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Research Article

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Effect of Credit and Operational Risk Management Practices on Financial Performance of Ethiopian Commercial Banks

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Abstract

Purpose: This study examines the effects of credit and operational risk management practices on the financial performance of Ethiopian commercial banks, measured by ROA and ROE, while controlling for bank size and age.

Methodology: A quantitative approach was employed, utilizing balanced panel data from 15 Ethiopian commercial banks spanning 2012 to 2022. Panel regression analysis was conducted using the random effects model for ROA and the fixed effects model for ROE, based on appropriate model selection criteria and diagnostic tests.

Findings: NPLR has a significant negative effect on ROA ($\beta = -0.0803$, $p = 0.001$) and ROE ($\beta = -0.6188$, $p = 0.035$). CAR positively affects ROA ($\beta = 0.0207$, $p = 0.013$) but negatively affects ROE ($\beta = -0.8489$, $p < 0.001$). CIR negatively and significantly affects both ROA ($\beta = -0.0094$, $p < 0.001$) and ROE ($\beta = -0.0717$, $p < 0.001$). Bank age negatively affects ROA ($\beta = -0.0172$, $p < 0.001$) and ROE ($\beta = -1.3341$, $p = 0.001$), while bank size positively affects ROE ($\beta = 0.1199$, $p = 0.002$) but has no significant effect on ROA.

Practical Implications: The findings indicated more rigorous credit appraisal and monitoring, enhanced cost efficiency, and optimal capital management. Additionally, regulators should strengthen risk-based supervision to improve banks' financial performance.

Originality: This study offers comprehensive panel evidence on the combined effects of credit and operational risk management on the performance of Ethiopian commercial banks, thereby contributing valuable empirical data to the relatively under-researched literature on banking in Sub-Saharan Africa.

Keywords: Credit risk, operational risk, financial performance, Ethiopian commercial banks.

JEL Classification: G21, G32, C23, and M41.

1. Introduction

Risk management has evolved considerably in the global banking industry, particularly following the 2007–2008 global financial crisis, which prompted regulatory reforms aimed at strengthening the resilience and stability of financial institutions. Consequently, banks have shifted from the traditional fragmented (silo-based) approach to a more integrated framework for managing enterprise risk, which enables the identification, assessment, and management of risks across the entire organization (Härle et al., 2016; Olayinka et al., 2017). This transformation reflects the growing recognition that effective risk management is essential for improving governance, supporting strategic decision-making and enhancing financial sustainability.

The Ethiopian banking sector has undergone significant institutional and regulatory transformations over the past century. Modern banking began with the establishment of the Bank of Abyssinia in 1905 during Emperor Menelik II's reign. The bank was later reconstituted as the Bank of Ethiopia in 1932. During the socialist regime (1974–1991), the banking sector was fully nationalized and characterized by weak governance, limited competition, and significant political intervention, which constrained its development (Alemayehu & Teklemedhin, 2012; Ayalew & Zhang, 2017; Chanie, 2015).

Following the economic reforms initiated in 1991, Ethiopia adopted a market-oriented financial system, culminating in the enactment of the Monetary and Banking Proclamation No. 83/1994. These reforms strengthened the autonomy of the National Bank of Ethiopia (NBE) and reopened the banking industry to private domestic investors, thereby fostering competition and expanding financial intermediation (Ayalew & Zhang, 2017; Kannan & Sudalaimuthu, 2016). The number of private commercial banks increased from one in 1994 to 31 in 2023 (NBE, 2023). Subsequent financial sector reforms, including the introduction of full-fledged interest-free banking and expanded ownership opportunities for foreign nationals of Ethiopian origin, have further accelerated banking industry growth.

Ethiopia's banking sector has undergone substantial structural changes over the past decade, including rapid branch expansion, the entry of new private banks, full-fledged interest-free banking, rising non-performing loan pressures in some segments of the sector, and, more recently, regulatory reform under Banking Business Proclamation No. 1360/2024, which has begun to open the sector to foreign participation (Tekalign, 2025).

Despite its expansion, the Ethiopian banking sector remains relatively underdeveloped, with financial intermediation and competition constrained compared to international standards, limiting its contribution to economic growth and financial inclusion (Dido, 2020; Fanta, 2016; Fanta & Makina, 2016). These challenges highlight the need for effective credit and operational risk management to enhance bank performance and stability. However, existing evidence indicates that risk management in Ethiopian commercial banks remains largely compliance-oriented, with limited strategic integration, insufficient resources, weak governance, and underdeveloped enterprise risk management systems (Biresaw & Sibindi, 2025).

Moreover, previous studies provide limited and inconclusive evidence, often examining credit and operational risks separately while giving little attention to bank-specific factors such as size and age. Accordingly, this study addresses this gap by investigating the combined effects of credit and operational risks on the financial performance of Ethiopian commercial banks from 2012 to 2022. Specifically, the study aims to:

1. Examine the effect of credit risk on the financial performance of Ethiopian commercial banks.
2. Investigate the effect of operational risk on the financial performance of Ethiopian commercial banks.
3. Evaluate the controlling effects of bank size and age on the financial performance of Ethiopian commercial banks.

The findings are expected to provide empirical evidence for bank managers and support the National Bank of Ethiopia’s risk-based supervisory framework and financial stability objectives.

2. Literature Review and Hypothesis

2.1. Theoretical Framework of Risk Management and Financial Performance

Commercial banks operate in a highly risky environment, facing credit, liquidity, operational, market, interest rate, foreign exchange, and regulatory risks. Because banking inherently involves risk-taking rather than risk avoidance, effective risk management is essential for maintaining financial stability and profitability (Mendoza & Rivera, 2017). Weak risk management can impair bank performance, undermine investor confidence, and negatively affect economic growth (Pekkaya and Demir, 2018).

The analysis of credit and operational risk in banking performance is based on several key theories. Financial intermediation theory posits that banks create value by mobilizing deposits, allocating credit efficiently, and managing information asymmetry and credit risk, thereby enhancing profitability and financial stability (Diamond, 1984; Gurley and Shaw, 1960). Complementing this, the Basel Risk Management Framework emphasizes that the effective identification, measurement, monitoring, and control of credit and operational risks are essential for maintaining capital adequacy, resilience, and sustainable financial performance (BCBS, 2021).

