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The underlying effect of unsystematic financial risk on banks' financial performance: An analytical study of commercial banks

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Abstract

The purpose of this study is to explore the impact of credit risk, liquidity risk, and operational risk on the profitability of banks in Jordan. Using data from conventional banks between 2017 and 2023, the study employs the generalized method of moments (GMM) for coefficient estimation to account for endogenous variables. The findings indicate that both credit and liquidity risks negatively affect bank profitability, with this negative effect evident when the risks are considered individually or together. However, operational risk does not have a significant direct impact on financial performance. This research contributes to the understanding of how financial risks influence bank performance, particularly in developing economies, and provides practical insights for senior management in financial institutions, offering guidance on risk management strategies to mitigate the adverse effects of credit and liquidity risks.

Keywords: Commercial banks, Credit risk, Financial performance, Liquidity risk, Operational risk.

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1. Introduction

Banks are essential to the financial sector of every economy, as they perform various key functions that support economic growth. The efficiency of the banking sector is vital for national development. With increasing globalization, banking systems worldwide are becoming more interconnected, leading to greater complexity in their operational frameworks. In response, regulators are continually developing advanced risk management techniques to mitigate the impact of various risks that could affect banks' profitability and overall financial performance. In Jordan, the financial stability of banks is key to the country's economic stability. A resilient financial system must be able to absorb unexpected shocks from both financial and real economic events. Consequently, financial risks must be carefully evaluated, priced, and managed to ensure system stability

[1]. Specifically, unsystematic risks pose significant threats to banks' stability, making risk management a critical task for both supervisors and analysts [2].

Risk assessment is a process used to evaluate, mitigate, and reduce uncertainty in investment decisions. It involves identifying potential risks that may lead to financial losses and analyzing their potential impact on an entity's financial outcomes [3, 4]. Investors rely deeply on a bank's financial performance to assess equity investments, using this information to identify strengths and make informed decisions [5]. Over the past decade, risk management in financial institutions has garnered heightened focus from regulators, industry professionals, and scholars, underscoring its crucial role in ensuring financial stability.

A bank's financial results are typically reflected in its financial statements, which highlight performance using key metrics. Among these, return on assets (ROA) and return on equity (ROE) are commonly used to evaluate a bank's success [6]. However, while ROE is widely recognized as a measure of financial efficiency, its reliance on high financial leverage can inflate the ratio, increasing the risk of potential bank failure [7]. Risk, therefore, can result in both favorable and unfavorable outcomes, with higher risks often leading to higher potential returns but also greater chances of instability [8].

This study addresses a critical gap in the literature by focusing on financial risks in the banking sector within a developing economy context, specifically Jordan. While most research emphasizes developed economies, limited attention has been given to the unique economic and regulatory environments of developing nations. Moreover, prior studies often neglect the interaction between different types of risks, providing an incomplete understanding of their combined effects. By adopting a comprehensive approach and leveraging recent data (2017–2023), this study delivers up-to-date insights that are particularly relevant to the current financial landscape. The methodological rigor achieved through the generalized method of moments further enhances the reliability of its findings.

Beyond academic contributions, this study offers valuable insights to regulators and policymakers by deepening their understanding of financial risks within the banking sector and assessing the effectiveness of existing risk management systems. It also provides a foundation for quantifying risk exposures, making it highly beneficial for senior management in financial institutions operating in developing economies.

2. Literature Review and Hypothesis Development

Financial performance is a key area of interest for researchers due to its crucial role in helping commercial banks achieve their primary goals, such as survival and sustainability. It is defined as a reflection of how well commercial banks perform, focusing on the use of financial metrics to assess the attainment of objectives. Financial performance is considered essential for the various operational practices of commercial banks, as it supports the provision of financial resources and offers investment opportunities across different performance areas that assist in fulfilling the objectives of stakeholders [9, 10]. Most studies examining the factors influencing bank profitability have utilized bank-specific characteristics, industry-specific elements, and macroeconomic and financial conditions to explain variations in profitability.

