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ORIGINAL

Determinants of Bank Profitability in Developed and Emerging Countries

Determinantes de la rentabilidad bancaria en países desarrollados y emergentes

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ABSTRACT

Objetive: this study examines Arab and international bank profitability—Return on Assets (ROA) and Return on Equity (ROE)—determinants. It highlights regional performance differences and the main financial drivers of profitability, focusing on macroeconomic shocks. The paper compares Arab and international bank performance and provides new profitability driver insights. It also shows that linear modelling is insufficient to describe ROE in Arab countries and that nonlinear modelling is needed. The discussion suggests ways policymakers and banks can boost profitability and financial resilience.
Method: the paper uses "multiple linear regression (MLR)" with panel data from heterogeneous countries over several years. Interest income, capital adequacy, non-interest income, cost-to-income ratio, loan-to-deposit ratio, and non-performing loans are tested for their effect on ROA and ROE in the MLR specifications. Time and regional trends are tested to account for economic crises like the 2008 global financial crisis (GFC) and the 2020 COVID-19 pandemic.
Results: findings exhibit very high regional variation in bank profitability. African countries—e.g., Botswana, Ethiopia, and Malawi—ranked better than European and Asian counterparts on both ROA and ROE. Arab countries such as Iraq, Syria, and Saudi Arabia exhibited high ROA, while Yemen, Egypt, and Djibouti showed high ROE. The research could not find a valid linear regression model for the ROE in the Arab nations, implying complex, non-linear dynamics. The major determinants of profitability are interest income, capital adequacy, non-interest income, and cost-to-income ratio. The macroeconomic shocks also tended to decrease profitability significantly by region.

Keywords: Bank Profitability; Arab and International Banks; GFC; COVID-19.

RESUMEN

Objetivo: este estudio examina los determinantes de la rentabilidad de los bancos árabes e internacionales —el rendimiento de los activos (ROA) y el rendimiento del capital (ROE)—. Destaca las diferencias de rendimiento regionales y los principales factores financieros que impulsan la rentabilidad, centrándose en las crisis macroeconómicas. El documento compara el rendimiento de los bancos árabes e internacionales y ofrece nuevos datos sobre los factores que impulsan la rentabilidad. También muestra que los modelos lineales son insuficientes para describir el ROE en los países árabes y que se necesitan modelos no lineales. El debate sugiere formas en que los responsables políticos y los bancos pueden impulsar la rentabilidad y la resiliencia financiera.

Método: el documento utiliza la «regresión lineal múltiple (MLR)» con datos de panel de países heterogéneos a lo largo de varios años. Se analizan los ingresos por intereses, la adecuación del capital, los ingresos no relacionados con los intereses, la relación entre costes e ingresos, la relación entre préstamos y depósitos y los préstamos morosos para determinar su efecto sobre el ROA y el ROE en las especificaciones de la MLR. Se analizan las tendencias temporales y regionales para tener en cuenta crisis económicas como la crisis financiera mundial de 2008 (CFM) y la pandemia de COVID-19 de 2020.
Resultados: los resultados muestran una variación regional muy elevada en la rentabilidad bancaria. Los países africanos, como Botsuana, Etiopía y Malaui, obtuvieron mejores resultados que sus homólogos europeos y asiáticos tanto en ROA como en ROE. Los países árabes, como Irak, Siria y Arabia Saudí, mostraron un ROA elevado, mientras que Yemen, Egipto y Yibuti registraron un ROE elevado. La investigación no pudo encontrar un modelo de regresión lineal válido para el ROE en los países árabes, lo que implica una dinámica compleja y no lineal. Los principales determinantes de la rentabilidad son los ingresos por intereses, la adecuación del capital, los ingresos no relacionados con los intereses y la relación entre los costes y los ingresos. Las perturbaciones macroeconómicas también tendieron a reducir significativamente la rentabilidad por región.

Palabras clave: Rentabilidad bancaria; bancos árabes e internacionales; CGF; COVID-19.

INTRODUCTION

Bank profitability has become a concern for scholars, regulators, as well as industry professionals, especially against the background of persistent financial volatility globally.[1] The 2008 financial crisis exposed main weaknesses within the structures of banks, which were accompanied by a fall in loan standards and a sharp rise in bad loans.[2,3] These financial imbalances have brought to the forefront the role that banks play in stimulating economic growth, particularly by mobilizing household savings and creating avenues for investment for people and businesses that face difficulties accessing capital.[4] A healthy and profit-making banking sector is paramount to ensuring the stability of the financial system and bolstering the economy's shock-absorbing capabilities.[5] Though banks obtain most of their income from interest-based activity, their profitability is affected by a multitude of factors, ranging from internal (bank-specific) to external (macro-economic context-based) dimensions.[6] Key determinants that feed into profitability still include effective management of assets, operating efficiency, and judicious policy measures.[1,7] However, owing to the complicated and ever-changing dynamics of financial scenarios, the identification of generalized determinants of profitability is a difficult undertaking.

In the past two decades, several banking crises have emerged, revealing underlying weaknesses due to poor asset and risk management practices, which eventually led to unemployment, corporate failures, and large-scale economic instability.[8] This situation has led to increased academic interest in the analysis of bank profitability since this is a measure of a bank's financial health and efficiency of operations.[9] The previous literature has explored the effect of internal determinants like the cost-income ratio, capital adequacy, non-performing loans, and liquidity, combined with macroeconomic factors like interest rates, inflation, and GDP growth.[10,11,12] However, the current body of research is inconsistent. Some studies suggest that the cost-income ratio adversely impacts profitability, while other research proposes a positive relationship when affected by capitalization levels and bank size.[13,14] Similarly, some scholars suggest that interest rates have an effect on ROA and equity (ROE), while other research claims a lack of effect exists.[15] These inconsistencies highlight the need for research specific to contexts that are particularly diverse regarding financial structures and institutional arrangements. A major weakness of the existing body of research is its primary emphasis on the developed economies with established financial markets.

Few studies have comprehensively examined bank profitability within Arab countries or decomposed the drivers that affect it compared with the world trend. Much of the existing research has focused on individual countries from the MENA region, for instance, Egypt[16], or compared regional performance without conducting a comparative analysis.[17,18,19] Given that Arab economies Jordan, Egypt, Morocco, and Tunisia experienced financial liberalization during the past thirty years,[20] the structural differences that exist within their banking industries remain inadequately researched. To date, however, there has not existed a comprehensive body of research on the determinants of bank profitability across Arab countries relative to other parts of the world using a unifying empirical framework. This is a serious omission from the existing body of knowledge, particularly given the important position that Arab economies hold in front of the world economy and their recent soaring growth rates. Filling this omission is necessary for the advancement of scholarship and the provision of policy-relevant analysis on banking performance across these regions with different financial and economic arrangements.

This research aims to explain the major determinants of the profitability of commercial banks measured by

ROA and ROE across Arab economies, comparing them with those identified for non-Arab economies to establish regional differences as well as explore the impacts of the COVID-19 post-pandemic recovery on profitability and provide actionable recommendations for policymakers and practitioners aiming to improve financial resilience. Adopting the Structure-Conduct-Performance paradigm, the research theoretically explains bank profitability as an emergent phenomenon that arises from internal practices specific to banks and macro-external structures. Theory provides the foundation for examining the impacts of differences across financial systems, regulating authorities, and institutional settings on performance outcomes across regions. In research methodology, the research applies a new hybrid method by combining classical econometric analysis with data mining models, Multiple Linear Regression (MLR), to improve the accuracy and robustness of the model. To the best of the authors' knowledge, no previous research has applied a combined technique to analyze determinants of profitability of banks across the Arab economies compared with the world at large.