Agency Theory further explains that weak governance and managerial inefficiencies can increase credit defaults and operational losses, ultimately reducing financial performance (Jensen & Meckling, 1976). In addition, the Cost Efficiency Theory argues that banks with lower operating costs relative to income achieve greater operational

efficiency and superior financial performance, supporting the use of the cost-to-income ratio as a proxy for operational risk (Al-Sharkas & Al-Sharkas, 2022). Finally, the Resource-Based View (RBV) suggests that superior internal resources, including skilled personnel, advanced technology, and robust risk management systems, provide a competitive advantage that strengthens risk management and improves financial performance (Barney, 1991). Collectively, these theories provide a comprehensive framework for explaining how effective management of credit and operational risks enhances the financial performance of commercial banks.

In Ethiopia, the banking sector plays a pivotal role in supporting economic and social development, making strong financial performance and prudent risk management indispensable for maintaining financial system stability and sustainable economic growth (Abdullah et al., 2022; Hailegebreal, 2016; Shifa et al., 2019). Ethiopia's financial sector, which relies on the banking system, requires careful management to ensure resilience and sustainability, addressing risks that impact banks' financial performance (Tassew & Hailu, 2019).

2.2. Credit Risk and Financial Performance

Credit risk refers to the possibility of financial loss arising when borrowers fail to meet their repayment obligations, making it the most significant risk faced by commercial banks (Bessis, 2015; Poudel, 2012). High levels of credit risk increase non-performing loans and loan loss provisions, thereby reducing profitability and threatening financial stability (Bhattarai, 2019; Adekunle et al., 2015). However, empirical evidence of its effect on financial performance is mixed. Several studies report that high credit risk adversely affects bank financial performance due to increased defaults and provisioning costs (Ali et al., 2022; Chand et al., 2024; Islam & Nishiyama, 2016), whereas others argue that effective credit risk management enhances financial performance by minimizing loan losses and strengthening financial stability (Adusei, 2015; Athari & Bahreini, 2021; Fadun & Silwimba, 2023).

Credit risk is driven by both internal and external factors. Internally, excessive lending, high-risk appetite, and weak credit risk management contribute to loan defaults, while externally, inflation, foreign exchange shortages, and unstable economic conditions increase borrowers' default risk (Adem, 2022; Feleke & Tafere, 2025; Tesfaye, 2019).

The Basel Committee on Banking Supervision (BCBS) emphasizes effective credit risk management, adequate loan provisioning, and sufficient regulatory capital as essential for the stability of the banking sector (BCBS, 2011, 2016, 2022). Consistent with these principles, the National Bank of Ethiopia (NBE) strengthened credit risk management through directive No SBB/43/2008, which classifies loans overdue by 90 days or more as non-performing and requires banks to maintain the Non-Performing Loan Ratio (NPLR) below 5% (NBE, 2008). In addition, directives No SBB/50/2011 and No SBB/78/2021 require commercial banks to maintain a minimum Capital Adequacy Ratio (CAR) of 8% of risk-weighted assets.

2.2.1. Nonperforming loan ratio(NPLR) and Financial Performance

Non-performing loans (NPLs) are loans for which borrowers have failed to repay the principal or interest for at least 90 days, indicating poor asset quality and elevated credit risk (Farnè & Vouldis, 2024). High NPL ratios reduce banks’ financial performance by increasing loan loss provisions, lowering interest income, and weakening financial stability (Nikolopoulos & Tsalas, 2017).

Empirical evidence generally supports a negative relationship between NPLs and the financial performance. Studies in Nigeria, Bangladesh, Nepal, Ghana, and Ethiopia found that higher NPLs significantly reduce banks’ financial performance by increasing credit losses and reducing asset quality (Bhattarai, 2016; Ernest & Fredrick, 2017; Kolapo et al., 2012; Lata, 2015; Ozurumba, 2016; Patwary & Tasneem, 2019; Teshome et al., 2018; Tseganesh, 2012). However, some studies have reported insignificant or mixed effects of NPLs on bank performance, suggesting that institutional characteristics, risk management practices, and economic conditions may influence this relationship (Adebisi & Matthew, 2015; Afriyie & Akotey, 2012; Boahene et al., 2012; Oluwafemi et al., 2014; Yimka et al., 2015). The literature underscores that while NPLs often weaken profitability and stability, their impact varies across countries and contexts, reflecting differences in risk management practices and macroeconomic environments. Accordingly, this study hypothesizes the following:

H_1: The nonperforming loan ratio (NPLR) has a negative and significant effect on the financial performance of Ethiopian commercial banks.

2.2.2. Capital Adequacy Ratio(CAR) and Financial Performance

The Capital Adequacy Ratio (CAR) measures a bank's capital relative to its risk-weighted assets and reflects its capacity to absorb losses, maintain solvency, and comply with regulatory requirements (Sari & Sulistyo, 2018; Sukmadewi, 2020). Adequate capitalization enhances financial stability, lowers funding costs, strengthens investor confidence, and supports sustainable financial performance (Berger & Bouwman, 2017; Bougatef, 2017).

Most empirical studies report a positive relationship between CAR and bank financial performance, suggesting that well-capitalized banks are more resilient and profitable (Chand et al., 2024; Isayas, 2022; Kanapiyanova et al., 2023; Noor & Suhendra, 2024; Parmankulova et al., 2022; Sahyouni & Wang, 2018). However, other studies argue that maintaining excessive capital reserves may reduce lending capacity and financial performance, resulting in a negative relationship (Batten & Vo, 2019; Dietrich & Wanzenried, 2011; Muriithi et al., 2016).

Country-specific studies also show divergent results: positive impacts in South Africa (Nyoka, 2019), Ethiopia (Teshome et al., 2018), Jordan (Al-Sabbagh, 2004), and Nigeria (Mamoud, 2017), but negative or insignificant effects in Ghana (Antwi, 2019), Kenya (Musyoka, 2017; Muriithi et al., 2016), and Ethiopia (Gizaw et al., 2013). Accordingly, this study hypothesizes the following:

H_2: The Capital Adequacy Ratio (CAR) has a positive and significant effect on the financial performance of Ethiopian commercial banks.

2.3. Operational Risk and Financial Performance

Operational risk arises from weaknesses in internal processes, systems, or human performance, including fraud, technological failures, and legal risks (BCBS 2021; Ishmail et al. 2023). Major losses often stem from insufficient internal controls (Chernobai et al., 2011), while the rising number of fraud cases highlights the need for stronger frameworks (Olukotun et al., 2013).

