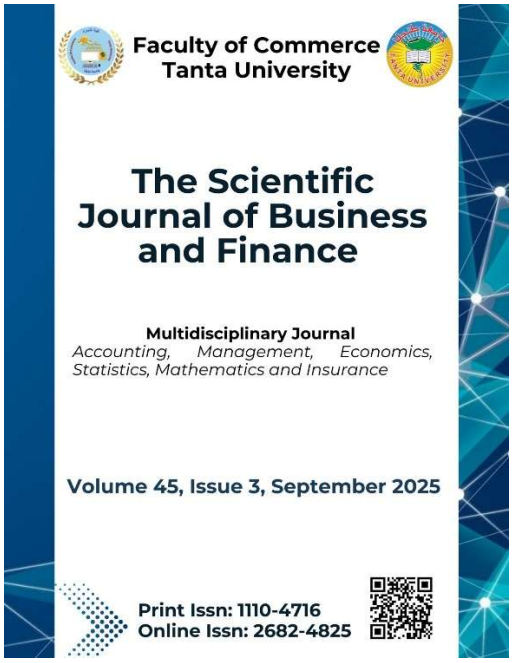

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The Impact of Financial Risks on Financial PerformanceEvidence from Egyptian listed banks

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The Impact of Financial Risks on Financial Performance

Evidence from Egyptian listed banks

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Abstract

This study explores the relationship between financial risks and bank profitability in Egypt, focusing on eleven publicly listed commercial banks from 2008 to 2023. Utilizing panel data models estimated in STATA 15, the analysis examines both bank-specific and macroeconomic determinants of performance, measured by return on assets (ROA) and return on equity (ROE). The dataset combines quarterly financial reports with country-level indicators from Euromonitor International and Trading Economics. Special attention is given to systemic events such as the Arab Spring, currency devaluations, and the COVID-19 pandemic. The results indicate that Egyptian banks exhibited resilience to these shocks. Capitalization positively influences ROA but negatively affects ROE, reflecting a leverage-related trade-off. Liquidity risk, operational inefficiency, and weak financial structure are found to be associated with lower profitability, while bank size and interest rates contribute positively. Macroeconomic variables—credit risk, inflation, economic growth, and money supply expansion—also significantly affect profitability. The findings highlight the dominant role of bank-specific factors over external conditions and provide policy insights for enhancing financial stability in emerging banking sectors.

Keywords: Bank Performance; credit risk; liquidity risk; return on assets; return on equity; Egypt & mena region; currency devaluation; panel data

1. Introduction

Performance management is a critical concern in contemporary banking, functioning as a link between strategic objectives and operational outcomes. In the context of financial institutions, performance is typically assessed through two fundamental dimensions: profitability and risk (Rose & Hudgins, 2013). Profitability reflects the institution's capacity to generate sustainable returns, while risk refers to uncertainties that may hinder this objective. Among the most significant risks faced by banks are credit and liquidity risk, both of which have substantial implications for financial stability and performance. This study examines the effects of these two risk dimensions on the profitability of Egyptian banks, utilizing panel data from 2008 to 2023.

Egypt provides a unique setting for this analysis, given the significant political and economic transformations it has undergone over the past decade. The 2011 Arab Spring, recurring episodes of currency devaluation (particularly in 2016 and 2022), and the global COVID-19 pandemic have exerted profound macroeconomic pressures. These events disrupted key sectors such as tourism and foreign direct investment, both of which are vital sources of foreign currency earnings. As a result, the Egyptian banking sector has faced the challenge of managing heightened financial risks while striving to maintain profitability.

In parallel with these external shocks, the Egyptian banking system has undergone significant regulatory reforms. Beginning in 2004, the Central Bank of Egypt (CBE) launched a comprehensive modernization program, including the phased implementation of Basel II standards, with Pillar I fully adopted during the 2012/2013 fiscal year. These reforms sought to strengthen financial stability by enhancing risk management frameworks, improving capitalization, and increasing regulatory oversight.

This study focuses specifically on credit and liquidity risks, which are regarded as pure risks in banking due to their potential to produce direct financial losses. If not accurately assessed and effectively managed, these risks can compromise an institution’s solvency and operational continuity. As such, a comprehensive risk management system is essential for mitigating adverse financial outcomes and ensuring long-term profitability.

1.1 Financial Risks and Bank Performance in Developed Economies.

The 2008 global financial crisis (GFC) marked a pivotal change in the management of financial risks within advanced banking systems. Credit risk, defined as the risk of borrower default, and liquidity risk, the incapacity to fulfil financial obligations, were central to the crisis. Empirical research demonstrates the direct influence of these risks on bank profitability. Research conducted by Demirgüç-Kunt and Huizinga (2010) and Berger and Bouwman (2009) identified substantial negative relationships between increasing non-performing loans (NPLs) and profitability measures (ROA and ROE). The initial liquidity freezes in interbank markets amplified

these effects, resulting in systemic losses. In response, regulators introduced Basel III, establishing elevated capital and liquidity requirements, including the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).

Pos-crisis research, such as that by (Altunbas, et al., 2017) and Beck and Keil (2021), underscore a trade-off between enhanced stability and diminished profitability. While risk exposure diminished, return on equity (ROE) also declined as a result of capital accumulation mandates. Throughout the COVID-19 pandemic, well-capitalized banks with diverse funding demonstrated stronger profitability, underscoring the significance of regulatory buffers.

1.2 Financial Risks and Bank Performance in the Middle East and Africa.

Financial institutions in the MEA region operate in an environment marked by macroeconomic fluctuations, political uncertainty, and inconsistent regulatory structures. These conditions exacerbate the impact of credit and liquidity risks on performance. Ben Naceur and Omran (2011) noted that weak legal frameworks and elevated sovereign vulnerability increase NPL ratios and reduce ROA/ROE. Liquidity is also constrained by shallow capital markets and limited financing sources, as shown by Al-Khouri (2012). Credit and liquidity constraints escalated during the Arab Spring and amid COVID-19, with performance deterioration most pronounced in banks with undiversified portfolios or inadequate supervision.