This research makes a valuable contribution to the body of knowledge on bank profitability. First, the research provides one of the few cross-country comparative analyses of the determinants of profitability for Arab countries using an international perspective, thus bridging a prominent geographical and contextual research gap. Second, the research provides enhanced theoretical contributions by examining the interactions between macroeconomic variables and bank-specific variables that affect profitability across different institutional regimes. Third, the research considers the post-COVID-19 era, thus providing timely insights on the recovery and adjustment of banks in Arab countries—a research area which has suffered from minimal coverage in current research. Fourth, the research makes methodological contributions by combining classical econometric methods with data mining methods using Multiple Linear Regression (MLR) to ensure the robustness and explanatory power of findings. Lastly, the findings provide significant policy and practical implications for policymakers, regulators, and financial institutions that are committed to enhancing bank performance and sustaining financial stability within emerging economies' financial markets.

The remaining sections of this paper are structured as follows: section 2 offers an overview of the literature review; section 3 outlines the research methodology; section 4 examines the empirical findings; and section 5 concludes by presenting the implications and recommendations.

Literature review

Factors that contribute to bank profitability have gained extra attention in both emerging and developed economies. A key internal determinant is the cost-to-income ratio (CIR), which measures a bank's operating efficiency by comparing its costs with its income. The scholarly literature reveals varied outcomes on the relationship between CIR and profitability.[21] Established that a positive relationship exists, which demonstrates that banks are able to pass on operating costs to consumers through pricing mechanisms when there is weak competition within a market. On the other hand,[10,22] revealed a strong inverse relationship, highlighting that poor control of costs suppresses returns. Another relevant consideration is the effect of bank overhead costs, which include personnel costs, administrative costs, and technology investments. The majority of the studies reveal a harmful effect on profitability,[23,24,25,26,27,28] although some studies highlight a multifaceted relationship. More specifically, with technology-based models of banks, investments in information technology may increase overhead costs at the beginning but improve efficiency and profitability in the long term.[29,30] These findings highlight the need for effective expense control measures to support bank performance across different financial situations.[31,32,33,34]

Another key driver of bank performance is interest revenue, which is commonly evaluated using the net interest margin (NIM)—the difference between revenues generated from loans and the cost of deposits. Empirical studies invariably establish a positive link between NIM and bank profitability.[35,36] This measure represents the direct evaluation of a bank's ability to generate income from its core intermediation function. However, in the face of rising competitive pressures and regulatory pressures, financial institutions are diversifying their revenue bases by including non-interest income streams, including fees and commissions. The empirical literature on non-interest income presents a mixed picture.[37,38] While some studies find a positive effect on profitability[39,40,41,42] others warn that overdependence on alternative sources of income could increase income volatility and risk exposure, especially in developing countries.[43] This suggests that, while diversification can open up new sources of revenue, its effectiveness depends on the strength of institutional structures and the effectiveness of risk management practices.

Moreover, In the area of credit risk and asset quality, Non-performing loan (NPLs) are oftentimes identified as a core determinant of profitability for banks. High levels of NPLs tend to contribute to higher loan loss provisions and reduced earnings, a correlation that has been affirmed by research carried out by both.[44,45,46,47,48,49] There is, however, heterogeneity observed in the findings across studies, with [50] finding that NPLs had a negligible effect, especially where banks have a sound capital base or those with the backing of government intervention. Another key indicator is that of the credit-to-deposit bank ratio, which captures a bank's lending performance

against deposit accumulation. The indicator is often positively linked to profitability since lending is the major revenue source for financial institutions.[51] A much higher than normal ratio, however, may signal liquidity risk, while a low ratio may imply inefficient use of resources. As argued by [32], optimal management of the ratio is crucial to ensure liquidity sustenance alongside revenue generation.

Furthermore, Capital strength is a primary motive for profitability, usually measured using the Capital Adequacy Ratio (CAR) and the general capital-assets ratio. The CAR indicates a bank's ability to absorb risk and remain solvent when under stress. There is a large body of evidence supporting the positive relationship between CAR and profitability[52] which indicates that banks with high capitalization are able to survive losses without impairing their operations. Both the CAR and the capital-assets ratio indicate a bank's total capital strength, which includes its attractiveness for funding and its potential to reduce default risk. The studies by [33] also support the argument that higher capital ratios beget higher profitability, especially when there is financial stress. Nevertheless, some authors suggest a trade-off where overcapitalization is seen as limiting leverage and, consequently, returns.[53] On the other hand, financial stability, measured using the Z-score, is important as well. A higher Z-score indicates a higher distance from insolvency and has a positive relationship with bank profitability,[54,55] thus confirming the view that stable banks are likely to maintain performance over the long term.

Liquidity management plays a central role within bank profitability due to the fact that a bank's liquidity assets to deposits and short-term financing ratios indicate the bank's ability to meet unforeseen withdrawals and financing disruptions. Although liquidity is paramount to stability, over-reliance on liquidity management can lead to low earnings due to idle funds that incur minimal returns. Some research work [56], explains the detrimental consequences of excess liquidity on profitability, while some other research, e.g.,[57,58] highlights the benefits of carrying prudent liquidity levels for sustaining business operations and cutting financing costs during times of crisis. These conflicting findings indicate that optimal profitability is not a function of excessive liquidity but a balanced trade-off between safety and investing. Also, Interest rate dynamics are crucial to a bank's profitability, as lending-deposit spread, which is the difference between what is collected from borrowers and that which is paid to depositors, is a major source of income. A number of research studies [59,60] support the evidence for positive profitability contribution from it, especially where capital markets are not well-developed. Regardless, evidence from individual contexts,[61] presents a negative or even null effect likely due to inefficiencies within the financial system itself. Even credit to the private sector at different rates has yielded mixed outcomes. While research based within Islamic bank contexts[62] shows positive correlation. Even the real rate of interest—found by deflating nominal interest rates to remove their inflation component—has a material impact on profitability since several research studies [63,64] support a positive relationship since higher real rates of interest usually indicate a healthy macroeconomic environment that is favorable to profitability of loans.

The factors influencing bank performance and lending practices in many situations have been the subject of recent research. Net interest margin is positively impacted by bank-specific elements as size, capital, and liquidity.[65] Bank efficiency is influenced by macroeconomic, sector-wide, and bank-specific variables in CEMAC and WAEMU nations, although democratic considerations often have a negative effect.[66] Income diversification, firm-specific elements, and macroeconomic variables all affect Indonesian banks' performance, with capital structure having a major impact.[67] Microenterprise lending in Vietnam is influenced by macroeconomic and bank-specific factors, with bigger banks lending to this sector at faster rates of growth.[68] Together, these studies demonstrate the intricate interactions between internal and external variables that influence bank performance and lending choices, highlighting the necessity of all-encompassing methods for assessing and enhancing the resilience and efficiency of the banking industry.