The cost efficiency theory posits that banks that effectively control operating and administrative costs relative to income achieve higher profitability, implying a negative relationship between the cost-to-income ratio(CIR) and financial performance (Al-Sharkas & Al-Sharkas, 2022). A high CIR reflects poor cost management, operational inefficiency, and weaknesses in internal controls, technology, or human resources, all of which increase operational risk and reduce financial performance (BCBS 2021; Ishmail et al. 2023).

2.3.1. Cost income Ratio(CIR) and Financial Performance

The cost-to-income ratio (CIR), defined as operating expenses divided by operating income, is widely used as a proxy for operational efficiency and risk in banking (Epure & Lafuente, 2015; Ali & Dhiman, 2019). A higher CIR indicates inefficiency, as expenses outweigh income, reducing profitability (Onsongo et al., 2020).

Empirical evidence consistently shows that a higher CIR is associated with a lower return on assets (ROA) and return on equity (ROE) because inefficient operations increase costs and erode financial performance (Athari, 2021; Parmankulova et al., 2022; Rahman et al., 2020). In Ethiopia, operational inefficiencies, including weak internal controls and outdated banking infrastructure, have been identified as significant constraints on bank performance, underscoring the need for stronger operational risk management (Getu, 2022; Legass and Roba, 2024; Muhammed et al., 2023). Globally, technological advances since the 1990s have improved efficiency; however, operational inefficiencies continue to constrain profitability (Rahman et al., 2020; Trujillo-Ponce, 2013). Accordingly, this study hypothesizes that

H_3: The cost-to-income ratio (CIR) has a negative and significant effect on the financial performance of Ethiopian commercial banks.

2.4. Control Variables and Financial Performance

Bank size and age are important control variables that influence bank financial performance. Bank size, measured by the logarithm of total assets, reflects economies of scale, diversification, and market power, although an excessively large size may create inefficiencies (Athari, 2021; Bougatef, 2017). Bank age captures experience, reputation, and learning advantages, but may also reduce flexibility due to organizational rigidity (Bose et al., 2018; Işık & Ersoy, 2022). Therefore, both variables are controlled to isolate the risk effects on financial performance.

2.4.1. Bank Size and Financial Performance

Bank size, commonly measured by the natural logarithm of total assets, is an important bank-specific determinant of financial performance (Charmer et al., 2018; Kamal, 2023). According to the economies of scale perspective, larger banks can spread fixed costs, diversify their operations, access lower-cost funding, and invest more in technology and risk management, thereby improving their financial performance and stability (Athari, 2021; Isayas, 2022). However, beyond an optimal scale, an increase in size may create operational inefficiencies, higher administrative costs, and bureaucratic complexities that reduce financial performance (Barros et al., 2007; Djalilov & Piesse, 2016; Gupta & Mahakud, 2020).

Empirical evidence on the relationship between bank size and financial performance is inconclusive. Several studies report a positive association between bank size and financial performance due to economies of scale and income diversification (Alfadli & Rjoub, 2019; Athari, 2021; Bougatef, 2017; Petria et al., 2015), whereas others find negative or insignificant effects, suggesting that the impact depends on institutional, economic, and regulatory conditions (Ayalew, 2021; Batten & Vo, 2019; Dietrich & Wanzenried, 2014; Singh & Sharma, 2016).

In Ethiopia, empirical findings are similarly mixed, with some studies reporting positive effects (Tseganesh, 2012; Tigist, 2014) while others indicate that larger bank size may reduce financial performance because of operational inefficiencies (Ayalew, 2021). Consequently, the effect of bank size on the financial performance of Ethiopian commercial banks remains an empirical issue that requires further investigation. Accordingly, this study hypothesizes that

H_4: Bank size has a positive and significant effect on the financial performance of commercial banks in Ethiopia.

2.4.2.Bank Age and Financial Performance

Bank age, commonly measured as the natural logarithm of the number of years since establishment, is a bank-specific characteristic that may influence financial performance through accumulated experience, reputation, and organizational learning (Bose et al., 2018). Older banks are likely to gain an advantage from greater risk management, customer confidence, and operational efficiency, which contribute to better financial performance (Işık & Ersoy, 2022; Musah, 2017). However, excessive organizational maturity may also result in bureaucratic rigidity and inefficiencies that weaken financial performance (Işık & Ersoy, 2022; Tariq et al., 2021).

Consequently, empirical evidence on the relationship between bank age and financial performance is inconclusive. While some studies report a positive association between bank age and financial performance (Işık & Ersoy, 2022; Kwashie et al., 2023), others find negative or insignificant effects, suggesting that older banks may experience declining efficiency or adapt more slowly to changing market conditions (Dawar, 2014; Isayas, 2022; Malik, 2011; Mwangi & Murigu, 2015).

In Ethiopia, evidence indicates that bank age has an insignificant, positive, or negative influence on financial performance, implying that its effect remains context-specific. Some studies found that banks' age has positive effects on financial performance (Tseganesh, 2012; Tigist, 2014), while Isayas (2022) observed negative and insignificant effects. Therefore, the relationship between bank age and the financial performance of Ethiopian commercial banks remains an empirical issue that warrants further investigation. Accordingly, this study hypothesizes the following:

H_5: Bank age has a positive and significant effect on the financial performance of Ethiopian commercial banks.

2.5. Bank Financial Performance

Financial performance reflects how effectively an organization manages its resources and investments to achieve profitability, stability, and its strategic objectives. It is important to investors, regulators, depositors, competitors, and other stakeholders because it provides evidence of an institution's financial health, managerial effectiveness, competitiveness, and long-term viability (Fatihudin & Mochklas, 2019; Fatihudin & Mochklas, 2018).

In banking research, profitability-based measures are widely used because banks' financial performance is closely associated with their ability to generate sustainable return. Common indicators include Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM) (Munyambonera, 2013; Ngunyu, 2019).

2.5.1. Return on Assets (ROA) evaluates how efficiently a bank converts its total assets into profits and is widely regarded as an important indicator of managerial and operational efficiency (Tan & Floros, 2012). Therefore, it captures the bank's ability to generate earnings from its asset base and has been extensively applied in empirical banking studies (Munyambonera, 2013; Isayas, 2022).