A growing body of literature indicates that risk management poses greater challenges for commercial banks compared to their Islamic counterparts. This discrepancy is primarily due to the unique characteristics of liquidity infrastructure, financing contracts, legal obligations, and governance structures that commercial banks must navigate. Much of the research examining the link between risk management and the financial performance of banks has been predominantly conceptual, establishing a theoretical connection between effective risk management practices and improved bank performance. However, empirical studies specifically investigating the relationship between risk management practices and financial performance in Jordanian banks remain scarce. Kamis [11] defines financial risk as the risk linked to financing activities, including financial transactions, and highlights the possibility of shareholders losing money when investing in companies with substantial debt burdens. This type of risk can be categorized into two types: systematic risk and unsystematic risk. Systematic risk, or market risk, originates from overarching economic conditions and general market trends, making it an unavoidable risk. Conversely, unsystematic risk pertains to risks that can be reduced or eliminated through various strategies [12].

Banks primarily generate revenue by extending significant amounts of credit to borrowers, which inherently carries substantial credit risk. According to Accornero [13], credit risk arises when borrowers fail to fulfill their debt obligations on time. A high rate of loan defaults can greatly undermine a bank's profitability. Credit risk occurs when a counterparty does not fully meet its contractual commitments within the specified timeframe, potentially leading to financial losses. Furthermore, credit risk can lead to liquidity crises and reduce the quality of a bank's assets. This concern is heightened in situations of information asymmetry, where uncertainty regarding the borrower's intentions or the potential misuse of funds can pose challenges for the bank.

Research examining the effects of credit risk on bank profitability has produced mixed findings. Some empirical studies indicate a negative correlation between credit risk and profitability [14, 15]. For instance, Sufian [16] studied the causes of bank profitability in Malaysia and found that higher loan concentration and credit risk significantly reduced profitability. However, banks that were well-capitalized and had varied their activities achieved higher levels of profitability. Berríos [17] examined the connection between credit risk, profitability, and liquidity using data from 40 banks. His findings indicated a negative association between riskier lending practices and the net interest margin. Ekinci and Poyraz [18] explored the relationship between credit risk and profitability in 26 Turkish commercial banks from 2005 to 2017, using data from annual reports. Profitability was measured by return on equity and return on assets, while credit risk was assessed by non-performing loans. The study found that credit risk negatively affects both ROA and ROE.

Other studies have provided positive evidence regarding the relationship between credit risk and bank profitability. [19, 20]. Gizaw, et al. [21] explored the impact of credit risk on the profitability of commercial banks, using a sample of eight banks and data spanning from 2003 to 2014. The study employed both descriptive and analytical methods. The findings

demonstrated that credit risk determinants, such as capital adequacy ratios, non-performing loans, and loan loss provisions, significantly influence bank profitability. It underscored the necessity of enhancing credit risk management to improve profitability in commercial banks.

Commercial banks serve as intermediaries by collecting excess funds from savers and providing loans to borrowers, allowing them to earn interest [22, 23]. In their efforts to boost financial performance through loan issuance, banks inevitably encounter a heightened risk of credit issues. According to Accornero [13], significant credit risk is a major factor leading to the collapse of a country's banking industry, which can sometimes expose the stability of the entire financial system.

Based on the current body of literature, this study proposes the following hypothesis for further examination:

H_1: Credit risk management has a positive and statistically significant impact on the performance of Jordanian commercial banks.

Liquidity risk is the potential financial loss a bank may encounter if it cannot fulfill its obligations or fund asset growth when due, without incurring high costs (IFSB, 2005). One of the main causes of liquidity risk is the mismatch between the maturity of a bank's assets and liabilities, as banks often use short-term deposits to finance long-term loans and investments. This gap can result in banks being unable to raise new liabilities or liquidate assets to satisfy depositors' withdrawal requests (BCBS, 2008). Managing liquidity is a significant challenge for banks; having too much liquidity can lead to missed investment opportunities in more profitable areas, while having too little can create severe issues, preventing them from meeting the cash withdrawal demands of depositors. Thus, banks aim to find a balance between liquidity and profitability to ensure ongoing viability, avoid insolvency, and maximize returns [24].