METHOD

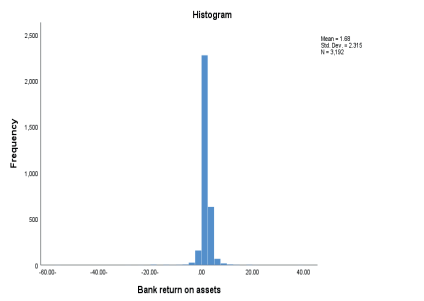
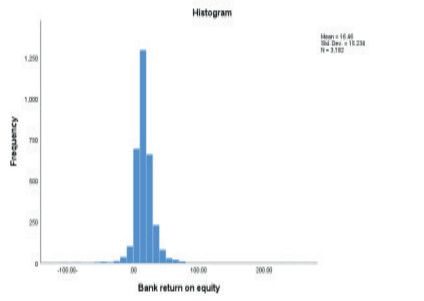
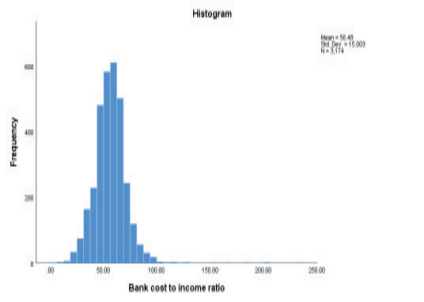
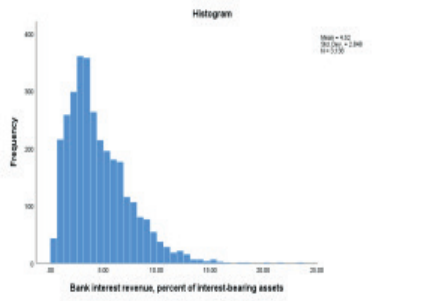
In this research, advanced statistical techniques are applied to fit the relationship between each of the major determinants of bank performance and the profitability measures, that is, ROA and ROE. The goal is to identify the most explanatory predictor variables, discover their patterns and relationships with each other, and establish sound econometric models that are capable of explaining and predicting profitability outcomes for different bank systems. For that purpose, Multiple Linear Regression Analysis (MLRA) is used within the research a widely used data mining and statistical tool particularly designed for financial and economics research modelling and forecasting of outcomes. Two individual applications of the use of MLRA are made for each of the two dependent variables (ROA and ROE) to investigate the effect of a given list of bank indicators on each of the profitability measures. A preliminary Exploratory Data Analysis (EDA) is done to analyze the distribution, consistency, and form of the data at the outset. The initial stage helps in the identification of outliers, understanding of variable distributions, and verification of the quality and sufficiency of the data for modelling purposes ahead.

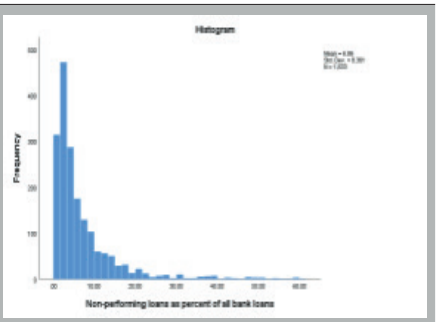
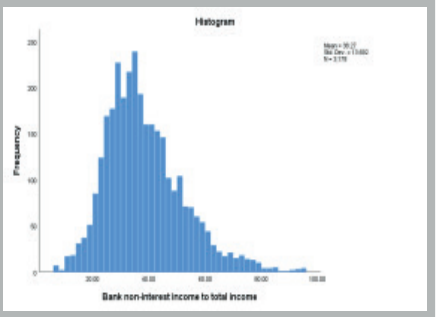
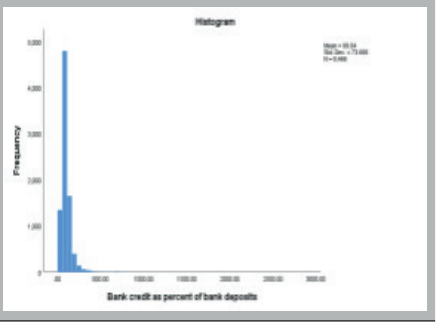
Two steps are required for the analysis. First, the models are estimated for the full dataset on world banks containing indicators for countries covered in the dataset. This allows general trend and relationship

identification that is applicable to banks globally. Second, the models are estimated for a filtered dataset containing Arab bank indicators only. The comparison method allows identification of region-specific differences or similarities for the performance of the predictor variables in front of profitability. It allows for consideration of the generalizability and applicability of the world findings to the context of the Arab bank as well. With a two-level strategy, the study contributes to the knowledge at a world and regional level about the extent to which financial performance measures affect banks' profitability. The formulated models are also ready for use in feasibility study and performance measurement to predict future or prospective profitability outcomes, thus being informative for policymakers, financial analysts, and banks.

An exploratory analysis of all worldwide study data

Table 1. Descriptive statistics and normality test for dependent and independent variable

Variable	Statistical scale						Histogram
	Minimum value	Mean	Median	Maximum value	Standard deviation	value P-	
ROA	55,41-	1,67	1,5	38,88	2,31	0	
ROE	112,19-	16,45	15,23	257,59	15,23	0	
cost to income ratio	5,03	56,47	56,35	237,05	15	0	
interest revenue	0,07	4,52	3,85	23,32	2,84	0	

Non-performing loans	0,08	6,86	3,91	61,11	8,36	0	
non-interest income to total income	6,12	38,27	35,96	95,42	13,69	0	
credit as percent of bank deposits	5,96	99,03	87,18	2861,11	73,66	0	

An exploratory analysis of the world dataset was carried out to obtain a clear picture of the distribution over time periods of key study variables. Table 1 presents the key measures of variability and central tendency, that is, the minimum, mean, median, maximum, standard deviation, and normality test (p-values) and frequency histogram for each variable. These measures allow for outlier identification, viewing the patterns within the data, and a check for normality assumption. The equality of the mean and median figures reflects no substantial deviation from most variables, a lack of extreme outliers that could skew the analysis. A skew to the right is, however, observed for variables like the loan-deposit ratio, the non-performing loans, and income from interest, where infrequent but large observations correspond with large maximums and standard deviations. This indicates the presence of some exceedingly large observations that could skew some results.

The complete evaluation of the "Return on Total Assets (ROA)" index reflects a huge difference in the performance of banks across different countries. As shown from table 2, the highest average ROA was reported by countries like Malawi, the Maldives, Papua New Guinea, Samoa, Sierra Leone, Uganda, and Zimbabwe during the stated study period. Leading the list was Malawi with a record average of 6,72 %, with Papua New Guinea standing at 6,38 % and the Maldives at 4,86 % close behind. The exceptionally high average ROA of these countries may imply that their banks are taking full advantage of good economic conditions, sophisticated financial networks, or good regulation schemes. On the other hand, countries like Ecuador, Greece, Portugal, Saint Lucia, and Ukraine had the poorest average ROA with some countries registering a negative return. Specifically, Ecuador had an average ROA of -0,14 %, Greece -1,12 %, and Portugal -0,08 %. These poor performances are possibly reflective of deep-seated macroeconomic issues, weaknesses within the financials, or volatility within the banking sector, which may be compounded by high levels of bad loans, weak credit growth, or stringent regulation. This difference reflects the sizeable differences at the international level in terms of banking profitability. These differences are attributed to differences in macroeconomic stability, financial market development, and institutions' quality across various economies. The large variation of ROA measures highlights the need for a richer analysis of the structural and policy drivers of the performance of banks within different contexts.

Table 2. The classification of the world's highest and lowest countries based on the rate of ROA

Country	Malawi	Maldives	Papua New Guinea	Samoa	Sierra Leone	Uganda	Zimbabwe
Mean	6,72	4,86	6,38	5,86	5,63	4,17	4,75
Country	Ecuador	Greece	Portugal	Saint Lucia	Ukraine		
Mean	0,14-	1,12-	0,08-	0,11-	0,06-		

A look at the ROE index by country explains somewhat the performance of banks globally. Table 3 presents the best and worst countries with the highest and lowest average ROE for the research period. The best countries with the highest average ROE include Botswana, Ethiopia, Guinea, Malawi, Papua New Guinea, Sierra Leone, and Zimbabwe, which are ranked for their exceptional ROE performance. Leading the list is Botswana with a strong average of 47,21 %, trailed by Ethiopia (38,43 %) and Guinea (37,51 %). These countries have evidence of good profitability of banks, which could be due to good financial prospects, good financial performance, or efficient banks. Contrariwise, there are some countries with the worst average ROE, for example, Greece, Ireland, Montenegro, North Korea, and Saint Lucia. The poorest performance is that of Greece with a -9,65 % ROE, which indicates severe financial troubles with banks' performance in Greece. Ireland (-3,49 %) and Montenegro (0,10 %) also have poor ROE, which could be evidence that they did not succeed with a ROE. North Korea has a ROE of 0,00 %, which may indicate that it has an under-developed or highly regulated banking sector. These low returns indicate an issue with a high business cost of conduct, poor financial stability, or regulation constraint that may be hindering banks' performance across those countries from being profitability. The difference across the highest and the poorest ROE also presents evidence of huge differences across the performance of banks across the globe. These differences may be due to macroeconomic stability, regulation, and financial condition of the banks across different economies. The difference across ROE presents evidence of the need for careful assessment of the drivers of banks' profitability across economies.

