



The Influence of Capital Adequacy, Cost-to-Income Ratio, Debt-to-Equity Ratio, Loan-to-Deposit Ratio, and Bank Size on the Performance of Jordanian Banks

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Abstract

The study aims to examine the impact of key financial factors, including capital adequacy, cost-to-income ratio, loans compared to deposits ratio, debt-to-equity ratio, and bank size, on the performance of banks in Jordan during the period from 2006 to 2023. Upon determining that all variables in the study were binary, either zero or one, through the Im, Pesaran, Shin, and Philip-Perron tests, we analyzed the banks' annual data utilizing autoregressive distributed lag (ARDL) methodology. The study's findings indicated that capital sufficiency and cost-to-income ratios adversely affect Jordanian banks' short- and long-term profitability. The loan-to-deposit ratio positively impacted the long-term performance of Jordanian banks while leaving their short-term performance unaffected. The size of the bank positively influenced both its long-term and short-term success. The debt-to-equity ratio did not influence their performance in the long term versus the short term. According to the authors, investors should consider capital adequacy, loan-to-deposit ratio, cost of capital, and bank size when making investment selections. The management of Jordanian banks should not retain excessive capital. The administration of Jordanian banks must achieve an equilibrium between profitability and liquidity goals by implementing appropriate lending policies.

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1. Introduction

Banks are crucial to the economy because they efficiently and effectively mediate funds between units experiencing surplus and deficit. By providing a safe place for people to save their money and invest it in businesses and other productive industries, banks help boost national economies and foster a more favorable environment for investment and business. In order to compensate for their employees, banks strive for huge profits. One essential statistic for bank performance is profitability, which shows management's capacity to make a profit over a specific time. This profit is used for interest payments to depositors, dividends to shareholders, and meeting day-to-day expenses. The performance of a bank is shaped by two main categories of factors: internal and external. The management of a bank keeps tabs on internal variables, which are elements or events that are impacted by problems within the bank. External variables, in contrast to internal variables, are sourced from outside the bank and are beyond the control of the bank's management. Striking a balance between these factors is crucial for the sustainable growth and profitability of each of these variables. The unpredictability and lack of control over external variables make them riskier than internal variables. A bank's capacity to profit across all its business lines is the best measure of its profitability. In this essay, we will use three earnings

capacity indicators: net interest margin (NIM), return on assets (ROA), and return on equity (ROE). Everyone from policymakers and regulators to bank managers and financial analysts to academics and investors is keenly interested in banking performance due to the sector's critical role in the development and stability of the country's economy (Bansal, Singh, Kumar, & Gupta, 2018; Rani & Zergaw, 2017).

Numerous writers have sought to study the variables that impact the performance of banks. Therefore, this study aims to assess the relationship between financial adequacy, liquidity, expense-to-revenue ratio, debt-to-equity, and bank size as they pertain to the performance of Jordanian banks. There are 25 commercial banks in Jordan, with 3 being Islamic and 10 being international banks, totaling 57 billion Jordanian dinars (JD) (equivalent to \$80.4 billion in US dollars). By the year's end of 2021, the average increase in banks' total assets was 5%. Assuming a 7% increase in credit, the COVID-19 pandemic caused a drop in bank profitability, which was reversed in 2021. The percentage of loans that did not perform in 2021 was 5.3%, down from 5.55% in 2019. Both return on equity and return on assets for indices fell from 1.2% in 2019 to 0.6% in 2021, indicating a decline in profitability. The capital ratio stabilized at 18.3% from 2019 to 2022, while the liquidity and capital ratios remained normal.

This study makes several significant contributions. In order to analyze the influence of capital adequacy, cost-to-income ratio, loan-to-deposit ratio, and bank size on the performance of banks in Jordan, we initially utilized an autoregressive distributed lag model (ARDL) that allows us to use several delayed periods. Second, the short- and long-term performance of Jordanian banks is examined, along with the correlations between specific internal factors. Finally, we compare our study's conclusions to those of other investigations to fill in the gaps in earlier research. Therefore, the study tries to answer the following question: What is the influence of the adequacy of capital, cost-to-income ratio, debt-to-equity ratio, loan-to-deposit ratio, and bank size on the performance of Jordanian banks? Here is the outline of the rest of the research: Section 2 encompasses the literature review, Section 3 encompasses the methodology (including the study model, sample, and variable measurement), Section 4 covers the data analysis, and Section 5 provides the summary.