The financial crisis highlighted the significance of liquidity risk in the financial sector, which pertains to the risk that a bank may be unable to fulfill depositor obligations or finance asset growth as they come due without sustaining unacceptable financial losses or costs [25]. This underscores the necessity of effective liquidity risk management for Jordanian commercial banks, which must efficiently handle liquidity risks to sustain solvency.

Various studies have examined the relationship between liquidity risk and financial performance, yet the results vary significantly. For example, Ali and Oudat [26] investigated the impact of financial risk on the performance of commercial banks listed on the Bahrain Exchange and found that liquidity risk had a minimal effect. Likewise, Ismail, et al. [27] explored the financial risks affecting the performance of Islamic banks in Malaysia, focusing on credit risk, liquidity risk, operational risk, and capital risk. They collected data from 15 Islamic banks for the period between 2008 and 2014 and found no significant connection between liquidity risk and bank performance. Ng'aari [28] examined the impact of risk management practices on the profitability of publicly listed commercial banks in Kenya over the period from 2002 to 2015. The study focused on liquidity risk management (assessed by the equity capital to total capital ratio). Panel regression analysis was employed, revealing a positive and significant correlation between each of the liquidity risk variables and bank profitability. Haque and Wani [29] investigated the relationship between financial risk and bank performance in India, analyzing five public banks and five private banks from 2008 to 2013. Their findings indicated that liquidity risk does significantly affect financial efficiency. Remarkably, while liquidity can impact bank performance in one country, it may have a minimal or even negative effect in another. Consequently, the current research proposes the following hypothesis:

H_2: Liquidity risk management has a positive and statistically significant effect on the performance of Jordanian commercial banks.

Operational risk pertains to the likelihood of unexpected variations from projected outcomes due to failures in human resource systems, technological processes, or other influencing factors. This risk can originate from both internal and external sources, encompassing all risks associated with fluctuations in a company's operational performance due to system failures, supervisory lapses, or uncontrollable events [30]. Commonly viewed as a residual risk, operational risk includes any risks encountered by a bank that are not classified as market or credit risks. To evaluate operational risk, it is essential to review the bank's financial statements, making necessary adjustments to the income statement by excluding the impacts of credit losses as well as any gains or losses related to market risk exposure. Banks face operational risk as a result of inadequate, outdated, or inappropriate practices within their internal operations, as well as from external events [31]. Such operational risk events are not exclusive to banks; they are inherent in the operation of any business.

Many researchers argue that operational risk can greatly impact financial stability and performance, especially if it results in the collapse of a financial institution or a loss of trust in the broader financial system. Consequently, both regulators and financial institutions place a strong emphasis on managing operational risk when assessing and mitigating threats to financial stability. De Jongh, et al. [32] identified operational risk factors as key contributors to the duration and severity of financial crises, thus impacting overall financial stability. The importance of effective operational risk management cannot be overstated; deficient management in this area can lead to unpredictable financial performance, adversely affecting bank revenues and diminishing net worth. Most critically, inadequate operational risk management can have upsetting systemic consequences, as evidenced by the role operational risk played in the 2008 financial crisis [33].

The complicated nature of banking operations increases the chances of significant operational risk events, which may impact profitability. To address these potential losses, banks often incorporate risk mitigation strategies into their financial planning [34]. However, even with operational risk management systems in place, there is evidence that these risks are not always effectively controlled. Fritz-Morgenthal, et al. [35] indicate that banks experienced considerable losses due to operational risks. These losses have a detrimental effect on overall performance by reducing the profits banks report. Thus, banks must adopt more robust risk management practices to lessen the impact of operational risks on their financial results. Muriithi [36] explored how operational risk affects the financial performance of Kenyan commercial banks. The study analyzed secondary data spanning from 2005 to 2014. The research considered several risk factors, including market risk, credit risk, liquidity risk, and operational risk. The results showed that operational risk has a significant adverse effect on the

financial performance of these banks. This paper proposes the following hypothesis for further examination, based on existing literature:

H_3: Operational risk management has a positive and statistically significant effect on the performance of Jordanian commercial banks.

