1.5 to 2.5, the assumption of independence of the residuals in all estimated regression relationships cannot be rejected.

To examine the homogeneity of variances, the modified Wald test was employed. The results of the modified Wald test indicated that the significance level for the estimated regression relationships ranged from 0 to 0.045, with all estimated relationships being less than 0.05 and trending toward zero. Given that the significance level of the modified Wald test is less than 0.05 in all cases, the null hypothesis of homogeneity of variances is rejected, indicating that the model has a problem with heteroscedasticity. Therefore, to address the issue of heteroscedasticity in the model estimation, the Generalized Least Squares (GLS) method was used to determine the relationships between organizational risk management and bank performance, considering company-level characteristics.

To determine how to estimate the models, the Chow or F-Limer test should be used. In the hypothesis testing model, the significance level of the F-Limer statistic (Chow) for all four models is less than the acceptable error level of 0.05. Therefore, the selected method for estimating the hypothesis testing model is the panel (combined) method. Additionally, the significance level of the Chi-Sq statistic for the Hausman test for the hypothesis testing model is also less than 0.05. Thus, the model for testing the research hypotheses should be estimated using the panel-fixed effects method. Furthermore, the significance level of the F statistic for each of the four models is less than the accepted error level (5%), indicating that the overall regression model is significant. The Durbin-Watson statistic is also within an acceptable range (1.5 to 2.5), indicating that there is no correlation among the error components of the model.

Given that all values in the multicollinearity assessment of the variables included in the model are below 10, no multicollinearity is observed in the models.

The relationship between the four performance metrics of the bank, which include: 1) Economic Value Added, 2) Net Profit, 3) Average Cost of Capital, 4) Return on Investments, as the dependent variable, and Organizational Risk Management as the independent variable, alongside other control variables or company-level characteristics, is summarized in Table 9 based on three regression models for each of the financial performance criteria.

Table 9. Risk Management and Performance

Variable	ROE	CC	ROA	EVA
β_0	-0.579	-0.581	-0.515	-0.579
ERM	0.584	0.359	1.112	0.069

SR	0.178	0.204	0.110	0.181
SR*ERM	0.072	0.095	0.127	0.078
FSI	-0.018	-0.017	-0.015	-0.018
FRI	-0.005	-0.008	-0.005	-0.005
CFO	0.041	0.045	0.011	0.041
GOP	-0.006	-0.006	-0.005	-0.005
GOV	0.016	-0.038	0.027	0.010
ALI	0.016	0.031	0.058	0.022
Coefficient of Determination	0.3426	0.3502	0.2981	0.3435
Adjusted R^2	0.2384	0.2472	0.1868	0.2394
Fisher Test	3.288	3.401	2.260	3.301
Durbin-Watson	2.109	2.113	2.094	2.112

5-Discussion

Based on the second column of Table 9, the analysis of variables using linear regression for the research model indicates that the coefficient of the independent variable, organizational risk management, is positive, suggesting a positive impact on financial performance based on economic value added. Furthermore, the implementation of organizational risk management, as indicated by the t-statistic, has a significant effect on financial performance based on economic value added (the corresponding t-statistic for this variable is 3.181). Therefore, the research hypothesis regarding the positive impact of organizational risk management on economic value added is accepted. In other words, the implementation of organizational risk management positively affects business performance based on the economic value-added metric in banks listed on the Tehran Stock Exchange. Correspondingly, the moderating effect of sustainability reporting on this relationship, represented by the variable SR*ERM, was also evaluated. The results indicate that sustainability reporting practices moderate the positive relationship between the implementation of ERM and business performance based on economic value added in banks listed on the Tehran Stock Exchange.

Regarding the research hypothesis and based on the third column of Table 9, the analysis of variables using linear regression for the research model shows that the coefficient of the independent variable, organizational risk management, is positive, indicating a positive impact on financial performance based on net profit. Additionally, the implementation of organizational risk management, as indicated by the t-statistic, has a significant effect on financial performance based on net profit (the corresponding t-statistic for this variable is 3.294). Therefore, the second research hypothesis regarding the positive impact of organizational risk management on net profit is accepted. In other words, the implementation of organizational risk management positively affects business performance based on the net profit metric in banks listed on the Tehran Stock Exchange. Similarly, the moderating effect of sustainability reporting on this relationship, represented by the variable SR*ERM, was evaluated. The results show that sustainability reporting practices moderate the positive relationship between the implementation of ERM and business performance based on net profit (NOPAT) in banks listed on the Tehran Stock Exchange.