2. Literature Review

Several microeconomic variables, such as capital adequacy, liquidity, debt-to-equity ratio, solvency management, and operational efficiency, have been the subject of investigations into the factors impacting bank performance (Chalise, 2019; Dahiyat, Weshah, & Aldahiyat, 2021; Suriyati, Marwansyah, & Syarif, 2023). This section aims to assess what is known about the factors that influence bank performance from previous studies.

Using data from 16 banks in India between 2017 and 2018 and 2022 and 2023, Jha and Agrawal (2022) examine how capital adequacy affects bank profitability. As a surrogate for bank profitability, they used three metrics: asset profitability, equity profitability, and net interest spread. The capital adequacy measure served as the independent variable. The study showed that capital sufficiency influences Indian banks' profitability, as measured by ROA, ROE, and net interest margin.

From 2007 to 2016, the performance of Nepalese banks was measured by return on assets. Chalise (2019) examined how factors, including capital adequacy, ownership ratio, cost-to-income ratio, debt-to-equity ratio, and firm size, affected this profitability. Using panel data from ten commercial banks and fixed effect models as the appropriate analytical tool, the study's main conclusion is that the cost-to-income ratio negatively impacts bank profitability. There is a small but detrimental connection between capital adequacy and bank profitability, a small but favorable connection between bank size and the debt-to-equity ratio, and a positive relationship between bank performance and the equity ratio.

Return on equity and return on assets were used to measure the performance of Vietnamese commercial banks from 2010 to 2018. Nguyen (2020) examined how capital adequacy affected this performance. Panel data estimate was used to examine the study's model, and the sample consisted of 22 Vietnamese banks. The research shows that state ownership and non-performing loans harm bank performance, while capital sufficiency, non-interest revenue, and net interest margin have a positive effect. Findings show that capital sufficiency positively affects profitability in small-sized banks but does not affect large-sized banks when the research sample is divided into two subsamples of these sizes. In contrast to small banks, big banks did not see a massive change in their ROE and ROA due to Basel II, according to the study.

The effect of the cost-to-income ratio on the efficiency of Nigerian tier 1 and tier 2 banks was studied by Ayinuola and Gumel (2023). Over twelve years (2010–2021), the data used were mainly secondary, drawn from the fact book of the Nigeria Stock Exchange and the annual reports of banks. The panel data method was used to examine how the independent variables related to the dependent variable. The results show that capital sufficiency and bank size have a favorable but minor effect on bank performance, while the cost-to-income ratio has a negative and significant impact. According to the research, tier 2 banks are more negatively affected by bank scale than tier 1 banks. Tier 1 banks are more profitable than tier 2, despite having a higher cost-to-income ratio.

Capital adequacy, credit growth, bank size, cost-income ratio, loan-deposit ratio, debt-to-equity ratio, and market share were some of the factors studied by Khaled Subhi (2023), who used a sample of ten Saudi banks operating between 2010 and 2021. The banks' performance and the independent variables were examined using panel data estimation. The results show that capital sufficiency has an adverse and statistically significant

outcome on ROA but a negligible effect on ROE. On the other hand, capital adequacy has a favorable and substantial effect on NIM when it comes to banks' performance metrics. Size, market share, and the ratio of loans to deposits are three other important factors that positively and significantly impact a bank's performance. Conversely, the cost-to-income ratio has an adverse effect and substantial influence when looking at banks' performance metrics like ROA, ROE, and NIM.

Paul, Bhowmik, and Famanna (2021) examined how bank profitability metrics are affected by various factors like liquidity, loan-to-deposit, deposit-to-total assets, liquid assets to deposit liquid and current assets were affected. As a measure of profitability, they utilized return on assets. Current assets, liquidity, the proportion of deposits to assets, the fraction of cash and equivalents to deposits, and the loan-to-deposit ratio were the six independent variables utilized, derived from a sample of 40 institutions within the Bangladeshi banking sector from 2009 to 2018. While the current ratio (CR) and liquid assets ratio (LAR) have little effect on banks' profitability, the deposit-to-assets ratio (DAR), cash and equivalents ratio (CER), and loan-to-assets ratio (LAR) all have a considerable impact on banks' performance. The main takeaway is that the liquidity variable substantially affects the efficiency of Bangladeshi banks.