Reform initiatives, such as the implementation of Basel III in the Gulf and North Africa, have enhanced resilience in certain markets. Naceur et al. (2018) and Samitas et al. (2022) demonstrate that banks exhibiting superior capital planning and liquidity management experienced a more rapid recovery from economic shocks. Nonetheless, performance indicators continue to exhibit volatility, and further regulatory harmonization is required to stabilize ROA and ROE throughout the region.

1.3 Financial Risks and Bank Performance in Egyptian Banks.

Egypt's banking industry serves as an intriguing case study for analyzing the relationship between financial risk and bank performance in an emerging economy. The nation has encountered a series of economic disturbances since 2008, including political instability following the 2011 revolution, two significant instances of currency depreciation (in 2016 and 2022), ongoing inflation, and the economic repercussions of the COVID-19 pandemic. These shocks have significantly affected credit and liquidity risk, two essential aspects of financial stability that directly influence banks' returns on assets (ROA) and returns on equity (ROE).

1.3.1 Credit Risk and Profitability in a Post-Revolutionary Environment

The consequences of the 2011 Arab Spring triggered a period of heightened credit risk within Egypt's banking industry. Worsening macroeconomic conditions, a decline in private investment, and escalating fiscal imbalances weakened borrowers' repayment capacity. El-Masry, Abdel-Bary, and Elamer (2022) documented a significant increase in non-performing loans (NPLs) from 2011 to 2014, particularly in banks with investments in the industrial and real estate sectors. Smaller private banks were disproportionately affected, leading to reduced ROA and deteriorating ROE.
The Central Bank of Egypt (CBE) implemented reforms to strengthen risk governance and improve asset quality. These included more stringent provisioning regulations, obligatory stress testing, and enhanced integration of credit bureau data. The NPL ratio in the banking industry declined from 10.5% in 2011 to below 4% by 2019 (IMF, 2023). Nonetheless, despite these advances, credit risk continues to be a formidable concern, particularly in a high-inflation, low-growth environment.

1.3.2 Liquidity Risk and Foreign Currency Constraints

Liquidity limitations in Egypt have traditionally been intensified by restricted access to foreign currency, especially during periods of capital outflows and declining tourism and remittance inflows. The years leading up to the 2016 devaluation were characterized by acute foreign exchange shortages, leading to delayed import transactions and disrupting banking operations.
KPMG (2020) concluded that banks became increasingly reliant on short-term central bank facilities to satisfy liquidity requirements between 2014 and 2016, particularly as the dollarization of deposits escalated. The profitability of banks was adversely affected by the high costs associated with liquidity assistance and the diversion of assets into low-yield, risk-free government securities. This preserved liquidity buffers but reduced income from conventional lending, thereby impairing both ROA and ROE.

1.3.3 The 2016 Currency Devaluation and Its Ramifications

The flotation of the Egyptian pound in November 2016, as part of the IMF-supported economic reform initiative, was a pivotal event. The adjustment of the exchange rate—from EGP 8.8/USD to above EGP 18/USD—triggered another wave of macro-financial stress. The devaluation reinstated foreign investor confidence and stimulated capital inflows, enhancing foreign exchange reserves and allowing for greater monetary policy flexibility. However, it exacerbated credit and liquidity problems in the short term.
From a credit risk standpoint, business borrowers with unhedged foreign currency debt faced significant increases in repayment obligations. Loan defaults rose temporarily, especially in industries reliant on trade and imports (Seliem, 2022). Banks responded by increasing provisions,

which negatively affected profitability metrics. Furthermore, cost inflation reduced consumer disposable income, adversely impacting retail loan performance and driving higher delinquencies. Liquidity risk was alleviated by the resurgence of foreign currency deposits and portfolio inflows following the devaluation. Financial institutions successfully replenished their liquidity reserves, while the Central Bank of Egypt's use of open market operations and foreign exchange auctions contributed to stabilizing economic conditions. Enhanced liquidity indicators, including the Liquidity Coverage Ratio (LCR), facilitated the gradual recovery of loan activities by 2018. Despite initial profitability challenges, several banks reported improved ROE by 2019, driven by expanded interest rate margins and increased investments in high-yield government securities.

1.3.4 COVID-19 Pandemic and the 2022 Devaluation: A Renewed Cycle of Stress

The COVID-19 crisis presented new issues for Egyptian banks, reawakening some weaknesses observed in previous years. The CBE instituted temporary forbearance measures, including loan payment deferrals and reduced reserve requirements, to avert an increase in non-performing loans (NPLs). Although these steps mitigated immediate credit risk, profitability suffered as banks were compelled to augment provisioning in anticipation of future defaults.

The problem was exacerbated by the 2022 devaluation, spurred by external factors such as increasing global interest rates, the Russia–Ukraine conflict, and heightened capital outflows. The Egyptian pound plummeted once again, surpassing EGP 30/USD, thereby rekindling some credit and liquidity stress patterns noted in 2016.

In contrast to the 2016 incident, the banking sector approached this crisis with enhanced capital levels and improved risk management procedures. Evaluations by the IMF (2023) indicate that banks sustained capital adequacy ratios above 15% and maintained sufficient liquidity buffers. Profitability indicators once again deteriorated, reflecting margin compression, reduced loan growth, and increased exposure to sovereign risk.

1.3.5 Strategic and Regulatory Responses

In the last ten years, the CBE and the banking sector have implemented several structural changes to tackle the fundamental causes of persistent financial distress. These encompass:

- Credit Risk Management: Enhanced credit scoring, risk-based pricing, and tighter underwriting standards.
- Liquidity Risk Management: Adoption of Basel III LCR and NSFR metrics, introduction of FX hedging tools, and increased reliance on domestic currency liabilities.
- Profitability Protection: Diversification of revenue through digital banking, bancassurance, and fee-based services.
- Capital Planning: Sustained capital adequacy through retained earnings, Tier 2 bond issuances, and periodic recapitalizations.

These measures have enabled Egyptian banks to better withstand shocks, but external vulnerabilities—particularly those associated with exchange rate volatility—continue to exert pressure on long-term performance.