Table 3. The classification of the world's highest and lowest countries based on the rate of ROE

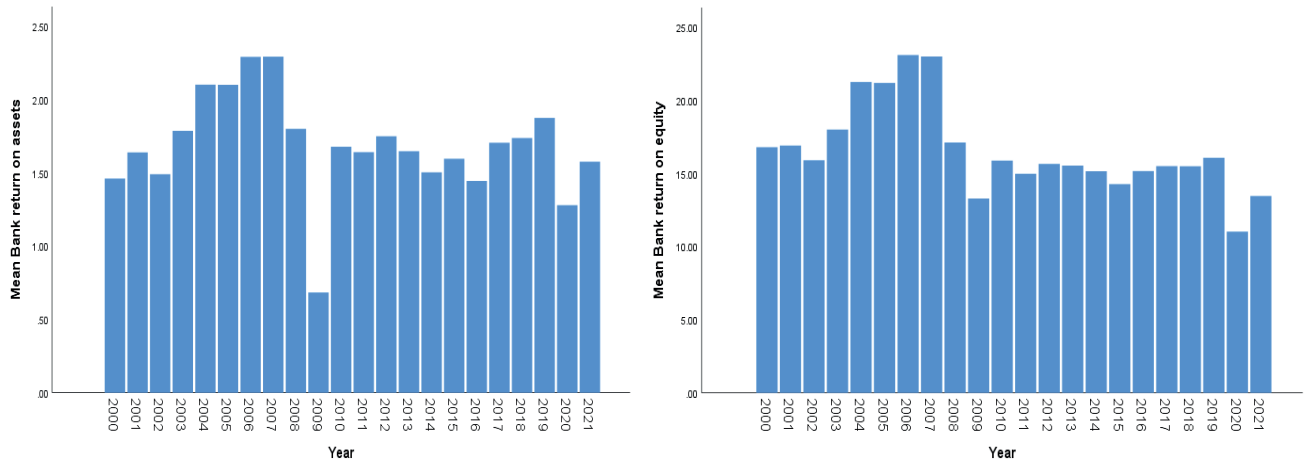
Country	Botswana	Ethiopia	Guinea	Malawi	Papua New Guinea	Sierra Leone	Zimbabwe
Mean	47,21	38,43	37,51	42,54	45,85	39,19	41,69
Country	Greece	Ireland	Montenegro	North Korea	Saint Lucia		
Mean	9,65-	3,49-	0,10-	0	1,27		

Moreover, Comparison of the ROA and ROE of the six continents reveals large differences in their performances. Table 4 presents the averages and standard deviations of the two measures, which present countries' performance according to each continent. The highest average ROA (2,57) and ROE (24,55) are for Africa. High levels for the two measures reveal that African countries, on average, record higher profitability over assets and equity. This could be due to higher returns on bank operations, effective costing structures, or good economic climates for some of the African countries. Furthermore, standard deviations for the two measures (2,27 for ROA and 16,87 for ROE) are moderate, suggesting some diversification but that the measures are relatively homogeneous for African countries. The European continent records the lowest average ROA and ROE at 0,94 and 9,43, respectively. The low ROA and equity could be due to the financial crises and poor growth that the European banks have recently gone through. Despite the recovery some states have undergone from financial crises, Europe has continued to suffer from low rates of interests and poor economies that could keep bank profitability low. Standard deviations (2,23 for ROA and 13,77 for ROE) for the two measures are close to those for the African continent and quite low, suggesting some homogeneity within the continent though the general performance is low. Asia follows Europe with a mean ROA of 1,57 and ROE of 15,45. Even though the measures of ROA and ROE are higher than those for the European continent, they are quite low compared to those for the African continent. Its standard deviations (2,58 for ROA and 13,78 for ROE) indicate some performance volatility across the countries of Asia owing to the heterogeneity of the continent from an economies' perspective ranging from emergent to full-fledged financial markets. North America and Oceania are relatively moderate with a higher mean ROA of 1,78 and ROE of 17,01 for North America, and a lower ROA of 1,59 but higher ROE for Oceania of 18,44. The standard deviations for both continents are lesser compared to those for Asia and Africa, indicative of lesser performance volatility. South America is as consistent with a higher mean ROA of 1,71 and ROE of 18,32, while its standard deviations of 2,26 for ROA and 14,01 for ROE indicate a relatively consistent but somewhat heterogeneous range of figures when compared with those for Oceania and North America.

Table 4. Continent classification across the globe based on the average and standard deviation of ROE and ROA

ROA		ROE		
Mean	Standard deviation	Mean	Standard deviation	Continent symbol
2,57	2,27	24,55	16,87	Africa (AF)
1,57	2,58	15,45	13,78	Asia (AS)
0,94	2,23	9,43	13,77	Europe (EU)
1,78	1,04	17,01	9,21	North America (NA)
1,59	1,40	18,44	9,66	Oceania (OC)
1,71	2,26	18,32	14,01	South America (SA)
1,68	2,31	16,46	15,23	All

From figure 1, it is clear that the highest return rates of the ROA index were for the years 2003–2008 and 2017–2019, and the highest return rates of the ROE index were for the years 2003–2007. Those were the years of good performance of countries with better financial outcomes of profitability. On the other hand, the financial performance for both indicators was at the minimum for the years 2009 and 2020. The fall of the performance for those years is most likely due to the 2008 financial crisis and fiscal effects of COVID-19 pandemic for the year 2020. These two incidents could have had massive adverse impacts on the banking industry globally, causing reductions of the assets and equity return rates for those years.

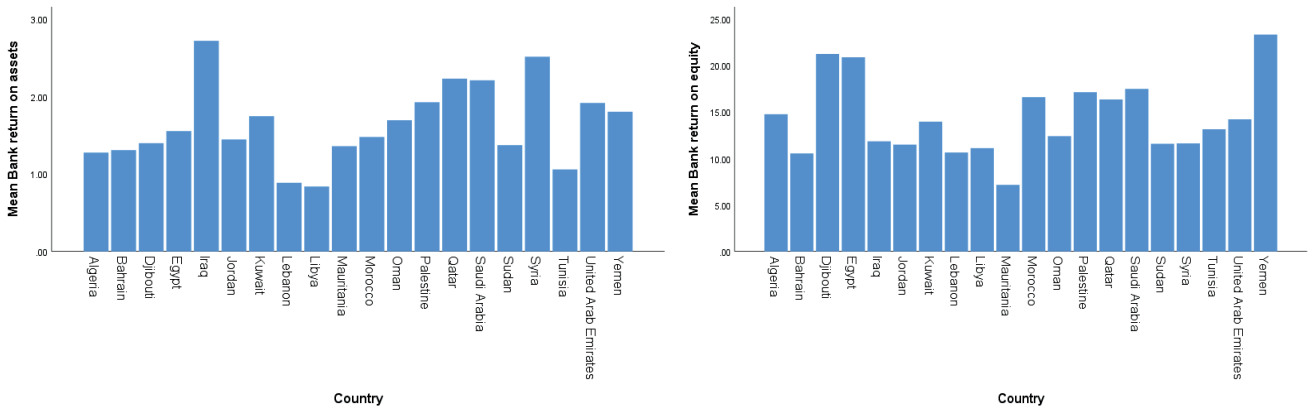


ROA ROE

Figure 1. Histograms of the ROA and ROE indicators based on the number of years of research