This study by Dahiyat et al. (2021) intends to examine, over the nine years spanning 2010–2019, the effect of liquidity and the effect of solvency management on the profitability of Jordanian manufacturing enterprises rated on the Amman Stock Exchange. They used two financial performance metrics, Return on Assets (ROA) and Earnings Per Share (EPS), as well as two proxies for liquidity and solvency management, the Current Ratio (CR) and total debts to total assets (TTA). One measure of a company's size is its (natural log) of total assets. Financial performance is little affected by liquidity, and the study found that solvency management negatively and substantially impacts company performance. On the other hand, firm size has positively and significantly impacted performance.

From 2016 to 2020, Oktaputri and Setyorini (2022) looked at infrastructure companies traded on the Indonesia Stock Exchange and how their profitability was affected by working capital efficiency, business risk, and liquidity, and derived from a sample of twelve infrastructure businesses. The investigation's model was estimated using multiple linear regression. The infrastructure industry's bottom line takes a hit when working capital efficiency, company size, and liquidity all take a hit. External factors accounted for 83.1% of the variance, while the research variables accounted for 16.9% of the variance in magnitude.

Suriyati et al. (2023) studied traditional and Islamic financial institutions in Indonesia to determine how various risks related to the banks themselves, liquidity risk, credit risk, operational risk, and macroeconomic variables like Gross Domestic Product (GDP), inflation, and unemployment impacted their profitability. They used secondary data from a cross-section of nine Islamic and sixteen conventional banks to perform a quantitative study estimation from 2017 to 2021. While other variables had little effect on Islamic banks' profitability, the results showed that credit and operational risk variables had a substantial adverse effect. Conversely, conventional banks' profitability is heavily influenced by inflation, GDP, and operational risk variables, whereas other variables have little to no effect.

A review of the studies cited above shows no clear correlation between bank size, capital adequacy, liquidity, cost-to-income, or debt-to-equity ratios and their impacts. While some studies have shown a positive association between the variables and the performance of the banks, others have found the opposite to be true. In the banking sector of Jordan, this study seeks to assess the impact of capital adequacy, liquidity, cost-income ratio, loans-deposit ratio, and bank size on performance over the last eighteen years. This is when regulators and policymakers have taken a keen interest, especially after the Basel III reforms were implemented. In addition, the study's results could help investors, bank managers, and regulators better understand how Jordanian banks are doing. The following hypotheses are derived from the literature review that underpins the study:

H₁: Capital sufficiency impacts the performance of Jordanian financial institutions.

H₂: The cost-to-income ratio affects Jordanian banks' performance.

H₃: The ratio of loans to deposits impacts the performance of Jordanian financial institutions.

H₄: Banks in Jordan are impacted by the debt-to-equity ratio, which impacts their performance.

H₅: The size of a Jordanian bank affects its performance.

3. Methodology

3.1. Research Design

The study provides a description of the key elements for the research because it is quantitative and examines the effects of adequacy of capital, liquidity, cost-to-income, loans-to-deposits ratio, and bank size on the performance of Jordanian banks. Additionally, it adheres to positivism and deductive reasoning. Previous studies utilized different methodologies, including the generalized method of moments (Ayinuola & Gumel, 2023), the random effects model (Khaled Subhi, 2023), simple regression, correlation analysis, and Analysis of variance (ANOVA) (Alamri & Almazari, 2021). The study's model is the Autoregressive Distributed Lag (ARDL) model and it choosing depend on its suitable to tiny samples. The accuracy of the model is based on whether the study's variables are cointegration into order one, order zero, or a mix of the two (Shrestha & Bhatta, 2018). The ARDL model suitable to small or finite samples, specifically for thirty or more observations. The method can be used even when variables are not cointegration at the same degree. In other words, the model can be used trustfully

when integrating orders zero and one variables, but not more. As [Pesaran, Shin, and Smith \(2001\)](#) stated autoregressive distributed lag (ARDL) model is applicable for estimating short and long-run relationship.