1.4 Objectives of the study

The primary objective of this study is to analyse the influence of bank-specific and macroeconomic factors on the profitability of Egyptian banks during the period 2008–2023. More specifically, the study addresses the following research questions:

- What is the effect of credit risk and liquidity risk on the profitability of listed commercial banks in Egypt?"

- What is the role of macroeconomic variables—including inflation, interest rates, and money supply growth—in influencing bank performance?

- How have major systemic events—such as the Arab Spring, currency devaluations, and the COVID-19 pandemic—affected bank profitability?

This analysis employs financial ratios related to asset quality, capital adequacy, and operational efficiency, alongside macroeconomic indicators, to evaluate bank performance using return on assets (ROA) and return on equity (ROE).

1.5 Contribution of the study

This research contributes to the existing literature by offering an in-depth assessment of how internal bank characteristics and external macroeconomic factors jointly influence bank profitability in a major emerging market. It is among the few studies to empirically examine the Egyptian banking sector during a period characterized by significant economic shocks and regulatory transformations.

By integrating events such as the Arab Spring, successive currency devaluations, and the COVID-19 pandemic in a single analytical framework, the study provides a comprehensive understanding of Egyptian banks' resilience and vulnerabilities. Moreover, the findings offer valuable insights for policymakers, regulators, and banking practitioners seeking to enhance risk governance and sustain profitability in volatile environments. The empirical evidence and visual illustrations presented in this study also serve as a reference for future researchers examining financial performance in similar contexts.

2 Literature Review

2.1 Understanding Bank Performance: Profitability and Risk

Bank performance is a central concern in financial economics due to its implications for financial stability, investment behaviour, and regulatory policy. Profitability and risk are the primary indicators used to assess banking performance (Rose & Hudgins, 2013). Effective performance management enables financial institutions to align their strategies with operational goals while maintaining risk within tolerable bounds.

Trujillo-Ponce (2013) emphasizes that understanding the drivers of bank performance facilitates capital allocation, credit access, and regulatory oversight. Banks are foundational to economic development, and their financial health is closely monitored by stakeholders, including regulators, investors, and policymakers (Lee, 2015). Ansell and Wharton (1992) define risk as the unintended consequences of decisions, underscoring its relevance in volatile environments.

Santomero (1997) classifies banking risks into six types: systematic (market) risk, credit risk, liquidity risk, operational risk, legal risk, and reputational risk. These categories affect profitability to varying degrees, requiring tailored management strategies. This study focuses on two of the most influential and readily measurable categories—credit and liquidity risk.

2.2 *Measures and determinants of profitability*

Bank profitability is commonly measured using return on assets (ROA) and return on equity (ROE). ROA reflects a bank's ability to generate earnings from its assets (Pasiouras & Kosmidou, 2007), while ROE assesses returns relative to shareholders' equity (Trujillo-Ponce, 2013). According to Ommeren (2011), profitability is shaped by internal bank characteristics—such as capitalization, size, structure, asset quality, and efficiency—and external macroeconomic factors, including inflation, growth, and interest rates, though only the former are directly controllable by management.

2.2.1 *Credit Risk and Bank Profitability*

The impact of credit risk on profitability remains inconclusive in the literature. Some studies suggest that higher credit risk may enhance profitability due to risk premia (Tarus *et al.,* 2012), while others highlight its adverse effects through loan defaults and provisioning costs (Saleh & Afifa, 2020; Abbas *et al.,* 2019; Islam & Nishiyama, 2016; Ozili, 2015). These findings imply that poorly managed lending practices can significantly erode profitability, particularly in emerging markets where credit monitoring systems may be weak.

2.2.2 Liquidity Risk and Profitability

Empirical evidence on the relationship between liquidity and profitability is similarly mixed. Pracoyo and Imani (2018) argue that banks with lower liquidity may achieve higher returns. Bordeleau and Graham (2010) find that holding more liquid assets improves profitability by lowering refinancing risk. Conversely, Tran et al. (2016),(Goddard, *et al.* 2013), and (Abbas ,*et al*., 2019) identify a negative relationship, noting that holding excess liquidity carries opportunity costs.

2.2.3 Capital Adequacy and Financial Structure

The role of bank capital in shaping profitability is widely debated. (Abbas, *et al.,* 2019) and Ozili (2017) report a positive association, especially in post-crisis contexts in Asia and Africa. However, Berger and Bouwman (2013) and (Barth, *et al.,* 2008) report inconclusive results, (while Tran, *et al.,* 2016) observe a positive effect for small banks but a negative effect for large institutions. These disparities suggest that bank size may moderate the capital–profitability relationship. Similarly, research on financial structure yields contrasting results. Trujillo-Ponce (2013) reports that diversified funding structures improve profitability in Spanish banks. In contrast, Ha (2020) finds that higher deposit-to-asset ratios place pressure on banks to utilize deposits efficiently, which may increase interest expenses and reduce profitability.

2.2.4 Operational Efficiency and Technology Adoption

Operational efficiency is a key internal determinant of profitability. Karakaya and Er (2013) find that larger banks face higher overhead costs, (while Fungáčová, *et al.,* 2020) identify structural and political constraints as sources of inefficiency. Conversely, Singh (2021) and Le and Ngo (2020) show that the adoption of financial technologies—such as ATMs and electronic banking—lowers operating costs and enhances performance, especially in developing market contexts.

2.2.5 Bank Size and Profitability

There is substantial empirical evidence indicating that larger banks are generally more profitable. Smirlock (1985), (Akhavein, *et al.,* 1997), and Rachdi (2013) document a positive association between bank size, measured by total assets, and profitability. In line with these findings, Kosmidou (2008) argues that bank size exerts a positive influence on performance, particularly when both internal and external factors are taken into consideration.

2.2.6 Macroeconomic Variables and Profitability

Economic conditions play a crucial role in shaping bank performance. Djalilov and Piesse (2016) find that GDP growth enhances profitability by stimulating credit demand, whereas economic downturns weaken credit quality and earnings. Inflation also affects profitability in complex ways. When anticipated, banks can adjust interest rates accordingly (Staikouras & Wood, 2011; Kosmidou, 2008), thereby boosting revenues. However, if unanticipated, inflation may outpace the growth of interest income, reducing margins.