2.5.2. Return on Equity (ROE), in contrast, measures the performance relative to shareholders' equity and reflects the return earned on owners' invested capital (Tan & Floros, 2012). While widely used, ROE may not fully capture the risk from leverage; however, it remains a central measure of shareholder value (Ghazouani & Moussa, 2013; Rahman et al., 2016; Rahman et al., 2015). Previous banking studies have employed both ROA and ROE to provide complementary measures of financial performance (Tan & Floros, 2012; Munyambonera, 2013).

This study uses ROA and ROE to measure the financial performance of the Ethiopian commercial banks. Using both indicators allows us to assess bank performance from two complementary perspectives: asset-use efficiency through ROA and shareholder returns through ROE. This provides a more comprehensive assessment of the financial performance of Ethiopian commercial banks.

2.6. Conceptual Framework and Hypothesis

In addition to the theoretical framework, a conceptual framework provides a structured representation of the key variables and their expected relationships in a study (Miles et al., 2014). It guides the empirical analysis by identifying independent, dependent, and control variables and explaining their interrelationships. In this study, the conceptual framework examines the effect of credit and operational risk management practices on the financial performance of 15 Ethiopian commercial banks from 2012 to 2022.

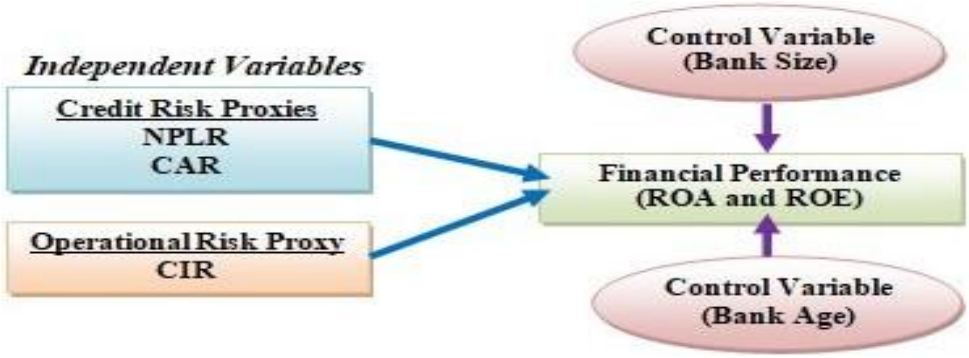


Figure 1: Proposed conceptual Framework

Credit risk and operational risk indicators are considered independent variables; bank size and age are included as control variables, and financial performance, measured by ROA and ROE, represents the dependent variable. The framework provides a basis for analyzing how credit and operational risk management practices influence the financial performance of Ethiopian commercial banks.

Hypothesis

H_1: The Non-performing Loan Ratio (NPLR) has a negative and significant effect on Ethiopian commercial banks return on assets (ROA).

H_2: The Non-performing Loan Ratio (NPLR) has a negative and significant effect on Ethiopian commercial banks Return on Equity (ROE).

H_3: The Capital Adequacy Ratio (CAR) has a positive and significant effect on Ethiopian commercial banks return on assets (ROA).

H_4: The Capital Adequacy Ratio (CAR) has a positive and significant effect on Ethiopian commercial banks (ROE).

H_5: The cost-to-income ratio (CIR) has a negative and significant effect on Ethiopian commercial banks (ROA).

H_6: The cost-to-income ratio (CIR) has a negative and significant effect on Ethiopian commercial banks (ROE).

H_7: Bank Size has a significant effect on Ethiopian commercial banks (ROA).

H_8: Bank Size has a significant effect on Ethiopian commercial banks (ROE).

H_9: Bank Age significantly affects Ethiopian commercial banks (ROA).

H_{10}: Bank Age has a significant effect on Ethiopian commercial banks (ROE).

3. Research Methodology

3.1. Research Approaches and Design

Quantitative methods allow hypothesis testing and generalization based on measurable data (Saunders et al., 2009). The research design combines descriptive and explanatory elements, providing both an overview of financial performance and an analysis of causal relationships (Kothari, 2014). Therefore, this study employs a quantitative approach with a descriptive and explanatory research design using panel data from 15 Ethiopian commercial banks over 11 years (2012–2022).

3.2. Data Sources and Collection Methods

Panel data, which integrates cross-sectional and time-series dimensions, were chosen to capture both differences across banks and changes over time (Miles et al., 2014). The data for this study were drawn from the audited annual financial statements of the sampled Ethiopian banks and publications of the National Bank of Ethiopia.

3.3. Populations and Sample Size

The target population comprised 24 commercial banks that met the study objectives. Using purposive sampling, 15 banks (62.5%) were selected based on their operational continuity, availability of reliable data, and sufficient operating history during the study period. Purposive sampling is appropriate when cases are selected according to predefined characteristics relevant to the research objectives (Etikan et al., 2016; Palinkas et al., 2015).

3.4. Model Specifications and Variable Descriptions

Panel data regression combines cross-sectional and time-series data, offering greater efficiency and control for unobserved heterogeneity than using either data type independently (Aljandali & Tatahi, 2018; Zulfikar, 2018). In this study, panel data comprising multiple Ethiopian commercial banks observed over the study period were analyzed using multiple linear regression. Specifically, Ordinary Least Squares (OLS)-based panel estimators, namely the Fixed Effects (FE) and Random Effects (RE) models, were employed to examine the effects of risk management practices on the financial performance of Ethiopian commercial banks. The panel regression model is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 NPLR + \beta_2 CAR_{it} + \beta_3 CIR_{it} + \beta_4 Age_{it} + \beta_5 Size_{it} + \varepsilon_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 NPLR + \beta_2 CAR_{it} + \beta_3 CIR_{it} + \beta_4 Age_{it} + \beta_5 Size_{it} + \varepsilon_{it}$$