3.2. Sampling

This study aimed to examine the relationship between bank performance and bank-specific variables (such as capital adequacy, debt-to-equity ratio, cost-to-income ratio, loans to deposits ratio, and bank size) derived from the annual financial reports of Jordanian banks. As of December 2023, twelve commercial banks were listed on the Amman Stock Exchange. The study utilized a sample of eleven banks after excluding one due to unavailable data from 2006 to 2023. Consequently, the balanced panel dataset consisted of 216 bank-year observations.

3.3. Research Model

To examine the impact of capital adequacy, liquidity, cost-income ratio, loans to deposits, and bank size on the performance of Jordanian banks. The regression model has been specified as follows:

$$ROAit = \alpha + CARit + LTDit + CICit + DERit + BSit + \varepsilon \quad (1)$$

$$ROEit = \alpha + CARit + LTDit + CICit + DERit + BSit + \varepsilon \quad (2)$$

$$NIMit = \alpha + CARit + LTDit + CICit + DERit + BSit + \varepsilon \quad (3)$$

Where:

ROA: Return on assets (Net profit to total assets).

ROE: Return on equity (Net profit to total equity).

NIM: Net interest margin (Difference between interest expense and interest revenue divided by net profit).

LTD: Loans to deposits ratio.

CIC: Cost-income ratio (Operating cost to operating profit).

DER: Debt-to-equity ratio (Total liabilities to total equity).

BS: Bank size (Natural logarithm of total assets).

ε : error term.

3.4. Variable Specifications

The study's dependent variables were net interest margin (NIM), return on equity (ROE), and return on assets (ROA), which are indicators of bank profitability. Five independent variables were employed in the study.

3.4.1. Dependent Variables

1. Return on assets (ROA): This profitability measure provides how much profit a bank generates from its assets. It also shows how successful a bank's management is in making a profit from its assets on its balance sheet. It is calculated by dividing profit after interest and tax by total assets. A higher return on assets indicates higher profitability.

2. Return on equity (ROE) measures a bank's profitability. It is considered an instrument of a bank's profitability and how efficiently its management generates profit. The higher the ROE, the more efficiently a bank's management generates growth from its equity financing. It is measured by dividing net profit by total equity.

3. Net interest margin (NIM) measures a bank's profitability and provides a clear picture of its operational efficiency. It is calculated by subtracting the interest the bank pays to creditors from the interest it earns from loans and dividing it by operating profit.

3.4.2. Independent Variables

1. Capital Adequacy Ratio (CAR): The bank's capital adequacy ratio is a financial ratio used to measure the bank's ability to face financial risks and bear potential losses by comparing its capital to the risks it is exposed to. This ratio is used as a regulatory tool to ensure the stability of the banking sector and protect depositors from the risks of bankruptcy. Regulatory capital includes basic capital (Tier 1) and supplementary capital (Tier 2), while risk-weighted assets represent the total assets owned by the bank after adjusting for the risks associated with them.

2. Cost-to-Income Ratio (CIR) is a financial ratio used to measure the efficiency of a bank in managing its operating expenses compared to its revenues. This ratio reflects the bank's ability to generate profits while controlling costs. It includes total operating costs, such as employee salaries, rents, administrative expenses, and information technology. Total operating income consists of revenues generated from interest, fees, commissions, and other banking services. A low ratio means that the bank manages its costs with high efficiency compared to its revenues, indicating better profitability. A high ratio indicates that costs are high compared to income, which may reflect poor operational efficiency or the need to improve operating strategies.

3. Debt-to-Equity Ratio (DER) is a financial ratio used to measure a bank's reliance on debt financing compared to shareholders' equity, which helps assess the level of financial risk ([Edison, 2019](#)). A high ratio indicates that the bank relies heavily on debt to finance its operations, which can increase the risk of financial distress, especially during periods of economic downturn. In contrast, a low ratio reflects a greater reliance on shareholder financing, which may indicate greater financial stability but slower growth opportunities.