Exploratory analysis of study data for arab countries

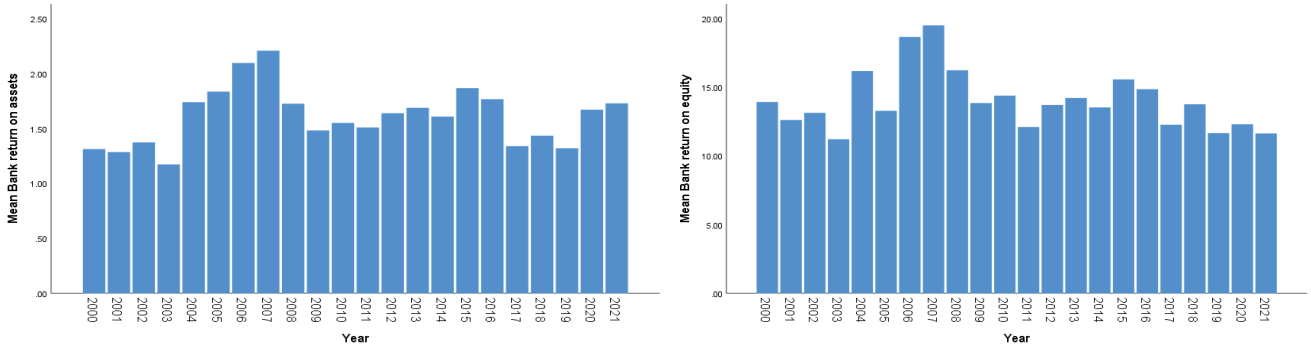
The objective of this section is to conduct an exploratory analysis of the ROA and ROE measures for Arab countries only. By examining the ROA and ROE measures, the intention is to see the trend of the measures for Arab countries compared to that which is observed across the globe. On examining the ROA index, Iraq, Syria, Saudi Arabia, and Qatar had the highest measures (figure 2). These countries have proven to be highly efficient with assets, which is a marker of good performance with a view to achieving returns on assets. On the contrary, the Libyan, Lebanese, and Tunisian countries had the worst ROA measures, which is a marker of poor performance with a view to asset management and efficiency compared to their regional counterparts. Contrariwise, on examining the ROE index, Yemen, Egypt, and Djibouti had the highest measures. These countries have proven to be able to generate strong returns vis-à-vis shareholders' equity, which is a marker of good profitability and effective deployment of equity capital. Contrariwise, Mauritania had the worst ROE, which is a marker that its banking sector was hit by poor performance with a view to achieving value for its shareholders during the study era. This contrast of comparing the ROA with the ROE measures has a purpose to paint the financial status and performance of Arab countries, highlighting strengths and weaknesses across the region. The following figures and tables explicate the same trend further.



ROA ROE

Figure 2. Histograms of ROA and ROE indicators for Arab countries

By comparing the performance of Arab nations based on ROA and ROE over the years, from figure 3 one may observe that the highest levels of ROA came during the years 2004 and 2007, and also during 2015 and 2016. These years depict signs of a better financial performance, where countries of the region had the capability to achieve higher returns from their assets. Similarly, for ROE, its highest levels were during the years 2006 and 2008, and another peak is depicted for the year 2004. These years depict the favourableness of the environment for profitability based on equity for Arab countries. On the contrary, the worst for both measures was recorded for the year 2003. This year is depicted to be a year of underperformance, which was possibly due to regional monetary issues, external shocks, or other adverse factors that had affected the financial sectors of Arab countries for that year.



ROA ROE

Figure 3. Histograms of the indicators of ROA and ROE for Arab countries, categorised by the number of years of research

Besides the aforementioned analysis, a "box plot" has also been utilized to compare and analyze further the degree of dispersion of the ROA and ROE value levels for Arab states. The box plot is a graphical representation of the distribution that highlights key statistical features like the median, interquartile range, and any outliers of the data. From the aforementioned plots, one is able to easily better facilitate the comprehensibility of volatility as well as the degree of dispersion of the abovementioned financial indicators across the region. Figure 4 indicates that Syria has the highest degree of variation of ROA value levels, followed by Iraq. This is due to the length of the box plot and the presence of large value outliers for the index for Syria, which signifies enormous degrees of financial volatility. On the other hand, the State of Palestine registered the minimum degree of fluctuation, which signifies a very large degree of stability for the ROA index. When it comes to the ROE index, there was minimal fluctuation noticeable for most Arab states. Nevertheless, Palestine, as well as Jordan, were the most stable, registering minimal variation for the ROE levels. Such stability signifies that the abovementioned states had ensured a generally steady level of profitability with respect to shareholders' equity over the study horizon.

A comparison of the statistical indicators for ROA and ROE for the Arab world with their respective indicators globally is a valuable source of information on financial performance within the region. A cross-country comparison of the statistics presented in table 5 with those shown in table 1 indicates that Arab countries' average ROA and ROE are overall typical of world averages. A distinguishing feature of the Arab world, however, is the fact that the region has smaller standard deviations for both indicators. This lesser volatility—with a standard deviation of 1,19 for ROA and 9,27 for ROE—reflects relatively smoother financial performance from Arab countries.