3. Data and Research Methodology

3.1. Study Population and Sample

The study adopted a quantitative analytical approach to investigate the effects of credit risk, liquidity risk, operational risk, and their interactions on bank profitability. The sample comprised 13 banks listed on the Amman Stock Exchange, covering the period from 2017 to 2023. Given the availability and consistency of data that met the study's criteria, the sample represents 100% of the target population. Since the study encompassed the entire population, its findings can be fully generalized to the broader banking sector. Islamic banks were excluded to ensure the homogeneity of the sample. Stata software was used for data analysis.

3.2. Model Specification

Panel data was employed in this study to account for the time effects applicable to the analysis. When working with panel data, two significant challenges—autocorrelation and endogeneity—are often encountered. According to Lassoued [37], the generalized method of moments is employed for data analysis, offering an effective approach to address these issues. Compared to ordinary least squares regression, the GMM model provides several advantages. The regression model used in this study is as follows:

$$PROF_{it} = \gamma 0 + \gamma_1 CRISK_{it} + \gamma_2 LIQR_{it} + \gamma_3 OPER_{it} + \gamma_4 BSIZE_{it} + \gamma_5 BAGE_{it} + \varepsilon_{it}$$

γ_0 = intercept; γ_1-γ_5 estimated coefficient of independent and control variables; ε_{it} represents the error terms for variables that have been either unintentionally or intentionally omitted or included.

3.3. Testing for Autocorrelation and Endogeneity

The Classical Linear Regression Model (CLRM) assumes that there is no autocorrelation in the data. According to Sekaran [38], the correlation between different error terms should be zero, indicating a lack of autocorrelation. The results in Table 1 show a p-value of zero from the Wooldridge test, indicating that all p-values are below 0.05. As a result, this rejects the null hypothesis that the data is free from autocorrelation, indicating that autocorrelation is indeed present. Additionally, the CLRM assumes that there are no issues with endogeneity. Sekaran [38] states that there should be no relationship between the error term and the explanatory variable; if such a relationship exists, endogeneity is a concern. Brooks [39] highlights that the Hausman test can be used to assess endogeneity, where the null hypothesis posits that the errors are uncorrelated. As shown, Hausman test values are below 0.10, suggesting the presence of endogeneity in the data.

In summary, the panel data results indicate problems with both autocorrelation and endogeneity, leading to violations of CLRM assumptions. Consequently, the ordinary least squares regression results cannot be considered the best linear unbiased estimators. To address these issues, a Generalized Method of Moments model can be utilized.

Table 1.
Wooldridge test for autocorrelation

'Wooldridge test for autocorrelation in panel data in developing countries'	
Model ROE	F = 7.469, Prob>F = 0.0127

3.4. Variables Definition

The return on equity is a key metric for assessing a bank's financial performance, as it measures the ability of a company to generate profits from the equity invested by its shareholders. It is calculated by dividing net profit by total equity [40, 41]. In the context of banking, credit risk is commonly measured by the non-performing loans ratio, which is a standard and widely applied indicator. A loan is considered non-performing when its payments on principal or interest remain unsettled for 90 days or more. As the volume of bad loans increases, the ratio of unpaid credits rises, negatively impacting the bank's profitability and potentially leading to its collapse. The liquidity ratio is a key indicator of the financial stability of both companies and financial institutions [42]. A widely used method for assessing liquidity is the Loan-to-Deposit Ratio (LDR), which compares a bank's total loans to its total deposits. This ratio offers valuable insight into how effectively a bank is utilizing its deposits to generate loans. A high LDR indicates that a bank is lending more than it has in deposits, raising potential concerns about its liquidity and ability to handle withdrawal demands. In contrast, a low LDR suggests that the bank has more deposits than loans, indicating stronger liquidity and a more cautious lending approach. Banks encounter operational risk due to the use of flawed, outdated, or inappropriate internal practices, as well as external events [31]. Such operational risk events are common across all businesses, not just banks, and these institutions recognize that such events are likely to occur. Operational risk is often viewed as a residual risk, encompassing any risks that are neither market risk nor credit risk. Additionally, banks face operational challenges such as limited funds, cost management issues, and mismanagement. Darmawi [43] assessed operational risk by calculating the ratio of total operating expenses to total operating income. To gain deeper insight into the relationship between the dependent and independent variables, this study includes two control variables: bank size and bank age. Table 2 presents the definitions and measurements of the variables employed in this study.