4. Loan-to-Deposit Ratio (LDR) is a financial ratio used to assess a bank's ability to convert deposits into loans and profits, reflecting the bank's efficiency in using its financial resources. This ratio is calculated by dividing the total loans granted by the bank by the total deposits it holds. This ratio is an important indicator of a bank's liquidity, as a very high ratio may mean that the bank is lending out most of its deposits, increasing liquidity risk, while a very low ratio indicates that the bank is not using its resources efficiently to generate profits. Generally, a ratio between 70% and 90% is considered a healthy indicator, but acceptable limits vary depending on the regulatory policies of each country. This ratio helps banks and investors assess the stability of the bank and its management of financial risks.

5. Bank size refers to how large or small a bank is in terms of its total assets, deposits, loans, capital, number of branches, and market share. The size of a bank is a key factor in determining its ability to compete, provide financial services, and take risks. Large banks have significant financial resources, allowing them to offer a wide range of financial products, while small banks may be more flexible and able to meet the needs of local markets. Bank size is usually measured by total assets, where the larger the assets, the greater the bank's ability to lend and generate profits; however, it may face greater regulatory challenges and operational risks.

4. Discussion of Empirical Results

This section outlines the key elements in this research, which includes the findings from the analysis of the data conducted to examine how the cost-to-income ratio, capital sufficiency, and other independent factors affect the performance of Jordanian banks. It includes ARDL calculations, unit root testing, correlation between research variables, and descriptive statistics for the study variables.

4.1. Descriptive Statistics

Testing the study variables' descriptive statistics (the average, minimum, maximum, and standard deviation) is essential for cross-sectional data and time series analysis. The upper and lower values of NIM, ROA, and ROE are (39.85), (7.52), and (24.45) respectively. The average values of NIM, ROA, and ROE are (3.101), (1.212), and (9.312) with a standard deviation of (0.031), (0.006), and (0.07) respectively. As for the independent variables, the average values of CAR, CIC, LTD, DER, and BS are (16.22), (2.135), (65.782), (13.754), and (9.378) with a standard deviation of (0.034), (2.375), (11.707), (2.708), and (0.414) respectively.

Table 1. Descriptive statistics.

Statistics	NIM	ROA	RoE	CAR	CIC	LTD	DER	BS
Mean	3.101	1.212	9.312	16.222	2.135	65.782	13.754	9.378
maximum	39.851	7.523	24.45	33.353	19.831	87.948	20.656	10.568
Minimum	1.410	0.000	-1.434	10.522	0.902	40.170	8.370	8.710
Std. dev.	0.031	0.006	0.070	0.034	2.375	11.707	2.708	0.414
Obser.	216	216	216	216	216	216	216	216

4.2. Correlation Matrix

We also looked at the correlations between the research variables. We ran a correlation analysis to reveal the strength and direction of the association among the research variables, and the results are shown in [Table 2](#). The Pearson value shows that the two factors are correlated with one another. The study's variables were found to be uncorrelated according to the findings of the correlation analysis. The findings indicate that the most remarkable figure was 54.61% for the correlation coefficient between the ROE and ROA variables. At -37%, the correlation between ROE and NIM was the lowest of all the variables.

Table 2. Correlation matrix.

Variables	NIM	ROA	RoE	CAR	CIC	LTD	DER	BS
NIM	1							
ROA	0.026	1						
ROE	-0.370	0.546	1					
CAR	0.095	0.200	-0.019	1				
CIC	-0.021	-0.029	-0.008	-0.028	1			
LTD	0.021	0.021	-0.037	-0.070	-0.046	1		
DER	0.043	0.168	-0.164	0.522	-0.108	0.270	1	
BS	0.004	-0.009	0.020	-0.086	-0.152	-0.199	-0.010	1

4.3. Unit Roots

To find the unit root of the dependent and independent variables, we employed the following tests: Im, Pesaran, Shin, and Philip-Perron ([Table 3](#)). Results show that, except for the NIM variable, all dependent variables are stable at the first difference, while ROA and ROE are stationary at the level. In addition, as shown by Philip-Perron, Shin, Im, Pesaran, and CIC, the independent variables NPL and CIC are level and first

difference stationary, whereas LTD, DER, and BS are non-stationary at the level. Nevertheless, as seen in [Table 3](#), all variables are stationary at first difference. In this inquiry, we will use the Autoregressive Distributed Lag (ARDL) model because the time series were indicated to be mixed and were not integrated at the same degree.