Interest rate movements also affect bank margins. Trujillo-Ponce (2013) identifies an inverse relationship between interest rates and profitability in Spain, attributed to interest rate risk on fixed-rate assets. Similarly, Kosmidou (2008) reports that interest rate changes can enhance earnings when effectively managed.

Finally, the effect of money supply growth remains debated. Kosmidou (2008) finds no significant impact, whereas Ha (2020) reports a positive association with ROA and ROE but a negative effect on the net interest margin (NIM), attributed to rising loan costs under expanded credit conditions

2.3 Related Theories

Previous studies predominantly employ accounting-based indicators—such as ROA, ROE, and NIM—to assess bank profitability

2.3.1 The Investment Behaviour Theory

Several studies have employed market-based indicators, such as Tobin's Q (TQ), introduced by James Tobin and William Brainard in 1968, to evaluate bank profitability. Rooted in investment behaviour or Q theory, TQ compares a firm's market value to its asset value: a value of one indicates fair market valuation; below one suggests that asset values exceed market value and may warrant asset sales; and above one signals overvaluation, encouraging further investment (Ali *et al.*, 2016). Moreover, Imbierowicz and Rauch (2014) outline two main theoretical perspectives explaining banks' risks and returns: The Classical Financial Intermediation Theory, advanced by Bryant (1980) and Diamond and Dybvig (1983), and the Industrial Organisation Approach, exemplified by the Monti-Klein banking model

*2.3.2 The Classical Financial Intermediation & Industrial Organization approach Theory***.**

The theory conceptualises banks as liquidity providers that supply funds to depositors and borrowers, thereby enhancing economic well-being while managing liquidity risk. In contrast, the Industrial Organisation Approach characterises banks as profit-maximising firms operating in oligopolistic loan and deposit markets, where deposit demand increases with higher interest rates and loan demand declines. Banks generate returns by receiving interest on loans (assets) and paying interest on deposits (liabilities). Both models indicate a theoretical link between liquidity and credit risk, generally positing a positive correlation, although the precise direction of this relationship remains uncertain (Imbierowicz and Rauch, 2014)

2.3.3 Expected Bankruptcy Cost Hypothesis & Signalling Hypothesis

Prior research has identified several hypotheses that explain the positive relationship between bank capitalisation and profitability. Trujillo-Ponce (2013) and Saona (2016) highlight the Expected Bankruptcy Cost Hypothesis and the Signalling Hypothesis as key explanations. The Signalling Hypothesis posits that well-capitalised banks convey managerial confidence in future prospects and the capacity to generate higher cash flows, often reflected in lower debt levels. The Expected Bankruptcy Cost Hypothesis complements this view by proposing that banks increase capitalisation to protect against potential bankruptcy costs. Trujillo-Ponce (2013) further argues that higher proportions of own funds improve solvency, reduce reliance on costly external borrowing, and offset the high cost of equity, thereby enhancing profitability. Berger (1995) also emphasises these two hypotheses as the most compelling explanations of the capital–profitability relationship

Saona (2016) observes that while profitability increases with capitalisation up to a certain point, it may decline beyond that threshold. The positive effect is explained by the Expected Bankruptcy Cost and Signalling Hypotheses, whereas the negative effect is attributed to reduced tax benefits from interest deductibility and the Efficiency-Risk Hypothesis. The latter posits that efficient banks can manage financial distress by increasing debt and lowering capitalisation, whereas inefficient banks prefer higher capital and lower debt to mitigate risks they cannot control. In such cases, both risk and return may decrease, resulting in a negative impact on bank profitability.

2.3.4 Industry Concentration & The Structure Conduct Performance Paradigm.

Industry concentration—commonly measured by the share of assets held by the five largest banks relative to total industry assets or by the Herfindahl-Hirschman Index (HHI)—plays a

significant role in bank profitability and can exert either positive or negative effects. The favourable impact has been examined through two key theories: the Structure–Conduct–Performance (SCP) Paradigm, also known as the Market Power Hypothesis, and the Efficient Structure Hypothesis. The SCP hypothesis posits that higher market concentration leads to greater profitability, as dominant banks can leverage their market power to achieve higher returns—a relationship investigated in studies such as Trujillo-Ponce (2013), Djalilov and Piesse (2016), and Saona (2016).

2.3.5 The Efficient Structure Hypothesis.

The Efficient Structure Hypothesis posits that banks with superior cost management can expand market share and enhance profitability through improved efficiency. Another important macroeconomic factor affecting bank profitability is the growth of a nation's money supply, which is regulated by central banks and reflects the total monetary value in the economy. According to the Quantity Theory of Money, changes in the money supply influence both nominal GDP and price levels, with household and bank behaviour shaping these outcomes. Accordingly, an increase in the money supply is generally expected to have a positive effect on bank profitability.

3. The Banking Sector in Egypt

Egypt's banking sector represents a cornerstone of the national financial system, providing a wide range of services, including commercial banking, insurance, mortgage lending, and financial advisory solutions. According to recent estimates, more than 118 million Egyptians make use of banking and insurance services, reflecting the sector's extensive outreach and strategic importance in financial intermediation.

The Egyptian banking system has deep historical roots, with the establishment of the first bank dating back to 1856. The sector comprises three primary categories: commercial banks, state-owned specialized banks, and business and investment banks. From an ownership perspective, banks are further classified into public sector banks, private sector institutions, joint-venture banks, and foreign banks. Each segment plays a distinct role in shaping Egypt's financial architecture.

Private banks in Egypt primarily serve trade and private sector financial services, although their market share remains limited due to structural barriers and regulatory constraints. Notably, the Central Bank of Egypt (CBE) has not issued any new commercial banking licenses since the 1970s, citing the adequacy of existing institutions to sustain sufficient market competition. According to the latest available data, 38 banks are registered and operating under the CBE's supervision (CBE, 2015; CBE, 2016a).