Table 1: Summary of Variables, Descriptions and Expected relationship						
Variables	**Notations**	**Proxies**	**Measurements**	**Expected effect**	**Sources**	**References**
Dependent variables	Return on Assets	ROA	Net Income/ Total Asset	NA	Computed from Annual Reports of Commercial Banks	Al-Aaraji(2024), Nguyen(2023), Naeem et al. (2017)
	Return on Equity	ROE	Net income/ Total Equity	NA		Yahya et al. (2014) Khrawish (2011)
Independent variables	CRP	NPLR	Non-performing loan /Total loan	-	Computed from Annual Reports of Commercial Banks	Antony and Suresh (2023),(Siltan(2022) ,Fathina (2022), Lee and Lee (2018), Ozili (2017)
		CAR	Total capital/risk weighted assets	+		
	ORP	CIR	Operating cost/ Operating income	-		Javaid and Alalawi (2018), Ahmed et al. (2011)
Control variables	Bank Age		The number of years since established	+	NBE	Kusi *et al. (*2019); Hunjra *et al. (*2020); Kafidipe (2021)
	Bank Size		Natural Log of Total Asset	+		Kusi *et al.*(2019); Kafidipe (2021)

Source: Reviewed from empirical literatures

3.5. Panel Data Analysis

Panel regression techniques, Fixed Effects (FE), and Random Effects (RE) models were applied. The FE model controls for time-invariant characteristics, while the RE model provides efficient estimates under the assumption of no correlation between unobserved effects and regressors (Breuer & Dehaan, 2024; Balázs et al., 2024). Model selection was guided by the Hausman test, where a p-value below 0.05 favored FE and above 0.05 favored RE (Brooks 2014). This ensured a robust estimation of the determinants of bank performance. Based on the empirical results, RE was selected for ROA, and FE was selected for ROE.

4. Results and Discussion

This section presents and discusses the empirical findings on the effect of credit and operational risk management practices on the financial performance of 15 Ethiopian commercial banks from 2012 to 2022. The analysis focuses on ROA and ROE as performance measures and examines the effects of NPLR, CAR, and CIR, as well as bank age and size. The results are interpreted using statistical evidence and compared with the relevant empirical literature to assess their theoretical and practical implications.

4.1. Descriptive Statistics Analysis Results

Table 2: Descriptive Statistics Analysis Results

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	165	2.787818	.8583543	0	5.13
ROE	165	21.58018	10.4767	2.5	77.71
NPLR	165	2.828727	1.874108	0	16.3
CAR	165	17.8823	6.383838	8.4	40
CIR	165	117.5919	53.13998	24.78	455.3
Age	165	17.93333	16.69385	1	80
Size	165	73.40606	41.62374	1	146

Source: Author's computation using STATA

Table 2 presents the descriptive statistics of 165 panel observations across a sample of 15 Ethiopian commercial banks from 2012 to 2022. The average ROA is 2.79% (SD = 0.86), ranging from 0% to 5.13%, indicating moderate asset utilization with limited variation; however, some banks achieved higher efficiencies. The mean ROE is 21.58% (SD = 10.48), with a wide range (2.5%–77.71%), reflecting strong shareholder returns but considerable disparities due to differences in the capital structure and risk management.

The average NPLR is 2.83% (SD = 1.87), below the 5% prudential benchmark, suggesting satisfactory credit quality, although the maximum of 16.3% highlights substantial credit risk in some banks. The mean CAR is 17.88% (SD = 6.38), well above the 8% regulatory minimum requirement, indicating strong capitalization and resilience, while the variation suggests differing capital strategies.

Operational efficiency was weak, with CIR averages at 117.59% (SD = 53.14), with a range of 24.78–455.30%. A mean above 100% indicates considerable operational inefficiency, with operating expenses exceeding operating income on average, while the wide dispersion demonstrates substantial differences in cost management across the sample banks during the study period. The control variables show heterogeneity: bank age averages 17.93 years (SD = 16.69), ranging from 1 to 80 years, while bank size averages 73.41 (SD = 41.62), reflecting diverse maturity and asset bases.

4.2. Correlation Analysis Results

Table 3: Correlation Analysis Results

	ROA	ROE	NPLR	CAR	CIR	Age	Size
ROA	1.0000						
ROE	0.4277	1.0000					
NPLR	-0.2835	-0.2572	1.0000				
CAR	0.3208	-0.1596	0.0324	1.0000			
CIR	-0.6499	-0.5463	0.2957	-0.1764	1.0000		
Age	-0.2709	0.5323	-0.1612	-0.0529	-0.0752	1.0000	
Size	-0.3947	0.2821	-0.0135	-0.3013	0.1805	0.6927	1.0000

Source: Author's computation using STATA

Table 3 presents a correlation matrix based on 165 panel observations from a sample of 15 Ethiopian commercial banks spanning 2012 to 2022. The non-performing loan ratio (NPLR) shows a negative correlation with both ROA ($r = -0.2835$) and ROE ($r = -0.25$), indicating that increased credit risk is associated with declining bank financial performance. The capital adequacy ratio (CAR) correlates positively with ROA ($r = 0.32$), supporting the view that adequate capital enhances financial performance, but correlates negatively with ROE ($r = -0.15$), suggesting that excessive capitalization can reduce shareholder returns by decreasing financial leverage. This highlights the trade-off between financial stability and profitability: while adequate capital improves resilience, excessive capital can limit equity returns.

Conversely, the Cost-to-Income Ratio (CIR) exhibits a strong negative correlation with Return on Assets (ROA) ($r = -0.64$) and Return on Equity (ROE) ($r = -0.54$), reinforcing the notion that cost inefficiency undermines financial performance. Bank age and size demonstrate mixed effects: age correlates negatively with ROA ($r = -0.27$) but positively with ROE ($r = 0.53$), suggesting that older banks may experience structural rigidity while maintaining shareholder confidence. Size shows a weak positive correlation with ROE ($r = 0.28$) but a negative correlation with ROA ($r = -0.39$), implying that larger banks benefit from economies of scale but face challenges in asset utilization.

4.3. Diagnostic Test and Inferential Analysis

4.3.1.Diagnostic Test Results

Table 4: Multicollinearity Tests Results

Variable	VIF	1/VIF
Size	2.43	0.411753
Age	2.23	0.448678
CIR	1.22	0.822672
CAR	1.18	0.849009
NPLR	1.13	0.881462
Mean VIF	1.64	

Source: Author's computation using STATA

Table 4 presents the results of the multicollinearity tests. The Variance Inflation Factor (VIF) values indicate that there is no multicollinearity problem among the explanatory variables in the model. All variables have low VIF values, ranging from 1.13 (NPLR) to 2.43 (Size), with a mean VIF of 1.64, which is well below the conventional thresholds of 5 or 10 (Wooldridge, 2020; Hair et al., 2019). Therefore, multicollinearity does not threaten the validity of the regression results.