Table 3. Results of unit roots test.

Variables	Im, Pesaran and Shin W-stat				Philip-Perron			
	Level		First difference		Level		First difference	
Dependent variables	Statistic	Probability	Statistic	Probability	Statistic	Probability	Statistic	Probability
NIM	-0.470	0.319	-4.309	0.000	-0.799	0.212	-4.535	0.000
ROA	-2.863	0.002	-5.914	0.000	-3.223	0.000	-4.451	0.000
ROE	-2.214	0.013	-6.105	0.000	-2.833	0.003	-4.327	0.000
Independent variables:								
CAR	-3.666	0.000	-8.890	0.000	-5.757	0.000	-9.547	0.000
CIC	-10.430	0.000	-8.328	0.000	-16.464	0.000	-4.193	0.000
LTO	-2.089	0.018	-6.379	0.000	-1.684	0.013	-5.378	0.000
DER	-1.335	0.090	-5.786	0.000	-2.266	0.011	-3.481	0.000
BS	0.876	0.200	-3.827	0.004	-1.667	0.067	-3.938	0.000

4.4. Bounds Testing Procedure

Performing an F-test is the first stage in the ARDL model for searching of the presence of cointegration between the study's variables, which is a long-run relationship. We didn't accept the null hypothesis that states there is no cointegration among variables because, as shown in [Table 4](#), the F-test value of 7.58 is higher than the upper critical value of the bounds. This indicates that the variables do, in fact, exhibit long-run cointegration.

Table 4. Bound test results.

Test statistic	Value	K
F-statistic	7.58	5
Critical value bounds		
Significance	Io bound	I1 bound
10%	2.55	3.67
5%	2.76	4.11
2.5%	3.35	4.62

4.5. Autoregressive Distributed Lag (ARDL) Model Estimation

[Table 5](#) displays the ARDL long-term outcomes, considering the long-run equilibrium link between the performance of Jordanian banks and characteristics such as capital adequacy, liquidity, cost to income, loans to deposits ratio, and the size of the bank.

The long-term performance metrics of Jordanian banks, return on shareholders-equity (ROE) and Return on Assets (ROA), are negatively and considerably impacted by the capital adequacy variable, as shown in [Table 5](#). This means that, everything else being equal, a 1% rise in the Capital Adequacy Ratio (CAR) will lead to a 0.470 decrease in ROE and a 0.531 decrease in ROA. According to [Table 1](#), during the research period, Jordanian banks had an average capital adequacy ratio of 16.2%, which is higher than the 12% criterion set by the Central Bank of Jordan. The finding is in line with economic logic because increasing a bank's capital means it can better handle risks, which means it can cut back on investments and get a lower return. This result agrees with the research of [Chalise \(2019\)](#) and [Antwi \(2019\)](#), who found the opposite to what [Ajayi, Ajayi, Enimola, and Orugun \(2019\)](#) said—that capital adequacy had a favorable influence on company performance. Net interest margin (NIM) is a measure of a bank's profitability in Jordan; nonetheless, the data show that capital sufficiency has a small but negative effect on NIM.

Measures of Jordanian banks' performance, such as return on equity (ROE), return on assets (ROA), and net interest margin (NIM), are statistically negatively affected by the cost-to-income (CIC) coefficient. As a result, we can see that as CIC goes down, bank profitability goes up. For example, for every 1% increase in CIC, ROE goes down by 0.460, ROA goes down by 0.378, and net interest margin goes down by 0.322. The efficiency and competence of the bank's management in supervising their operational activities are shown by all the other constants, including the cost-to-income ratio (CIR). Important in the banking industry, it aims to boost a bank's bottom line by reducing operational costs and increasing operational profits, thereby improving the bank's overall performance. In order to increase market share and profitability in the face of fierce competition in the banking business, bank management focuses on cutting expenses and offering services at competitive prices. The results of this study are in agreement with those of [Lisboa \(2016\)](#) and [Abdelqader, Almansour, and Almansour \(2020\)](#), who found that cost-to-income ratios have a detrimental effect on bank performance.