Since 2008, Egypt's banking sector has navigated a series of economic and political disruptions, including the 2007–2008 Global Financial Crisis and the 2011 Arab Spring. Despite these challenges, the sector demonstrated resilience, supported by structural reforms launched in the early 2000s. These reforms encompassed the privatization and restructuring of state-owned banks, the strengthening of supervisory frameworks, and the adoption of improved risk management practices. Collectively, these measures enabled Egypt's banking system to preserve stability, avoid systemic crises, and reinforce public confidence during periods of macroeconomic volatility (Nasr, 2012).

4. Egyptian Banking Reforms

Egypt's banking sector has undergone substantial transformation since the early 2000s through a phased reform agenda led by the Central Bank of Egypt (CBE). The first phase of the Financial Sector Reform Program (2004–2008), launched in September 2004, focused on strengthening the structural soundness and regulatory capacity of the banking system. This phase was built on four core pillars: (1) restructuring and privatizing state-owned banks, (2) raising minimum capital requirements, (3) enhancing the supervisory framework at the CBE, and (4) resolving the burden of non-performing loans (NPLs).

To facilitate greater international integration, restrictions on foreign ownership were lifted, including the removal of the 49% cap on foreign equity in Egyptian banks. In parallel with these legal amendments, the CBE established specialized departments for risk management, information technology, and management information systems within state-owned banks. These initiatives were reinforced by comprehensive financial audits conducted between 2004 and 2007 in line with international accounting standards.

A key objective of this phase was to reduce concentration in the banking sector and promote market competition. Legislative reform under Law No. 88/2003 introduced stricter capital thresholds—EGP 500 million for domestic banks and USD 50 million for foreign branches—and raised the capital adequacy ratio requirement to 10%. As a result, several banks merged or were acquired to comply with the revised standards. At the same time, the liberalization of deposit and lending rates, together with the deregulation of banking service fees, enhanced operational flexibility. The state also restructured nearly 45% of outstanding NPLs (approximately EGP 26 billion), as well as the debts of state-owned enterprises to state-owned banks.

The second phase of the reform initiative, launched in 2009, aimed to align the Egyptian banking sector with international best practices under the Basel II framework. This phase focused on technological upgrades and institutional preparedness to meet enhanced risk management

standards. The CBE Board of Directors formally approved the implementation of Basel II capital adequacy norms in December 2012 (CBE, 2015), with the reform phase extending through that year

Ongoing regulatory oversight remains a critical component of Egypt's banking governance. The CBE supervises all 38 operational banks to ensure compliance with capital adequacy, liquidity, and other prudential requirements. In addition, qualitative criteria—such as corporate governance standards, board and management competence, and the effectiveness of internal control and information systems—are rigorously monitored to safeguard the integrity and resilience of the financial system.

5. Data and Research Methodology

This study employs a balanced panel dataset comprising eleven commercial banks listed on the Egyptian Stock Exchange, observed quarterly from 2008 to 2023. These banks were selected based on the consistency and availability of their financial disclosures throughout the study period. Bank-specific data were obtained from the Egypt for Information Dissemination (EGID) database, which provides standardized and audited financial reports.

To capture the macroeconomic context, data were retrieved from multiple reputable sources, including the International Monetary Fund (IMF), World Bank, Central Bank of Egypt (CBE), Euromonitor International, and Trading Economics. These sources provide comprehensive coverage of macroeconomic indicators relevant to banking performance in Egypt.

This study employed STATA 15 and the R statistical programming language for both descriptive and inferential analyses. Panel regression models were applied to examine the effects of internal bank-specific factors and external macroeconomic variables on financial performance.

The dependent variables in this study are:

- Return on Assets (ROA**)** – a measure of profitability relative to total assets.
- Return on Equity (ROE) – a measure of profitability relative to shareholder equity

The independent variables include both financial and macroeconomic factors:

- Credit Risk (CR) – typically measured by the ratio of non-performing loans to total loans.
- Liquidity Risk (LR) – proxied by the ratio of liquid assets to total assets or total loans to total deposits.
- Capital Adequacy (CA)– measured by the capital adequacy ratio (CAR).
- Bank Size (BS)– proxied by the natural logarithm of total assets.

- Operational Efficiency (OE) – measured by the cost-to-income ratio.
- Economic Growth (EG)– GDP growth rate.
- Inflation Rate – annual percentage change in consumer prices.
- Interest Rate (IR) – benchmark interest rate set by the CBE.
- Money Supply Growth (M1)– annual change in the M1 monetary aggregate

5.1 *Data Presentation*

A summary of the data is provided in the subsequent table, which encompass descriptive statistics of the variables from the primary dataset obtained from the quarterly financial reports

Table 1. Descriptive Statistics of the findings

Variables	Mean	Minimum	Maximum	Standard Deviation	Co-efficient of variation
ROA	0.006	-0.45	0.074	0.007	1.167
ROE	0.062	-1.116	0.3	0.092	1.483
CR	0.137	0	1.006	0.184	1.343
LR	0.48	0.085	6.287	0.364	0.758
CA	0.091	0.027	0.932	0.45	0.50
OE	1.184	-16.81	169.48	6.859	5.793
BS	24.31	21.20	27.45	1.279	0.052
FS	0.962	0.085	0.963	0.652	0.678
EG	4.02	-3.80	13.77	2.64	0.657
INF	75.61	27.50	189.90	41.45	0.548
IR	11.64	8.26	19.42	3.50	0.301
M1	13.20	11.97	14.68	0.77	0.058

The preceding table indicates that ROA, used as an indicator of bank profitability in the primary analysis, has a mean value of 0.60%, representing the average return of the sample banks over the study period relative to asset size. The standard deviation of ROA is 0.7%, which is relatively large compared to the modest mean value.

The minimum ROA value is –0.45%, indicating that the bank with the lowest value incurred losses at a certain point, as reflected by the negative ROA. In subsequent years, however, the bank improved its financial standing and returned to profitability. It should be noted that these figures represent quarterly income for each period, meaning that losses recorded in some quarters may still translate into positive annual income

The descriptive statistics for ROE differ from those for ROA, with a mean of around 6% and a notable dispersion of 9.2%. The maximum and minimum values are 30% and –111.6%, respectively. Since ROE shares the same numerator as ROA, the same principles apply to its negative minimum values.