About the research hypothesis and based on the fourth column of Table 9, the analysis of variables using linear regression for the research model indicates that the coefficient of the independent variable, organizational risk management, is positive, suggesting a positive impact on financial performance based on average cost of capital. Furthermore, the implementation of organizational risk management, as indicated by the t-statistic, has a significant effect on financial performance based on average cost of capital (the corresponding t-statistic for this variable is 3.012). Therefore, the third research hypothesis regarding the positive impact of organizational risk management on average cost of capital is accepted. In other words, the implementation of organizational risk management positively affects business performance based on the average cost of capital metric in banks listed on the Tehran Stock Exchange. Correspondingly, the moderating effect of sustainability reporting on this relationship, represented by the variable SR*ERM, was also evaluated. The results indicate that sustainability reporting practices moderate the positive relationship between the implementation of ERM and business performance based on reducing the average cost of capital (WACC) in banks listed on the Tehran Stock Exchange.

About the research hypothesis and based on the fifth column of Table 9, the analysis of variables using linear regression for the research model shows that the coefficient of the independent variable, organizational risk management, is positive, indicating a positive impact on financial performance based on return on investments. Additionally, the implementation of organizational risk management, as indicated by the t-statistic, has a significant effect on financial performance based on return on investments (the corresponding t-statistic for this variable is 2.561). Therefore, the fourth research hypothesis regarding the positive impact of organizational risk management on return on investments is accepted. In other words, the implementation of organizational risk management positively affects business performance based on the return on investments metric in banks listed on the Tehran Stock Exchange. Similarly, the moderating effect of sustainability reporting on this relationship, represented by the variable SR*ERM, was evaluated. The results indicate that sustainability reporting practices moderate the positive relationship between the implementation of ERM and business performance based on the level of business investment (IC) in banks listed on the Tehran Stock Exchange.

6-Conclusion

The results of the present study indicate that organizational risk management has a positive and significant impact on the financial performance of banks. By examining four key performance metrics, including economic value added, net profit, average cost of capital, and return on investments, it was determined that effective implementation of organizational risk management can lead to improved financial performance for banks listed on the Tehran Stock Exchange. Specifically, the t-statistics obtained from linear regression analyses demonstrate the positive and significant influence of this variable on financial performance, which has been confirmed for each of the metrics examined.

Additionally, the results show that sustainability reporting acts as a moderating factor in these relationships. In other words, sustainability reporting practices can enhance the positive impact of organizational risk management on the financial performance of banks. These findings emphasize the importance of considering sustainability and transparency in reporting alongside risk management, indicating that banks can improve their financial performance by enhancing these two areas.

1 .Organizational Risk Management helps banks identify and effectively manage financial and operational risks. This process includes identifying, assessing, and controlling risks, which can lead to improved financial decision-making and reduced costs associated with unforeseen risks. By mitigating risks, banks can achieve better financial performance and, consequently, generate more economic value added.

2 .The findings indicate that organizational risk management positively affects the net profit of banks. This is because effective risk management allows banks to prevent financial losses and, in turn, identify and capitalize on more profitable opportunities. In other words, risk management can lead to increased revenues and reduced costs, ultimately contributing to improved net profit.

3 .Implementing organizational risk management can lead to a reduction in the average cost of capital (WACC). Banks that manage their risks well are typically in a better position in terms of creditworthiness and investor confidence, allowing them to attract capital at lower costs. This, in turn, aids in enhancing financial performance and increasing returns on investments.

4 .The findings also suggest that sustainability reporting acts as a moderating factor in this relationship. Banks that adhere to transparent and sustainable reporting practices can garner greater trust from stakeholders and customers. This trust can lead to attracting new investors and retaining existing customers, thereby contributing to improved financial performance.

5 .Organizational risk management can also enhance returns on investments. By identifying and mitigating risks associated with investments, banks can make better decisions regarding financial resource allocation, resulting in higher returns from their investments.

Based on the results of the study and the positive impact of organizational risk management on the financial performance of banks, three practical recommendations are proposed as follows:

1 .Banks should strengthen and improve their risk management systems. This includes developing and implementing organizational risk management (ERM) strategies that can aid in identifying and assessing risks, as well as improving financial decision-making. Given the positive impact of risk management on economic value added and net profit, investing in this area can lead to enhanced financial performance for banks.

2 .Banks should pay special attention to improving sustainability reporting practices. Given the study's findings that sustainability reporting can moderate the positive relationship between ERM implementation and financial performance, banks should focus on transparency and accuracy in sustainability reporting. This action can help increase investor and stakeholder trust, ultimately leading to improved financial performance.

3 .Banks should provide training and empowerment programs for their staff in the areas of risk management and sustainability reporting. These training programs can help employees gain a better understanding of the importance of risk management and its impact on financial performance, thus improving internal processes within banks. This initiative can lead to the establishment of a stronger organizational culture regarding risk management and sustainability.