Table 5 shows that the loan-to-deposit ratio (LTD) is a positive and statistically significant indicator of the performance of Jordanian banks. It clearly affects the return on equity (ROE) and return on assets (ROA) at the 5% level, and the net interest margin (NIM) at the 1% level. These results suggest that Jordanian banks can increase their interest earnings by improving the management of their resources, which helps them provide more loans and increase their income. A bank can also improve its performance by increasing the loan-to-deposit ratio, provided that it can generate sufficient revenues from granting loans to customers. Despite the presence of some non-performing loans, banks are able to provide credit effectively. These findings are consistent with the studies of [Sultan, Ahmed, Ameen, and Singh \(2020\)](#) and [Edison \(2019\)](#), which also showed a positive relationship between the loan-to-deposit ratio and bank profitability. However, [Lin and Chen \(2021\)](#) and [Abdelqader et al. \(2020\)](#) found that there is an inverse relationship between the loan-to-deposit ratio and bank profitability.

When analyzing the performance of banks in Jordan, it becomes clear that the debt-to-equity ratio does not have a significant impact on ROE, ROA, and NIM. This is because banks' operating expenses do not cover their debts, which makes this ratio ineffective on the efficiency of banks in Jordan. Loans affect the profitability of the bank only if they are used in operating activities that generate revenues. This result is consistent with what [Khaled Subhi \(2023\)](#) found, but it differs from the results of the studies of [Alamri and Almazari \(2021\)](#) and [Mugun \(2019\)](#), which found a positive relationship between the debt-to-equity ratio and bank performance. In contrast, this study did not find any impact of this ratio on the performance of Jordanian banks.

At a significance level of 5%, it appears that bank size has a positive and significant effect on the performance of Jordanian banks, especially on ROE, ROA, and NIM. This means that larger banks perform better due to their greater capabilities, extensive experience, and ability to spread costs over a larger number of services, which reduces the cost of providing services compared to smaller banks. Several studies, such as [Ahamed \(2017\)](#) and [Petria, Capraru, and Ihnatov \(2015\)](#), confirm that there is a positive relationship between bank size and performance. However, other studies, such as [Djalilov and Piesse \(2016\)](#) and [Brahmaiah \(2018\)](#), have shown that bank size does not directly affect its performance.

Table 5. Regression estimation of long-run ARDL results.

Variables	Dependent variables					
	ROA		ROE		NIM	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
C	0.508	0.756	1.091	0.573	-0.126	-2.104**
CAR	-0.531	-3.155**	-0.473	-3.301**	-0.103	1.367
CIC	-0.378	-2.767**	-0.460	-2.763**	-0.322	-2.242**
LTD	0.224	2.732**	0.328	2.844**	0.411	3.576**
DER	0.049	0.880	0.098	1.026	0.035	0.652
BS	0.229	2.862**	0.447	2.707**	0.341	2.262**
Regression statistics						
Observations	215		215		215	
R-Squared	0.480		0.422		0.454	
Adjusted R-squared	0.467		0.402		0.434	
F-statistic	13.484		10.758		9.411	
Prob (F-statistic)	0.000		0.000		0.000	

Note: Values in parenthesis represent t-statistic; ** denotes that the coefficient is significant at 5% respectively.

Indicators of performance for Jordanian banks, such as Return on Shareholders' Equity (ROE), Net Interest Margin (NIM), and Return on Assets (ROA), are negatively affected by cost-to-income and capital adequacy variables, according to **Table 6**'s ARDL short-term results. A 1% increase in Capital Adequacy Ratio (CAR) in the short term reduces the performance of the banks by 17.3%, according to the coefficient of capital adequacy. A 1% increase in the Cost-to-Income Ratio (CIC) leads to a 47.9% decrease in bank performance, according to the coefficient of the cost-to-income variable, which is 47.9. Additionally, as measures of the short-term profitability of Jordanian banks, the results demonstrated that NIM, Return on Assets (ROA), and Return on Equity (ROE) are positively impacted by the size of the bank. With a coefficient of 42.3% for bank size, we can see that performance improves by 47.3% for every 1% increase in bank size. Finally, the results showed that bank performance in Jordan is unaffected by the loan-to-deposit and debt-to-equity ratios.