Table 5: Diagnostic Test for Panel Data

Econometric Test	Statistic for ROA/ROE	P-Value for ROA/ROE
Wooldridge Test	0.620	0.5185
Breusch–Pagan	0.13	0.7202
Jarque–Bera	4.172	0.1242
Unit root(Levin–Lin–Chu)	-5.3197/-4.901	0.000/0.000
Kao co-integration	-2.241/-2.693	0.0125/0.0035
Ramsey RESET	1.04/2.04	0.3760/0.1115
Friedman test	13.22	0.5089

Source: Author's computation using STATA

Table 5 above shows the diagnostic tests indicating that the estimated panel data models are statistically sound and free from major econometric issues.

The diagnostic tests confirm the robustness of the panel data model. The Wooldridge test for autocorrelation ($p = 0.5185$) indicates no serial correlation, ensuring unbiased estimates (Drukker, 2003). The Breusch–Pagan test ($p = 0.7202$) shows no heteroskedasticity, suggesting homoscedastic residuals (Breusch & Pagan, 1979). The Jarque–Bera test ($p = 0.1242$) confirms the normality of residuals, validating the model's assumptions (Jarque & Bera, 1980).

The Levin–Lin–Chu unit root test ($p = 0.000$) rejects the null hypothesis of non-stationarity, confirming the stationarity of the variables (Levin et al., 2002). The Kao cointegration test ($p = 0.0125/0.0035$) indicates long-run equilibrium relationships among the variables (Kao, 1999). The Ramsey RESET test ($p = 0.3760/0.1115$) shows no evidence of model misspecification (Ramsey, 1969). Finally, the Friedman test ($p = 0.5089$) suggests no cross-sectional dependence, supporting the validity of the panel structure (Pesaran, 2004).

The diagnostic results indicate that the estimated models are statistically robust and free from significant econometric issues. The estimated coefficients and hypothesis tests are reliable, making them suitable for drawing inferences about the effects of credit and operational risk management on bank performance.

4.3.2. The Hausman Test Panel Data Analysis on ROA and ROE

The Hausman test was conducted to determine whether the Fixed Effects (FE) or Random Effects (RE) model is more appropriate for estimating the relationship between risk management practices and the financial performance of Ethiopian commercial banks from 2012 to 2022.

Brooks (2014), the Hausman test was applied to determine the FE or RE panel regression model provides the better fit. The test is framed with two competing hypotheses:

H_0: The random effects specification is valid, if the p-value > 0.05

H_1: The fixed effects specification is valid, if the p-value < 0.05

The null hypothesis (H_0) states that the Random Effects model is appropriate because the individual-specific effects are uncorrelated with the explanatory variables, while the alternative hypothesis (H_1) favors the Fixed Effects model.

Table 6: The Hausman Test Results

Performance	Chi-square (χ^2)	P-value	Decision	Model Selection
ROA	10.50	0.062	Failed to reject H_0	Random Effects (RE)
ROE	56.32	0.000	Reject H_0	Fixed Effects (FE)

Source: Author's computation using STATA

Table 6 presented the Hausman test results model choices for the two performance measures (ROA and ROE). For the ROA model, the Hausman test produced χ^2=10.50 with p=0.062, which is statistically insignificant at the 5% level. Since the null hypothesis could not be rejected, the Random Effects (RE) model was selected as the more efficient and appropriate estimator for ROA, indicating that there is insufficient evidence that the individual bank-specific effects are correlated with the explanatory variables (Hausman, 1978). In contrast, the ROE model Hausman test generated χ^2=56.32 with p=0.000, leading to rejection of the null hypothesis and supporting the Fixed Effects (FE) model. This implies that unobserved firm-specific effects are correlated with the explanatory variables, making FE more consistent and reliable for the ROE estimation (Baltagi, 2021; Greene, 2018).

4.4. Regression Analysis Results and Discussion

4.4.1. Random Effect Analysis and Discussion on Return on Assets(ROA)

Table 7 shows the results of the Random Effects (RE) model that provides significant evidence on the determinants of ROA among sample Ethiopian commercial banks from 2012 to 2022. The model is jointly significant (Wald χ^2 = 201.98, p < 0.001) and explains 58.38% of the variation in ROA (Overall R^2 = 0.5838), indicating satisfactory explanatory power (Baltagi, 2021; Wooldridge, 2020).