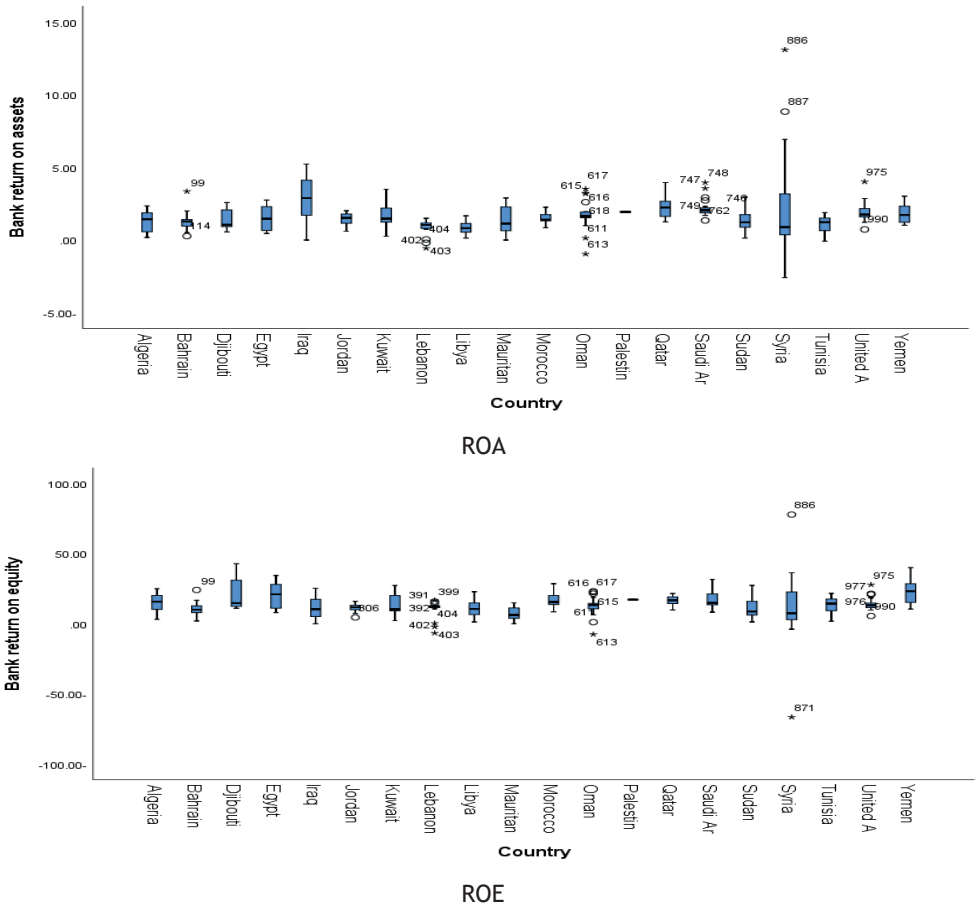


Figure 4. The box shape for the indicators of ROA and ROE for Arab countries

Lower dispersion is a sign that, unlike the wider world trend, Arab countries have recorded relatively consistent returns during the recent time frame. The stability may be a sign of improvements on their management, regulation arrangements, or financial sector stability. Reduced contrast for both ROA and ROE is a sign that banks from Arab countries have recorded fewer extreme performance outcomes, thus validating the impression of a financial environment that is more consistent and stable across the region.

Table 5. The most important statistical measures for ROA and ROE for Arab countries

	ROE	ROA
Minimum value	-66,47	-2,59
Mean	13,25	1,5
Median	14,06	1,61
Maximum value	77,71	13,09
Standard deviation	9,27	1,19

RESULTS

Correlation and linear regression analysis on all study data

The statistical analysis at this stage is done because it is meant to investigate the linear relationships of the response variables-ROA and ROE-and the research's predictor variables. By so doing, it prepares the data for the construction of suitable linear models for analyzing the causal financial relationships between variables.

Table 6 presents the matrix of correlation coefficients that indicates some interesting associations. Positive and statistically significant associations exist with variables such as bank lending-deposit interest rate spread, bank overhead costs, bank interest income, and capital for ROA. For instance, a correlation coefficient of 0,418 exists for ROA and bank interest income, which indicates a positive relationship at a very high magnitude. Negative associations are seen with the cost-income ratio, non-performing loans to total loans, and the loan to deposit ratio, which indicate that costs, defaults, and loan to deposit ratios decrease ROA. No correlation

was surprisingly found for ROA for variables such as standard scores of the banking sector, bank liquidity, non-interest income to total income, and the real interest rate that indicate that the variables have no direct effect on ROA.

Similarly, for ROE, positive and statistically significant associations with bank interest income, capital adequacy, and the interest rate are seen. Bank interest income has a correlation of 0,431 with ROE, which reflects a strong positive relationship. The cost-income ratio, the ratio of non-performing loans to loans, and the loan-deposit ratio are negatively correlated, reflecting that variables reduce ROE. Once again, with ROA, no statistically significant associations for ROE with the interest rate spread, capital-to-risk-weighted assets ratio, banking system z-scores, bank liquidity, and the real rate of interest are seen. These findings reveal key determinants of bank performance, where most of the predictive variables have statistically significant positive or negative associations with ROA and ROE.

Table 6. Matrix of binary linear correlations between the study's predictive variables and the two response variables

		ROA	ROE
Bank lending-deposit interest rate spread	Pearson Correlation	0,103**	0,098**
	Sig. (2-tailed)	0,000	0,000
Bank cost to income ratio	Pearson Correlation	-0,237**	-0,271**
	Sig. (2-tailed)	0,000	0,000
Non-performing loans as percent of all bank loans	Pearson Correlation	-0,167**	-0,183**
	Sig. (2-tailed)	0,000	0,000
Bank overhead costs, percent of total assets	Pearson Correlation	0,186**	0,193**
	Sig. (2-tailed)	0,000	0,000
Bank interest revenue, percent of interest-bearing assets	Pearson Correlation	0,418**	0,431**
	Sig. (2-tailed)	0,000	0,000
Bank credit as percent of bank deposits	Pearson Correlation	-0,118**	-0,127**
	Sig. (2-tailed)	0,000	0,000
Banking system regulatory capital to risk-weighted assets	Pearson Correlation	0,235**	0,042
	Sig. (2-tailed)	0,000	0,052
Banking system z-scores	Pearson Correlation	0,045*	0,024
	Sig. (2-tailed)	0,012	0,174
Bank liquid assets to deposits and short-term funding	Pearson Correlation	0,081**	0,055**
	Sig. (2-tailed)	0,000	0,002
Banking system capital, percent of assets	Pearson Correlation	0,288**	0,106**
	Sig. (2-tailed)	0,000	0,000
Bank non-interest income to total income	Pearson Correlation	0,003	-0,038*
	Sig. (2-tailed)	0,850	0,035
Interest rates on bank credit to the private sector	Pearson Correlation	0,172**	0,180**
	Sig. (2-tailed)	0,000	0,000
Real interest rate	Pearson Correlation	-0,003	0,002
	Sig. (2-tailed)	0,879	0,936

**. Correlation is significant at the 0,01 level (2-tailed)

*. Correlation is significant at the 0,05 level (2-tailed)

Multiple linear regression of ROA based on all the predictor variables is shown in table 7. Among the most important variables for evaluating the model are correlation coefficient (R), coefficient of determination (R^2), and analysis of variance (ANOVA). Probability value reported under the ANOVA table declares there is a statistically significant relationship between the response variable and the independent variables. However, for identifying the best prediction variables, the regression equation is going to be refit several times using the best model-building strategy. At this stage, ROA seems to be a determining factor for the dependent variable.

Table 7 provides the efficiency measures of R = 0,53 and R^2 = 0,28, which represents a moderate fit. The value of Adjusted R^2 is 0,27, so 27 % of the variance of ROA is explained by the explanatory variables. The

standard error is 1,51, and the regression model is statistically significant with the F-statistic being 22,03 (p-value < 0,01).

Table 7. Measures of the efficiency of the linear regression analysis model for ROA on all predictive variables

R	R Square	Adjusted R Square	Std. Error		
0,53	0,28	0,27	1,51		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	655,91	13	50,45	22,03	0,00
Residual	1689,85	738	2,29		
Total	2345,76	751			

Subsequently, after careful analysis, the most appropriate model was selected, as seen from table 8. Table 8 indicates the best-selected variables for the regression model. The R has fallen slightly to 0,47, and the coefficient of determination is 0,22, meaning that the current model accounts for about 22 % of the ROA variation. The adjusted R^2 is 0,21 and standard error is 2,39, showing a higher unexplained variation in the current model compared to the previous one. Residual mean square has also increased, and the F-statistic is 74,45 (p-value < 0,01) showing a highly significant relationship.

Both the coefficients of determination and correlation have fallen slightly, and the standard error of the estimate (Std. Error) and the mean square error have increased. We realize this from the comparison of the results of the linear regression analysis presented in tables 7 and 8. The conflicting outcomes are a clear and significant indication that there is no linear relationship between the dependent variable and the predictors.

Table 8. Measures of the efficiency of the linear regression analysis model of ROA on the best selected predictive variables

R	R Square	Adjusted R Square	Std. Error		
0,47	0,22	0,21	2,39		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	2129,57	5	425,91	74,45	0,00
Residual	7700,60	1346	5,72		
Total	9830,18	1351			

Table 9 presents the linear regression coefficients for ROA using the best selected predictors. The five best predictors that have a statistically significant effect on ROA are entered into the equation. The constant is 0,689 with a t-statistic of 1,703 and a p-value of 0,089, which is on the borderline of being at the 0,10 level of being statistically significant. Among predictors, bank cost to income has a coefficient of -0,046 with a highly statistically significant t-statistic of -8,858 and a p-value of 0,000, which shows that with higher cost-income, ROA is lower. Also, the share of non-performing loans from total loans provided by the bank has a coefficient of -0,071, with a t-statistic of -7,964 and a p-value of 0,000, which reflects that with higher rates of non-performing loans, ROA is lower.