Table 6. Regression estimation of Short-run ARDL results.

Variables	Dependent variables					
	ROA		ROE		NIM	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
C	0.015	1.974	0.013	1.674	0.026	1.122
CAR	-0.173	-2.175**	-0.676	-2.621**	-0.154	-2.327**
CIC	-0.479	-3.668**	-0.563	-3.456**	-0.434	-3.146**
LTD	0.022	1.452	0.024	1.642	0.034	1.236
DER	0.032	0.961	0.075	1.124	0.029	0.765
BS	0.423	2.551**	0.356	2.476**	0.443	2.536**
ECT(1)	-0.573	2.654**	-0.547	2.354**	-0.521	2.241**
Regression statistics						
Observations	215		215		215	
R-squared	0.491		0.431		0.461	
Adjusted R-squared	0.454		0.421		0.442	
F-statistic	11.404		9.432		9.541	
Prob (F-statistic)	0.000		0.000		0.000	

Note: Values in parenthesis represent t-statistic; ** denotes that the coefficient is significant at 5% respectively.

4.6. Residual Assumption Test

Table 7 shows that the study's model does not have autocorrelation, as indicated by residual assumptions. This occurs when the Lagrange Multiplier (LM) value exceeds 5%. Furthermore, the findings demonstrated that the residual is normally distributed since the Jarque-Bera (JB) value is greater than 5%. Lastly, the residual was homoscedastic with a Breusch-Pagan (BPG) value greater than 5%.

Table 7. Estimation of residual assumption test.

Assumption test	Statistic value	p-value
Autocorrelation (Lagrange multiplier (LM))	1.674	0.321
Normality (Jarque-Bera (JB))	0.431	0.914
Heteroscedasticity (Breusch-Pagan (BPG))	27.234	0.562

5. Conclusion

Capital adequacy, loan-to-deposit, cost-to-income, debt-to-equity, and bank size were the metrics that were analyzed in this study of Jordanian banks. From 2006 until 2023, twelve banks in Jordan were monitored yearly for the research. We employed autoregressive distributed lag (ARDL) when analyzing the study's data. We utilized the Philip-Perron, Im, Pesaran, and Shin tests to discover the unit roots of the study's variables before utilizing the ARDL model. Given that the integrated level was mixed in the two tests, we adjusted the ARDL model to fit the study. According to the statistics, drawing from a sample that included all Jordanian banks from 2006 to 2023, the average performance of all Jordanian banks during that time was satisfactory, with ROA of 1.9%, ROE of 9.3%, and NIM of 3.3%. In addition, the results showed that operating efficiency (cost-to-income maximization of 19.83%) and a more significant capital adequacy ratio (16.2%) separate Jordanian banks. Significant results from the ARDL estimation are as follows: (1) There is a long-run equilibrium association between the performance of Jordanian banks and the independent variables; (2) capital adequacy and cost-to-income negatively impacted the long-term and short-term performance of Jordanian banks; (3) bank size positively affected the long-term and short-term performance of Jordanian banks; and (4) the debt-to-equity ratio did not affect the long-term or short-term performance of Jordanian banks. In consideration of the study's results, the writers propose:

1. Investors should consider capital adequacy, loan-to-deposit ratio, cost of capital, and bank size variables when making investment decisions.
2. The management of Jordanian banks should not have excess capital adequacy. The results of the study show that the average value of the Capital Adequacy Ratio (CAR) is 16.2%, which is above the ratio required by the Central Bank of Jordan.
3. Jordanian banks' management must adhere to suitable credit policies to balance liquidity and profit objectives. The study's findings indicate that the loan-to-deposit ratio positively impacts their performance.
4. Conduct additional research and studies to incorporate macroeconomic and microeconomic factors that could affect the performance of Jordanian banks.

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