The average capital adequacy ratio for the sample banks over the entire period is 9.1%. This average is generally favourable when compared to the Basel II minimum requirement of 8% for regulatory capital ratios. The standard deviation of 4.5% reflects the dispersion around the mean; however, the maximum value of 19.32% is significantly higher than the average.

The credit risk variable, measured by loan loss reserves as a percentage of total bank loans, recorded an average of 13.7%, with a considerable dispersion of 18.4% and a maximum value significantly higher than the mean. Liquidity risk, quantified by the ratio of total loans to total assets, shows a mean of 48% and a modest standard deviation of 36.4%. This suggests that, on average, the sampled banks maintain liquidity risk values relatively close to the mean, effectively managing their loans-to-deposits ratio to uphold liquidity positions and secure the financing required for their lending activities.

The elevated standard deviation of the operational efficiency indicator relative to its mean signifies substantial variability in management's expenditure control capabilities among the sampled banks. Bank size also influences efficiency, as larger banks are generally considered to have greater capacity to leverage new technologies for system enhancement and efficiency gains. However, disparities in bank size are not evident from the descriptive statistics, which show minimal variance. This is because the bank size variable was measured using the natural logarithm of total assets, which mitigates the impact of size differences across the sample, as shown in the preceding comparison of bank assets.

The financial structure variable has an average of 96.2% with a low standard deviation, indicating the sample banks' significant reliance on clients' deposits as a primary source of financing compared to other liabilities.

Inflation was measured using the consumer price index during the sample period, with a mean of 75.61% and minimum and maximum values of 27.50% and 189.90%, respectively. The interest rate in Egypt ranged from 8.26% to 19.42%, with an average of 11.64% over the sample period, reflecting the stringent measures implemented by the CBE. Finally, money supply growth recorded a mean of 13.20%, with maximum and minimum values of 14.68% and 11.97%, respectively.

5.2 Correlation Analysis

The Pearson product-movement coefficient is utilized to quantify the degree of relationship between two or more variables. The correlation coefficient offers a measure of both the direction and magnitude between two variables.

Table 2. Correlations (Bank-Specific)

	ROA	ROE	CR	LR	CA	OE	BS	FS
ROA	1.000							
ROE	0.811***	1.000						
CR	-0.394***	-0.408***	1.000					
LR	0.025	-0.002	-0.119**	1.000				
CA	0.472***	-0.026	-0.045	0.058	1.000			
OE	-0.050	-0.027	-0.004	-0.003	-0.035	1.000		
BS	0.335***	0.286***	-0.186***	0.031	0.001	-0.065	1.000	
FS	0.064	0.053	-0.022***	-0.116	0.010	-0.008	0.077	1.000

The above table presents the correlation matrix for all dependent and independent bank-specific variables. An initial examination reveals a positive correlation between ROA and capital adequacy; however, this correlation turns negative when profitability is measured by ROE. The positive association between capitalization and ROA is consistent with the literature highlighting the favourable link between capitalization and bank profitability, particularly the Signalling Hypothesis and the Expected Bankruptcy Cost Hypothesis.

Consequently, elevated capitalization or reduced debt is expected to correlate with banks that have favourable future prospects. The Expected Bankruptcy Cost Hypothesis posits that banks anticipating higher bankruptcy costs due to external factors are more likely to increase capitalization to safeguard against potential losses.

The existing literature, as noted by Trujillo-Ponce (2013), widely agrees that improved capitalization strengthens bank stability and reduces external borrowing costs, which outweigh the increased cost of equity. Nonetheless, the DuPont analysis demonstrates that ROE equals the product of ROA and the equity multiplier. Consequently, an increase in capital and total equity will reduce the equity multiplier (assets/equity), thereby lowering ROE. Furthermore, reduced debt—resulting from a declining equity multiplier—diminishes tax-shield benefits, leading to lower after-tax profits and ultimately reduced profitability. Therefore, a negative correlation between capital and ROE is anticipated according to the DuPont framework (Tran, *et al.*, 2016).

The matrix indicates a negative correlation between bank profitability—measured by both ROA and ROE—and credit risk, quantified by loan loss reserves relative to total loans. This inverse relationship is expected, since higher loan loss reserves signal weaker asset quality and greater credit risk. Elevated credit risk ratios reflect an increase in amounts reserved but not charged off from the loan portfolio, resulting in lower interest income and higher provisioning expenses.

Accordingly, a negative correlation also emerges between profitability (ROA and ROE) and bank liquidity risk, as measured by the ratio of loans to total assets.

A negative correlation is commonly observed between bank profitability—measured by ROA and ROE—and liquidity risk, as captured by the ratio of total loans to total assets. This ratio reflects the proportion of a bank's assets tied up in loans, which are inherently less liquid than other asset classes such as cash or marketable securities. A higher loans-to-assets ratio indicates greater liquidity risk, as it implies that a larger portion of the bank's balance sheet is committed to long-term, less liquid assets, while its liabilities (e.g., deposits) remain short-term and volatile.

The operational efficiency variable, measured by the cost-to-income ratio, exhibits substantial negative associations with both indicators of bank profitability. This is expected, since more efficient and profitable banks tend to operate at reduced costs. Previous studies—including Pasiouras and Kosmidou (2007),(Athanasoglou, *et al.* ,2008), Kosmidou (2008),(Ali, *et al.* ,2011), Dietrich and Wanzenried (2011), and Trujillo-Ponce (2013)—demonstrate a consensus that greater efficiency correlates with enhanced profitability, indicating that banks with superior expense management are more profitable. Recent technological developments in global banking systems, including those in Egypt, have facilitated more effective expenditure management, thereby enhancing profitability. Conversely, banks with weaker operational efficiency experience the opposite effect.