Table 2.
Variables definition and measurement.

Variables	Definition	Measurement
PROF	Bank profitability	Return on equity
CRISK	Credit risk	Non-performing loans to gross loans
LQIR	Liquidity risk	Loans to deposit ratio
OPER	Operational risk	Total operating expenses to total operating income
BSIZE	Bank size	logarithm of total assets
BAGE	Bank age	Age of commercial banks

4. Results and Empirical Analysis

4.1. Descriptive Statistics and Correlation Matrix

Table 3 presents the descriptive statistics for all variables included in the empirical model, offering valuable insights into the characteristics of the banking sector in Jordan. The mean return on equity of 7.45 and a standard deviation of 3.31 indicate moderate variability among Jordanian banks, with performance levels ranging from 2.36 to 15.89. Regarding credit risk, the mean of 0.066 and a standard deviation of 0.025 indicate low variability, with values ranging from 0.021 to 0.12, suggesting that most banks manage risk similarly. Jordanian banks demonstrated a strong liquidity position, reflected by a mean liquidity ratio of 1.368 and a low standard deviation of 1.30, which suggests effective liquidity management. Banks consistently maintained ratios well above regulatory requirements, indicating prudent practices. The liquidity ratios ranged from 1.33 to 1.38, highlighting consistency within the sector. Operational risk statistics show a mean of 18.11 and a standard deviation of 0.991, reflecting low variability. The tight range between 15.32 and 17.22 indicates consistent management of operational risks across the banks.

Table 3.
Descriptive Statistics.

	Mean	Standard deviation	Maximum	Minimum
PROF	7.45	3.31	15.89	2.36
CRISK	0.066	0.025	0.12	0.021
LQIR	1.368	1.30	1.38	1.33
OPER	18.11	0.991	17.22	15.32
BSIZE	21.99	0.78	25.11	19.33
BAGE	40.17	17.69	91	26

4.2. Correlation Matrix

Table 4 presents the Pearson correlation coefficients for the study variables and examines the interactions between variables to assess whether any might impact predictions. The table indicates that all coefficients are below 0.07. Correlation analysis helps evaluate the linear relationship between two explanatory variables [39]. Table 4 illustrates the relationships between variables, showing that LQIR and CRISK are negatively correlated with the dependent variables, aligning with the literature's view. The negative correlation between LQIR and PROF is -0.377, while CRISK and PROF is -0.399. In contrast, OPER and PROF are generally positively correlated with the dependent variables at 0.0906. The correlation results indicate no multicollinearity issues, as all predictor pairs have correlation coefficients below 0.80 [44], confirming the absence of multicollinearity concerns in the study model.

Table 4.
Correlation matrix.

	PROF	LQIR	CRISK	OPER	BSIZE	BAGE
PROF	1.0000					
LQIR	-0.3778*	1.0000				
CRISK	-0.3996*	0.3486*	1.0000			
OPER	0.0906	0.4795*	0.4345*	1.0000		
BSIZE	0.5763*	-0.1638	-0.5684*	-0.1259	1.0000	
BAGE	0.1289	0.4276*	0.2219*	0.3528*	0.1461	1.0000

4.3. Regression Results

Table 5 presents the regression results for the GMM model, displaying the coefficients, t-statistics, standard errors, and probability values for all explanatory and control variables. The R^2, which measures the model's explanatory power, is approximately 32%, while the adjusted R^2 for the GMM model is 30%. The F-statistic, used to assess the model's statistical validity and its ability to explain variations in the dependent variable, is 0.000. With a significance value (Prob F = 0.000) below 0.05, the results suggest that the combined impact of the independent variables is statistically significant.