Table 7: Random Effect (RE) model Regression Analysis Results on Return on Asset (ROA)

```
Random-effects GLS regression                   Number of obs      =       165
Group variable: Code                            Number of groups   =        15

R-sq:                                           Obs per group:
     within  = 0.5214                                         min =        11
     between = 0.7845                                         avg =      11.0
     overall = 0.5838                                         max =        11

                                                Wald chi2(5)       =    201.98
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
NPLR	-.0803505	.0251819	-3.19	0.001	-.1297061	-.030995
CAR	.0207515	.0083632	2.48	0.013	.0043599	.0371432
CIR	-.0094854	.0009256	-10.25	0.000	-.0112996	-.0076712
Age	-.0172457	.0047041	-3.67	0.000	-.0264656	-.0080258
Size	.0000258	.0016942	0.02	0.988	-.0032948	.0033465
_cons	4.066804	.2246587	18.10	0.000	3.626482	4.507127
sigma_u	.1473704					
sigma_e	.53560557					
rho	.07037797	(fraction of variance due to u_i)				

Source: Author's computation using STATA

Table 7 presented that the NPLR has a negative and significant effect on ROA ($\beta = -0.0804$, $p = 0.001$). A one-unit increase in the non-performing loan ratio (NPLR) will reduce the return on assets (ROA) by 0.08%, ceteris paribus, indicating that higher credit risk diminishes financial performance through increased provisions, lower interest income, and weakened lending capacity. Therefore, H_1 is accepted. This finding emphasizes the necessity of sound credit assessment, loan monitoring, and recovery practices and aligns with evidence that deteriorating asset quality adversely affects bank financial performance. The results of this study are consistent with our expectations and support the findings of Nguyen (2023), Tangngisalu et al. (2020), Bhattarai (2019), Athanasoglou et al. (2008), Patwary and Tasneem (2019), and Nyarko-Baasi (2018), all of whom identified a significant negative relationship between non-performing loan ratios (NPLR) and return on assets (ROA).

CAR positively and significantly affects ROA ($\beta = 0.0208$, $p = 0.013$). A one-unit increase in CAR is associated with approximately a 0.021% increase in ROA, holding other factors constant. Accordingly, H_2 is accepted. Strong capitalization enhances banks' capacity to absorb losses, maintain confidence, and support profitable lending. This study's finding aligns with our expectations and is consistent with previous studies by Batten and Vo (2019), Teshome (2018), Berger and Bouwman (2017), and Yuvaraj and Gashaw (2013), who found that the capital adequacy ratio has a positive relationship with return on assets. However, it does not support the findings of Anbar and Alper (2011).

The cost-to-income ratio (CIR) has a negative and highly significant effect on financial performance ($\beta = -0.0095$, $p < 0.001$), confirming that operational inefficiency diminishes financial performance; therefore, H_3 is accepted. Enhancing cost control, process efficiency, and digitalization is crucial for improving return on assets (ROA). This finding aligns with our initial expectations and is supported by the research of Parmankulova et al. (2022), Kumar et al. (2022), Athari (2021), Alfadli and Rjoub (2020), and Bougatef (2017). These studies demonstrate that operational efficiency, as measured by the cost-to-income ratio, negatively impacts a bank's return on assets.

The age of banks has a negative and significant effect ($\beta = -0.0172$, $p < 0.001$), rejecting the hypothesis of a positive impact. Older banks may experience rigidity, outdated systems, and higher administrative costs, indicating a need for modernization. This result contradicts our expectations but aligns with the findings of Shehata et al. (2017), Nguyen et al. (2014), and Ujunwa (2012), who found that age negatively, affects ROA. However, it contrasts with the findings of Sardo et al. (2018) and Kramaric et al. (2017), who reported a positive relationship between age and ROA.

Finally, bank size has a positive but insignificant effect (β = 0.0003, p = 0.988), thereby rejecting the hypothesis of a positive impact. Asset expansion alone does not guarantee improved financial performance without efficient resource utilization. The results of this study align with the findings of Kwashie (2022) and Parvin et al. (2019), who found that bank size did not have a significant influence on ROA. While Athari and Bahreini (2023), Isayas (2022), Athari (2021), Alomari and Azzam (2017), and Dey et al. (2015) reported a significant effect of bank size on ROA, this study does not support that conclusion.

4.4.2. Fixed Effect Analysis and Discussion on Return on Equity (ROE)

Table 8 presents the results of a fixed effects regression model examining return on equity (ROE) among 15 Ethiopian commercial banks during the study period from 2012 to 2022. The model is statistically significant (F = 33.41, p < 0.001), indicating that the explanatory variables jointly influence shareholder returns. It explains 53.54% of the within-bank variation (R^2 = 0.5354). Additionally, the significant individual effects test (F = 5.59, p < 0.001) confirms the presence of bank-specific characteristics, supporting the use of the fixed effects estimator (Baltagi, 2021; Wooldridge, 2020).

Table 8: Fixed Effect (FE) model Regression Analysis Results on Return on Equity (ROE)

```
Fixed-effects (within) regression               Number of obs      =       165
Group variable: Code                            Number of groups   =        15

R-sq:                                           Obs per group:
     within  = 0.5354                                         min =        11
     between = 0.7120                                         avg =      11.0
     overall = 0.1351                                         max =        11