The bank size variable shows a substantial positive association with bank profitability metrics, as indicated by the correlation matrix. The relationship between bank size and profitability remains somewhat ambiguous in the literature. Nonetheless, the positive impact is supported by the perspective that larger banks possess greater capacity to adopt new technologies and refine existing systems, thereby improving operational efficiency and enhancing profitability. The sample banks also appear to benefit from economies of scale, which further strengthens their profitability

Table 3. Correlations (Macroeconomic Data)

	ROA	ROE	EG	INF	IR	M1
ROA	1.00					
ROE	0.82***	1.00				
GDP	0.019	0.019	1.00			
INF	0.22	0.21	-0.07	1.00		
IR	0.19	0.31	0.11	0.64***	1.00	
M1	0.26	0.28	0.1	0.96***	0.58**	1.00

The literature indicates that banks are influenced by their operational environment, similar to other organizations. Consequently, the structure of the financial market, the nation's economic conditions, and the legal and political climate may all affect bank performance.

GDP growth, defined as the annual variation in GDP, serves as an indicator of macroeconomic conditions. The GDP growth rate is expected to influence many factors associated with the supply of and demand for loans and deposits. A positive correlation is observed between ROA and ROE.

Another significant macroeconomic factor that may influence both bank expenses and revenues is inflation (INF). Staikouras and Wood (2003) indicate that inflation can exert direct effects (e.g., an increase in labor costs) and indirect effects (e.g., fluctuations in interest rates and asset values) on bank profitability. Perry (1992) further asserts that the impact of inflation on bank performance depends on whether the inflation is anticipated or unanticipated.

The interest rate is the percentage applied to the total amount borrowed or saved and is typically expressed as the annual percentage rate (APR). According to Molyneux and Thornton (1992), interest rates exert a positive and significant influence on ROE, as shown in the above table. Samuelson (1945) and Yahya, Akhtar, and Tabash (2017) have also reported a favourable correlation between interest rates and bank performance, indicating that increasing interest rates enhance bank profitability.(In contrast,Olasibi, *et al.,* 2019) argue that interest rates have a negative and significant effect on bank profitability. (Similarly, Ahmed, *et al.,* 2015) found only a minimal impact of interest rates on Kenyan banks, diverging from the earlier findings

The Quantity Theory of Money posits that variations in the money supply lead to changes in nominal GDP and the price level. The money supply refers to the total stock of money circulating in the economy. While it is primarily determined by the policies of the CBE, it is also influenced by the behaviour of households that hold money and the banks that manage these funds.

Mamatzakis and Remoundos (2003) employed the money supply as an indicator of market size and found that it substantially affects bank profitability. This study examines the expansion of the money supply (M1), which shows a positive correlation with bank profitability and margins.

5.3 Unit Root Test

A unit root test is a statistical procedure used in time series analysis to determine whether a time series is stationary or non-stationary. Data must be free from unit root problems to obtain reliable estimates. Unit root tests examine the stationarity of a time series using the concept of a unit root. In this study, the Harris-Tzavalis Unit-Root test was employed to detect potential unit root issues. The null and alternative hypotheses for this test are as follows: the null hypothesis assumes that all panels contain unit roots, while the alternative hypothesis assumes that at least one panel is stationary (Budiono & Purba, 2023).

Table 4. Results of Unit Root Test for the Study Variables (Bank Specific)

Variables	Harris-Tzavalis		Levin–Lin–Chu	
	Statistic	P-value	Statistic	P-value
ROA	0.43	0.00	-4.99	0.00
ROE	0.51	0.00	-3.45	0.0003
CR	0.90	0.00	-0.82	0.2
LR	0.123	0.00	-1.39	0.082
CA	0.33	0.00	-0.17	0.43
OE	0.018	0.00	-6.22	0.00
BS	0.97	0.90	2.86	0.99
FS	-0.012	0.00	-4.46	0.00
1st difference				
BS	-0.50	0.00	-11.15	0.00

The above table presents the results of the unit root tests for the study variables. It is evident that the study data are stationary based on the Harris-Tzavalis Unit-Root and Levin-Lin-Chu tests, as the p-values are below the 5% significance level, except for the BS variable, which became stationary after first differencing. Therefore, the study's hypotheses can be tested using panel data models without concern for spurious regression.

Table 5. Results of Unit Root Test for the Study Variables (Macroeconomic Data)

Variables	Harris-Tzavalis		Levin–Lin–Chu	
	Statistic	P-value	Statistic	P-value
ROA	0.59	0.000	-3.91	0.000
ROE	0.717	0.000	-2.25	0.01
INF	1.05	1	14.59	1
GDP	0.61	0.000	-5.20	0.000
IR	0.97	0.94	5.38	1
M1	1.006	0.99	9.86	1
1st difference				
INF	0.70		0.000	-2.23	0.0128
M1	0.035		0.000	-18.52	0.000

The above table presents the results of the Harris-Tzavalis and Levin-Lin-Chu unit root tests for the study variables. Based on the p-values, all of which are below the 0.05 significance level, the data for most variables are found to be stationary. However, the variables INF and M1 require first differencing to achieve stationarity. Given these findings, panel data models can be confidently applied to test the study's hypotheses without concern for spurious regression.

5.4 Cointegration Tests

To assess the extent of integration of the time series data used in the model, the study employed the Kao cointegration test to examine the long-run relationship between the dependent variable and the dimensions of the independent variables. The results for the bank-specific variables are presented as follows:

Table 6. Cointegration Tests

Model 1			
Model	Methods	Static	P-Value
$ROA \sim X_{it}$	Modified Dickey-Fuller t	-26.6662	0.000
	Dickey-Fuller t	-13.4742	0.000
	Augmented Dickey-Fuller t	-8.1321	0.000
	Unadjusted modified Dickey-Fuller t	-33.1923	0.000
	Unadjusted Dickey-Fuller t	-13.8476	0.000
Model 2			
$ROE \sim X_{it}$	Modified Dickey-Fuller t	-31.4101	0.000
	Dickey-Fuller t	-13.9292	0.000
	Augmented Dickey-Fuller t	-9.3181	0.000
	Unadjusted modified Dickey-Fuller t	-34.0936	0.000
	Unadjusted Dickey-Fuller t	-14.0112	0.000

The results in the above table indicate the significance of the Kao test, leading to the rejection of the null hypothesis that the model data are not cointegrated. Accordingly, the alternative hypothesis is accepted, confirming the presence of cointegration among the study variables.