A negative correlation of -0.0022 with a p-value of 0.034 in non-performing loans shows a significant negative effect on the performance of Jordanian commercial banks, impacting the broader financial system, particularly in developing economies. This finding is consistent with the study by Ghenimi, et al. [45], which demonstrates that increased total assets or investments are closely associated with enhanced firm performance. By addressing credit risk, banks not only reduce the

volume of bad debts but also lower the need for loan loss provisions. There is an apparent negative link between credit risk and bank profitability. Commercial banks operate under a straightforward business model, primarily relying on public trust and deposits as their main source of funding to issue loans. They generate profit by charging higher interest rates on loans than what they pay to depositors. However, this process involves inherent risks. Poor risk management can lead to the mismanagement of public expectations. As a result, recent studies have examined how these risks, individually and in combination, influence bank profitability.

A negative correlation of -0.1869 between the liquidity risk indicator and profitability suggests that as banks maintain sufficient liquid assets to guard against potential risks, their profitability declines. This relationship is statistically significant, with a p-value of 0.000. This result corresponds most closely with the findings of Siddique, et al. [22], who also observed a strong and robust negative relationship between LQIR and bank profitability. These authors describe the trade-off between liquidity and profitability as a "major concern faced by banks" (p. 146). They explain that while higher liquidity may protect banks from stability problems and enhance their creditworthiness, it may also limit the banks' abilities to be profitable and to make productive loans and investments.

Conversely, operational risk appears to have a positive effect on bank profitability, which challenges the third hypothesis. Although this relationship is statistically insignificant, with a p-value of 0.147, it is important to note that the coefficient is positive, though small (0.0082). Interestingly, while Yang, et al. [46] found an insignificant relationship, their study differed slightly, as it did not indicate that operational risk negatively impacts banking profitability. Despite the lack of strong statistical evidence, managing operational risk remains essential, as effective control can help banks reduce losses and improve efficiency, ultimately contributing to profitability.

Table 5.
Fixed-effect GMM estimation results for the ROE model.

Dynamic panel-data estimation, generalized method of moments						
Group variable id			Number of obs. 91			
Time variable year			R-squared = 0.3297 Adj R-squared = 0.3033			Prob > F = 0.0000
ROE	**Coefficient**	**Std. Error**	**t**	**P>|t|**	**[95% Conf. Interval]**	
CRISK	-0.0022523	0.0023715	-0.95	0.034	-0.006945	0.0024404
LQIR	-0.1869548	0.0398114	-4.70	0.000	-0.2657344	-0.1081751
OPER	0.0082878	0.0056785	1.46	0.147	-0.0029489	0.0195244
BSIZE	0.0169423	0.0099512	1.70	0.091	-0.0027523	0.0366369
BAGE	0.004192	0.0087121	0.48	0.631	-0.013049	0.021433
Haus test ($\chi 2$) = 51.524 P-value ($\chi 2$) = 0.000						

5. Conclusion

This section encapsulates the primary findings of the study and suggests avenues for future research. The summary is aligned with the study's objectives, emphasizing the results of the statistical analyses conducted to evaluate the proposed hypotheses. The findings indicate that credit risk and liquidity risk negatively impact the financial performance of Jordanian commercial banks, underscoring the importance of effective risk management strategies. It is recommended that policymakers and financial institutions prioritize the management of these risks. Additionally, banks should offer expert guidance to borrowers on effective strategies for achieving satisfactory returns on total firm investments. Maintaining a robust liquidity position is essential for banks to succeed in a competitive landscape. While operational risk may not have a direct effect on financial performance, it is still a crucial factor to consider in risk management strategies. To promote a stable and resilient financial system, stakeholders—including policymakers and financial institutions—should concentrate on mitigating credit and liquidity risks while also taking operational risk into account when applicable. Although this study is focused on commercial banks, the model can be adapted for use in Islamic banks, and future research could explore comparative analyses between commercial and Islamic banking institutions.

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