Conversely, bank interest income as a fraction of interest-bearing assets has a positive coefficient of 0,366, a t-value of 13,696 and a p-value of 0,000, which reflects that ROA is associated with higher interest income. The bank system regulation capital to risk-weighted assets has a positive coefficient of 0,057, a t-value of 3,563 and a p-value of 0,000, which reflects that ROA is associated with higher capital adequacy ratios. Non-interest income to total income has a positive coefficient of 0,034 with a t-value of 5,651 and a p-value of 0,000, which reflects that a rise in the non-interest income is associated with higher ROA.

This best model-based endpoint regression helps remove those variables that are likely to be strongly related to ROA on a non-linear scale. These five variables listed on table 9 are the most powerful variables for ROA prediction with a good statistical significance and a definite requirement of being a part of the model.

In addition, table 10 presents the efficiency measures of linear regression for ROE using all the predicator variables. The correlation coefficient is good for the model (R = 0,71), which indicates a good line relationship for the response variable (ROE) and predictor variables. The coefficient of determination (R^2 = 0,50) indicates that the predictor variables explain about 50 % variance for ROE, a very good explanatory performance for other models compared to other models. Additionally, the adjusted R^2 of 0,49 indicates that even with the adjustment for the number of predicators, the model explains a very large proportion of variance for ROE. The

standard error of the estimate (7,46) indicates an impression of the accuracy of predictions, an acceptable fit. The ANOVA table also indicates that the model is statistically significant because the F statistic (56,23) is statistically significant at the 0,00 level, an indication that the overall model is statistically significant. It indicates that the relationship is strong and meaningful for ROE with the predicator variables and that the performance of the model is better compared to the efficiency of the ROA regression model. These findings indicate the linearity of the linear regression model for ROE, which indicates that the selected variables explain the variations on ROE effectively.

Table 9. Coefficients of the linear regression model of ROA on the most optimal selected predictive variables

Model	Coefficients		t	Sig.
	Beta	Std. Error		
(Constant)	0,689	0,404	1,703	0,089
Bank cost to income ratio	-0,046	0,005	-8,858	0,000
Non-performing loans as percent of all bank loans	-0,071	0,009	-7,964	0,000
Bank interest revenue, percent of interest-bearing assets	0,366	0,027	13,696	0,000
Banking system regulatory capital to risk-weighted assets	0,057	0,016	3,563	0,000
Bank non-interest income to total income	0,034	0,006	5,651	0,000

Table 10. Measures of the efficiency of the linear regression analysis model for ROE on all predictive variables

R	R Square	Adjusted R Square	Std. Error		
0,71	0,50	0,49	7,46		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	40665,43	13	3128,11	56,23	0,00
Residual	41110,52	739	55,63		
Total	81775,95	752			

Table 11 reports the results of the linear regression model for ROE using the best-fitting group of prediction variables found. The correlation coefficient (R = 0,71) and the coefficient of determination (R^2 = 0,50) are identical to those of the complete model, and they indicate that the reduced version has exactly the same explanation capability. Similarly, the same adjusted R^2 estimate of 0,49 and the same standard error of the estimate (7,49) indicate that the predictive accuracy of the model has not suffered a serious loss at the expense of using fewer predictors. At the same time, however, the F-statistic has increased to 106,26 from 56,23 for the complete model. The increase indicates that the reduced version is a better statistical explanation of the variance of ROE for the number of predictors used. In contrast, however, it also indicates that although the model still appears to be robust, the associations of the prediction variables and ROE are highly likely to be not exactly linear a parallel with the earlier findings established for the ROA analysis. This likelihood of a lack of linearity calls for cross-validation using alternative versions of the model or the inclusion of interaction or polynomial terms.

Table 11. The linear regression analysis model's efficacy in terms of ROE for the most optimal selected predictive variables

R	R Square	Adjusted R Square	Std. Error		
0,71	0,50	0,49	7,49		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	41674,65	7	5953,52	106,26	0,00
Residual	42189,43	753	56,03		
Total	83864,08	760			

Table 12 presents the strongest ROE difference predictors. Specifically, regression analysis informs us that there are seven predictors that have statistically significant impacts on ROE based on the respective t-statistics and respective p-values. Bank interest revenue as a percentage of interest-bearing assets is the strongest positive contributor with a β = 2,93 and a respective p < 0,001, which indicates that banks that report higher interest income have a tendency to report higher returns on equity. Similarly, share of total income from non-interest income and the deposits-lending spread of interest rates have positive effects on ROE, although to a lesser degree. Conversely, cost-income ratio and non-performing loans have their strong negative effects on ROE, which is an indicator of the perverse effect of inefficiency and credit risk on banks' profitability. Banking system capital as a percentage of assets is also statistically significant and negatively related to ROE, which may be an indicator of the capital adequacy for return generation trade-off. Lastly, but certainly not least, the credit-deposits ratio also has a negative effect on ROE, conceivably for liquidity and risk management concerns. Interestingly, the analysis confirms that responses of both response factors ROA and ROE are affected similarly by common predictors such as share of non-performing loans, interest income, and non-interest income. This again contributes to the instrumental role that has these financial ratios playing when making general bank performance across various profitability measures.

Table 12. Coefficients of the linear regression model of ROE for the most optimal selected predictive variables

Model	Coefficients		t	Sig.
	Beta	Std. Error		
(Constant)	30,19	1,56	19,34	0,00
Bank lending-deposit interest rate spread	0,11	0,04	2,50	0,01
Bank cost to income ratio	-0,40	0,02	-17,41	0,00
Non-performing loans as percent of all bank loans	-0,39	0,04	-9,05	0,00
Bank interest revenue, percent of interest-bearing assets	2,93	0,14	20,56	0,00
Bank credit as percent of bank deposits	-0,01	0,00	-3,27	0,00
Banking system capital, percent of assets	-1,12	0,09	-11,80	0,00
Bank non-interest income to total income	0,23	0,03	8,73	0,00

Correlation and linear regression analysis of data for arab countries

Table 13 presents the correlation of the response variables (ROA and ROE) with the predictive variables for the Arab countries. The results reveal that there exists a positive and statistically significant linear relationship for ROA with some major financial indicators, i.e., bank interest income, capital adequacy measured using the banking system capital to assets ratio and non-interest income as a proportion of total income. A highly statistically significant and adverse correlation of ROA exists with the bank cost-to-income ratio, which indicates that operating inefficiencies adversely affect profitability.

For ROE, once again the income from bank interest is found to be highly positively related, showing that it plays a most important role in supporting better bank performance. Contrary to that, the real interest rate, cost-income ratio, and capital requirement are found to be highly negatively related to ROE, showing that risk aversion, a high cost, or conservative capital buffers are likely to drive returns downwards to shareholders. Otherwise, other variables like the proportion of the non-performing to total loans, the difference between lending and deposit rates, overhead costs, credit-deposits, liquidity, and z-scores do not indicate any statistically significant linear relationship with ROA or ROE. These findings highlight that while some financial indicators always relate to profitability for Arab countries, some may require a nonlinear or context-specific method of analysis.

The results of the linear regression analysis for the ROA based on all predictive variables for Arab countries are presented in table 14. The fit of the overall model is confirmed by the very high correlation coefficient of R = 0,880 and coefficient of determination of R^2 = 0,774. The value of the adjusted R^2 of 0,682 also reflects that nearly 68,2 % of the variability of ROA is explained by the given independent variables even after controlling for the number of predictors. The statistical significance of the proposed model is also confirmed by ANOVA table using an F-statistic of 8,426 and a p-value of 0,000, which reflects the fact that the dependent variable is being highly accurately estimated using the given model. As is evident from the given findings, not only is the relationship between ROA and the predictor variables strong but is also statistically significant. But to give a better-fitting model and to comment on the most influencing predictors, the regression analysis is to be run using an optimal model selection technique at the next stage.