6. Main Analysis Results

6.1 Results of the ROA Model

This section presents the empirical findings for the ROA model, using pooled, fixed-effects, and random-effects estimations. The analysis is based on panel data collected from eleven Egyptian banks over the 2008–2023 period. The regression specification includes key bank-specific variables, such as credit risk, liquidity ratio, capital adequacy, operational efficiency, bank size, and financial structure. The model is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 LR_{it} + \beta_3 CA_{it} + \beta_4 OE_{it} + \beta_5 BS_{it} + \beta_6 FS_{it} + \epsilon_{it}$$

All models are estimated at the 5% significance level. The analysis includes tables presenting the regression coefficients for each model type, along with statistical tests for model selection, including the Breusch-Pagan LM and Hausman tests. The results indicate that the random-effects model is the most appropriate based on the statistical diagnostics. Significant variables affecting ROA include credit risk, bank size, and capital adequacy.

The regression results indicate that credit risk has a statistically significant negative relationship with ROA across all models, confirming the theoretical expectation that higher credit risk reduces profitability. Bank size is positively and significantly associated with ROA, suggesting that larger banks benefit from economies of scale. Capital adequacy also exhibits a strong positive influence on ROA, underscoring the importance of a well-capitalized banking system. Liquidity risk and operational efficiency, although negatively signed, are statistically insignificant in most specifications. The random-effects model was selected as the preferred specification based on the Breusch-Pagan Lagrange Multiplier (LM) test and the Hausman test.

To complement the analysis, macroeconomic variables—including inflation, GDP growth, interest rates, and money supply growth—were incorporated into the models. These variables are captured in the following specification:

$$ROA_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 EG_{it} + \beta_3 IR_{it} + \beta_4 MS_{it} + \epsilon_{it}$$

To account for the influence of external economic conditions, a second set of models was estimated using macroeconomic indicators: inflation, Gross Domestic Product (GDP) growth, interest rate (IR), and money supply growth. The regression analyses indicate that money supply growth consistently exhibits a positive and significant impact on ROA, suggesting that increased liquidity in the economy can support bank profitability by expanding lending activities. Inflation has a marginally significant negative effect on profitability, indicating potential challenges in pricing loans and managing costs under inflationary pressures. Interest rates and GDP growth show no significant effect in most model specifications. Model diagnostics, including R-squared values and F-tests, support the explanatory power of the selected models, and the random-effects model is again favoured based on these diagnostics

6.2 *Results of the ROE Model*

Similarly, the empirical results for ROE were analyzed using the same econometric techniques. The model specification includes the same bank-specific variables and is estimated over the same timeframe. The panel regression equation is presented as follows:

$$ROE_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 LR_{it} + \beta_3 CA_{it} + \beta_4 OE_{it} + \beta_5 BS_{it} + \beta_6 FS_{it} + \epsilon_{it}$$

The regression results indicate that credit risk and bank size are significant determinants of ROE. As in the ROA model, the Breusch-Pagan LM and Hausman tests suggest that the random-effects

model is appropriate for the data. These results imply that bank-specific characteristics play a critical role in determining financial performance, as measured by ROE.

The ROE model follows a similar estimation framework to the ROA model but emphasizes shareholder returns. As with the ROA model, pooled, fixed, and random-effects models were estimated. The regression results indicate that credit risk has a significant negative effect on ROE, reflecting higher provisioning costs associated with riskier loan portfolios. Bank size remains a significant positive determinant of profitability, highlighting the benefits of scale. Capital adequacy, financial structure, and liquidity risk are statistically insignificant in most model specifications, suggesting a weaker direct influence on shareholder returns. Operational efficiency is also not significant, though consistently negative. Based on the LM and Hausman test results, the random-effects model is deemed appropriate for the analysis.

To complement the analysis, macroeconomic variables—including inflation, GDP growth, interest rates, and money supply growth—were incorporated into the models. These variables are captured in the following specification

$$ROE_{it}=\beta_0+\beta_1 INF_{it}+\beta_2 EG_{it}+\beta_3 IR_{it}+\beta_4 MS_{it}+\epsilon_{it}$$

Extending the ROE model to include macroeconomic variables, the results confirm that money supply growth has a significant positive influence on profitability, similar to the ROA model. Inflation exhibits a statistically significant negative impact on ROE, highlighting the challenges posed by rising prices on banks' cost structures. The interest rate and GDP growth variables remain statistically insignificant. These findings underscore the crucial role of monetary expansion in supporting profitability, while also emphasizing the destabilizing effects of inflation on bank performance. Model selection tests validate the random-effects model as the optimal specification for the macroeconomic analysis.

7. Discussion of Findings

The empirical results derived from the random-effects models—encompassing both bank-specific and macroeconomic variables—underscore the complex and dynamic nature of bank profitability among Egyptian listed banks during the period 2008–2023. The findings reveal that the effect of capitalization on bank profitability depends on the chosen profitability metric. Specifically, capitalization has a positive impact on Return on Assets (ROA), suggesting enhanced asset productivity with increased capital buffers. However, it negatively affects Return on Equity (ROE), reflecting the dilution of financial leverage as indicated by the equity multiplier. This inverse relationship between capitalization and ROE aligns with prior research, which shows that higher equity capital may reduce profitability by limiting the leverage effect

Consistent across both the ROA and ROE models, liquidity risk, operational inefficiency, and an imbalanced financial structure were associated with reduced bank performance. These results

highlight the importance of robust liquidity management and cost-efficiency strategies to safeguard profitability. Conversely, bank size and interest rates demonstrated a statistically significant positive relationship with profitability, suggesting that economies of scale and favourable interest rate environments contribute to improved financial outcomes

Furthermore, the macroeconomic variables—credit risk, economic growth, inflation, and money supply expansion—emerged as influential determinants of bank profitability. The findings indicate that both internal (bank-specific) and external (macroeconomic) factors must be simultaneously managed and monitored to sustain bank performance in volatile economic contexts such as Egypt, particularly in light of recurring shocks, including the Arab Spring, currency devaluations, and the COVID-19 pandemic.

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