References

Abu-Rumman, A. (2021). The Impact of Risk Management on Financial Performance of Banks: The Case of Jordan. 12(5), 1332–1342. https://doi.org/10.17762/TURCOMAT.V12I5.2024

Arefi, F., & Hafezian, M. (2023). Evaluating risk management in Iranian banking based on IFSB guidelines. Journal of Innovation Management and Operational Strategies, 4(2), 117-136. [In Persian]

Beltratti, A., & Stulz, R. M. (2012). The credit crisis around the globe: Why did some banks perform better?. Journal of financial economics, 105(1), 1-17.

Bogonko, J. (2023). Risk Management and Financial Performance of Commercial Banks Listed at the Nairobi Securities Exchange. International Journal of Finance, 8(2), 40–64. https://doi.org/10.47941/ijf.1255

Chakravarthy, B.S., 1986. Measuring strategic performance. Strat. Manag. J. (7)(5), 437e458.

DeAngelo, H., Stulz, R.M., 2015. Liquid-claim production, risk management, and capital structure: why high leverage is optimal for banks. J. Financial Econ.(2), 219–236.

Ellul, A., & Yerramilli, V. (2013). Stronger risk controls, lower risk: Evidence from U.S. bank holding companies. The Journal of Finance, 68(5), 1757e1803.

Erkens, D.H.,Hung, M., Matos, P.P., 2012. Corporate governance in the 20 07-20 08 financial crisis: evidence from financial institutions worldwide. J. Corporate Finance 18 (2), 389–411.

Fallah, F., & colleagues. (2023). Identifying factors affecting risk management in the Tax Affairs Organization. Accounting and Auditing Research, 58, 65-82. [In Persian]

Florio, C. & Leoni, G. (2017), Enterprise risk management and firm performance: The Italian case. The British Accounting Review, 49, 56-74.

Ghabishi, & colleagues. (2022). Examining risk and its management in Islamic banking. Political Sociology of Iran, 27, 387-412. [In Persian]

Hoyt, R. E. & Liebenberg, A. P. (2011). "The value of enterprise risk management". Journal of Risk and Insurance, 78, 795-822.

Jaelani, A. (2024). The Influence of Risk Management on Financial Performance (Study on Banking Companies Listed on The Indonesia Stock Exchange 2018-2022). International Journal of Management Studies and Social Science Research, 06(01), 265–275. https://doi.org/10.56293/ijmsssr.2024.4824

Kaplan, R.S., Norton, D.P., 1996. The Balanced Scorecard: Translating Strategy into Action. Harvard Business Press, Boston, MA, USA.

Khazari, M. (2023). Risk management in smart banking businesses. Management Science Research, 16, 103-114. [In Persian]

L.A. Gordon, M.P. Loeb, C.Y. (2009). Tseng, Enterprise risk management and firm per formance: A contingency perspective, J. Account. Public Policy 28 (2009), 301–327.

Maulana, A., Dwita, M., Fitriyani, M., Sunaryo, D., & Adiyanto, Y. (2024). Risk Management As A Determinant Of Indonesian Banking Financial Performance: A Systematic Literature Approach. https://doi.org/10.54373/ifijeb.v4i5.2120

Movahed, A. B., Aliahmadi, A., Parsanejad, M., & Nozari, H. (2023). A systematic review of collaboration in supply chain 4.0 with meta-synthesis method. Supply Chain Analytics, 4, 100052.

Movahed, A. B., Movahed, A. B., & Nozari, H. (2024). Opportunities and challenges of marketing 5.0. Smart and sustainable interactive marketing, 1-21.
Nozari, H., Abdi, H., Szmelter-Jarosz, A., & Motevalli, S. H. (2024). Design of dual-channel supply chain network based on the internet of things under uncertainty. Mathematical and Computational Applications, 29(6).
Nozari, H., Movahed, A. B., & Movahed, A. B. (2024). The AIoE Revolution: Redefining Organizational Maturity in a Hyper-Connected World. Applied Innovations in Industrial Management, 4(1), 10-17.
Richard, P.J., Devinney, T.M., Yip, G.S., Johnson, G., 2009. Measuring organizational performance: towards methodological best practice. J. Manag. 35 (3), 718e804.
Selvarajan, T., Ramamoorthy, N., Flood, P.C., Guthrie, J.P., MacCurtain, S., Liu, W. (2007). The role of human capital philosophy in promoting business innovativeness and performance: test of a causal model. Int. J. Hum. Resour. Manag. 18(8), 456e1470.
Stulz, R.M., 2016. Risk management, governance, culture, and risk taking in banks. Econ. Policy Rev. (August) 43–60.