Table 13. Matrix of binary linear correlations between the study's predictive variables and the two response variables for Arab countries

		ROA	ROE
Bank lending-deposit interest rate spread	Pearson Correlation	0,042	-0,089
	Sig. (2-tailed)	0,550	0,207
Bank cost to income ratio	Pearson Correlation	-0,484**	-0,481**
	Sig. (2-tailed)	0,000	0,000
Non-performing loans as percent of all bank loans	Pearson Correlation	-0,126	-0,041
	Sig. (2-tailed)	0,276	0,719
Bank overhead costs, percent of total assets	Pearson Correlation	0,000	-0,079
	Sig. (2-tailed)	0,997	0,127
Bank interest revenue, percent of interest-bearing assets	Pearson Correlation	0,269**	0,189**
	Sig. (2-tailed)	0,000	0,000
Bank credit as percent of bank deposits	Pearson Correlation	0,097	-0,030
	Sig. (2-tailed)	0,078	0,583
Banking system regulatory capital to risk-weighted assets	Pearson Correlation	0,166*	-0,128
	Sig. (2-tailed)	0,021	0,077
Banking system z-scores	Pearson Correlation	-0,017	-0,011
	Sig. (2-tailed)	0,741	0,837
Bank liquid assets to deposits and short-term funding	Pearson Correlation	0,093	-0,009
	Sig. (2-tailed)	0,074	0,859
Banking system capital, percent of assets	Pearson Correlation	0,243**	-0,314**
	Sig. (2-tailed)	0,002	0,000
Bank non-interest income to total income	Pearson Correlation	0,223**	0,020
	Sig. (2-tailed)	0,000	0,709
Interest rates on bank credit to the private sector	Pearson Correlation	0,132	0,127
	Sig. (2-tailed)	0,051	0,059
Real interest rate	Pearson Correlation	-0,127	-0,200**
	Sig. (2-tailed)	0,062	0,003

**. Correlation is significant at the 0,01 level (2-tailed).

*. Correlation is significant at the 0,05 level (2-tailed).

Table 14. Measures of the efficiency of the linear regression analysis model for the ROA on all predictive variables for Arab countries

R	R Square	Adjusted R Square	Std. Error		
0,880	0,774	0,682	0,668		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	41,401	11	3,764	8,426	0,00
Residual	12,061	27	0,447		
Total	53,462	38			

Table 15 illustrates the linear regression equation results for predicting ROA using the optimal predictor variables for the Arab countries. The model has a good fit based on a correlation coefficient (R) of 0,835 and a coefficient of determination (R^2) of 0,697. The adjusted R^2 statistic of 0,642 indicates that roughly 64,2 % of the variance of ROA is explained by the selected predictors, adjusting for the number of variables in the model. Although the figures are slightly lesser than those of the full model (table 14), they are statistically significant. The increase, however, of the standard error of the estimate (0,710) and the mean square error (0,504) indicates a moderate loss of explanatory power. The findings indicate that although the reduced model has a strong explanatory power, the relationship between the dependent and the independent variables could not be perfectly linear.

Table 15. The most effective predictive variables for Arab countries in terms of the ROA, as measured by the linear regression analysis model

R	R Square	Adjusted R Square	Std. Error		
0,835	0,697	0,642	0,710		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	44,155	7	6,308	12,514	0,00
Residual	19,155	38	0,504		
Total	63,310	45			

Table 16 provides the coefficients for the linear regression model for the impact of the selected prediction variables on ROA for the Arab economies. The results suggest that various variables have statistical significance with positive and negative effects on ROA. Of concern is the bank cost-income ratio (beta) = -0,052, (p) < 0,001) and the proportion of non-performing loans to total loans (beta) = -0,280, (p) < 0,001), which are inversely related to ROA, suggesting that inefficiency and poor asset quality decrease profitability. Likewise, bank overheads as a proportion of total assets (beta) = -0,401, (p) = 0,024) inversely relate to ROA, suggesting that increased administrative and operating charges impede performance. Contrariwise, bank income from interest as a proportion of interest-bearing assets (beta) = 0,506, (p) < 0,001) and the proportion of the proportion of non-interest income to total income (beta) = 0,034, (p) < 0,001) exert positive effects, ensuring efficiency of traditional and diversified sources of revenue to improve profitability. Of concern is that the size of the regulatory capital to the risk-weighted assets has a positive relationship with ROA (beta) = 0,205, (p) < 0,001), which indicates the favourability of strong capital adequacy on ROA, whereas capital as a proportion of assets has a negative relationship with ROA (beta) = -0,333, (p) < 0,001), suggesting a potential under-employment of capital resources. These results support the effectiveness of efficiency, asset quality, capital composition, and income composition on bank profitability for the Arab economies.

Table 16. The coefficients of the linear regression model of ROA on the most predictive variables for Arab countries

Model	Coefficients		t	Sig.
	Beta	Std. Error		
(Constant)	3,304	0,771	4,287	0,000
Bank cost to income ratio	-0,052	0,009	-5,816	0,000
Non-performing loans as percent of all bank loans	-0,280	0,047	-5,967	0,000
Bank overhead costs, percent of total assets	-0,401	0,170	-2,353	0,024
Bank interest revenue, percent of interest-bearing assets	0,506	0,107	4,740	0,000
Banking system regulatory capital to risk-weighted assets	0,205	0,043	4,800	0,000
Banking system capital, percent of assets	-0,333	0,069	-4,824	0,000
Bank non-interest income to total income	0,034	0,008	4,331	0,000

As evident clearly in table 17, there is a serious restriction on the estimation of ROE of Arab countries using the “ordinary least squares (OLS)” regression with all the predictor variables included in the model. The model provides perfect correlation and determination coefficients of R = 1,000 and R^2 = 1,000, and the adjusted R^2 and the standard error also take extreme values with a value of 1,000 and 0,000, respectively, which reveal that there is perfect multicollinearity—a situation where the independent variables are linearly dependent on one another. Actually, the F-statistic and the p-value cannot be computed as there are no values reported in the table, which further reveals that the OLS assumptions are violated.

Table 17. The most effective predictive variables for Arab countries in terms of the efficacy of the linear regression analysis model for ROE

R	R Square	Adjusted R Square	Std. Error		
1,000	1,000	1,000	0,000		
Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	3863,934	7	551,991		
Residual	0,000	38	0,000		
Total	3863,934	45			

CONCLUSIONS

This study analyzes the determinants of ROA and ROE in Arab and global banking sectors, revealing significant regional disparities. African banks consistently outperformed European and Asian counterparts, while Arab banks showed mixed results. Profitability peaked in the early 2000s but plummeted during major crises like 2008 and COVID-19, underscoring acute vulnerability to external shocks. Key drivers include interest/non-interest income, capital adequacy, and the cost-income ratio (critical for both ROA and ROE), alongside asset quality (NPLs) and liquidity management. A key limitation was the inability to establish a robust linear model for ROE determinants in Arab countries, indicating complex, non-linear relationships beyond standard methodologies. Consequently, banks must prioritize cost efficiency, strong capital buffers, revenue diversification, asset quality, and robust risk management. Arab regulators need frameworks capturing these complex interactions. Future work should focus on applying non-linear modeling and machine learning algorithms to better understand Arab ROE dynamics, investigate the long-term impact of macro shocks using extended data panels, and explore the specific mechanisms driving resilience in certain Arab states.

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