                                                F(5,145)           =     33.41
corr(u_i, Xb)  = -0.9449                        Prob > F           =    0.0000
```

ROE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
NPLR	-.6188212	.2905252	-2.13	0.035	-1.193033	-.0446098
CAR	-.8489028	.1234443	-6.88	0.000	-1.092885	-.60492
CIR	-.0717947	.0113173	-6.34	0.000	-.094163	-.0494265
Age	-1.334126	.3899365	-3.42	0.001	-2.10482	-.563432
Size	.1199516	.0389728	3.08	0.002	.0429235	.1969798
_cons	62.07362	4.414823	14.06	0.000	53.3479	70.79934
sigma_u	25.597347					
sigma_e	5.7225217					
rho	.95240027	(fraction of variance due to u_i)				

F test that all u_i=0: F(14, 145) = 5.59 Prob > F = 0.0000

Source: Author's computation using STATA

Table 8 shows that the non-performing loan ratio (NPLR) has a negative and significant effect on return on equity (ROE) (β = −0.6188, p = 0.035), indicating that a one-unit increase in NPLR reduces ROE by approximately 0.619%, ceteris paribus. Therefore, hypothesis H_1 is accepted. This result suggests that poor loan quality diminishes shareholder returns by lowering interest income and increasing provisioning and recovery costs, highlighting the importance of effective credit appraisal, monitoring, and recovery systems. The findings align with our expectations and are consistent with those of Işık (2022), Athari (2021), Horobet et al. (2021), and Batten & Vo (2019).

CAR has a negative and highly significant effect (β = −0.8489, p < 0.001). A one-unit increase in CAR is associated with an approximate 0.8489% decrease in ROE, holding other factors constant. Therefore, H_2 rejects the hypothesis of a positive impact. While strong capitalization enhances stability, excessive capital buffers reduce leverage and limit shareholder value, emphasizing the necessity of an optimal capital structure. This result is contrary to our expectations and is supported by the findings of Batten and Vo (2019), Berger and Bouwman (2017), and Anbar and Alper (2011) who found that CAR adversely affect shareholders returns.

CIR negatively and significantly affects ROE (β = −0.0718, p < 0.001). A one-unit increase in CIR is associated with approximately a 0.0718% decrease in ROE, ceteris paribus. Thus, H_3 is accepted. Higher operating expenses relative to operating income reduce shareholder returns. This underscores the importance of cost management, process efficiency, and digital transformation. The result aligns with our expectations and is corroborated by the findings of Al Sharkas & Al Sharkas (2022) and Bougatef (2017).

The age of banks negatively influences ROE (β = −1.3341, p = 0.001), rejecting H_4, which hypothesized a positive effect. Older banks may suffer from organizational rigidity, legacy systems, slower technological adaptation, and a need for modernization. This result contradicts our expectations but aligns with the findings of Isayas (2022), Szegedi et al. (2020), and Pastore et al. (2020), who found that age adversely affects shareholder returns. In contrast, Kramaric et al. (2017) and Adusei (2011) reported a positive effect of age on ROE.

Conversely, bank size positively and significantly affects ROE (β = 0.1200, p = 0.002), leading to the acceptance of H_5. This supports the notion that larger banks benefit from economies of scale, market power, and diversified income sources. The result aligns with our expectations and is consistent with the findings of Adewale et al. (2023), Athari (2021), and Elsas et al. (2010).

4.5. Hypothesis Test Result Summary

Table 9 summarizes the hypothesized relationships and the empirical findings for **ROA and ROE**, together with the corresponding hypothesis decisions based on the expected directions and statistical significance of the estimated coefficients.

Table 9: Summary of Hypothesis Results and Decisions

Summary of Hypothesis Testing on ROA						
Variables	**Coefficient**	**z-stat**	**p-value**	**Significance**	**Direction**	**Decision**
NPLR	-0.0803	−3.19	0.001	***	Negative	Accept
CAR	0.0207	2.48	0.013	**	Positive	Accept
CIR	-0.0094	-10.25	0.000	***	Negative	Accept
Age	-0.0172	−3.67	0.000	***	Negative	Reject
Size	0.0000	0.02	0.988	NS	Positive	Reject
*****: p<0.01; **: p<0.05; *: p<0.10; NS: Not significant**						
Summary of Hypothesis Testing on ROE						
Variables	**Coefficient**	**t-stat**	**p-value**	**Significance**	**Direction**	**Decision**
NPLR	−0.6188	−2.13	0.035	**	Negative	Accept
CAR	-0.8489	-6.88	0.000	***	Negative	Reject
CIR	-0.0717	-6.34	0.000	***	Negative	Accept
Age	-1.3341	-3.42	0.001	***	Negative	Reject
Size	0.1199	3.08	0.002	***	Positive	Accept
*****: p<0.01; **: p<0.05; *: p<0.10; NS: Not significant**						

Source: Author's computation using STATA

5. Conclusions and Recommendation

5.1. Conclusions

This study examined the effects of credit and operational risk management practices on the financial performance of Ethiopian commercial banks using balanced panel data from 15 banks over the period 2012–2022. Financial performance was measured by return on assets (ROA) and return on equity (ROE), while credit and operational risk management practices were represented by the non-performing loan ratio (NPLR), capital adequacy ratio (CAR), and cost-to-income ratio (CIR). Bank age and bank size were included as control variables.

The empirical findings demonstrate that credit risk and operational risk are the most consistent determinants of bank financial performance. The non-performing loan ratio (NPLR) negatively and significantly affects both ROA and ROE, confirming that poor asset quality and increasing loan defaults reduce financial performance. Similarly, the

cost-to-income ratio (CIR) exhibits a strong negative and significant effect on both performance indicators, indicating that operational inefficiency substantially weakens bank financial performance.

The study also found that capital adequacy has mixed effects on financial performance. While higher capital adequacy improves return on assets (ROA) by enhancing banks' ability to absorb unexpected losses and maintain financial stability, it reduces return on equity (ROE), suggesting that excessive capitalization may lower shareholder returns by reducing financial leverage. Furthermore, bank age negatively influenced both ROA and ROE, implying that organizational maturity alone does not guarantee improved performance unless accompanied by continuous innovation and operational modernization. Bank size positively influenced ROE but had no significant effect on ROA, indicating that larger banks benefit from economies of scale in enhancing shareholder returns, although asset growth alone does not necessarily improve operational performance.

The findings confirm that effective credit risk management, efficient operational cost control, and optimal capital allocation are essential for enhancing the financial performance and long-term sustainability of Ethiopian commercial banks.

5.2. Recommendations

Based on the findings, the following recommendations are proposed:

First, commercial banks should strengthen credit risk management by improving borrower screening, adopting robust credit-scoring models, conducting periodic credit reviews, and enhancing loan monitoring and recovery systems. Early warning systems should be improved to identify problem loans before they deteriorate into non-performing assets.

Second, banks should improve operational efficiency by reducing unnecessary operating expenses, modernizing internal processes, investing in digital banking technologies, and strengthening internal controls and enterprise risk management systems. Enhancing cost efficiency will directly improve both ROA and ROE.

Third, banks should maintain an optimal capital structure. While adequate capital enhances financial stability, maintaining excessively high capital levels may reduce returns to shareholders. Therefore, management must balance effective capital utilization with regulatory capital requirements.

Fourth, mature banks should continuously invest in organizational innovation, digital transformation, staff development, and business process reengineering to minimize the bureaucratic inefficiencies associated with organizational aging.

Finally, smaller banks should pursue strategic growth through market expansion, product diversification, technological innovation, and strategic alliances or mergers to benefit from economies of scale without compromising operational efficiency.

5.3. Policy and Practical Implications

The findings offer several important implications for policymakers, regulators, and bank management.

For the National Bank of Ethiopia (NBE), the results underscore the importance of enhancing risk-based supervision by placing greater emphasis on asset quality monitoring, operational risk governance, and the continuous evaluation of banks' cost efficiency. Regulatory policies should encourage banks to maintain prudent lending standards while ensuring adequate but not excessive capitalization.

For commercial bank boards and executive management, the study demonstrates that risk management should be integrated into strategic decision-making rather than treated solely as a regulatory compliance function. Banks should enhance their enterprise risk management frameworks by incorporating credit, operational, and capital management into their corporate governance structures.

The study also emphasizes the importance of accelerating digital transformation. Investments in financial technology, automated credit assessment systems, artificial intelligence, data analytics, and cybersecurity can significantly reduce operational costs and enhance decision-making quality.

For investors and shareholders, the findings provide evidence that effective risk management practices directly contribute to sustainable financial performance and the creation of long-term shareholder value.

5.4. Contribution to Knowledge

This study contributes to the banking and risk management literature by providing recent empirical evidence on the combined effects of credit and operational risk management practices on the financial performance of Ethiopian commercial banks. It utilizes balanced panel data and appropriate panel econometric techniques. Unlike many previous Ethiopian studies that focused on a single risk dimension, this research simultaneously evaluates credit risk, capital adequacy, and operational efficiency while controlling for bank-specific characteristics. The findings enhance the literature on banking risk management in emerging economies and offer evidence-based recommendations for bank managers, regulators, and policymakers aiming to strengthen financial stability and improve the performance of the banking sector.

5.5. Limitations

The study is limited to Ethiopian commercial banks and covers the period from 2012 to 2022, which may restrict the generalizability of the findings to other contexts. Additionally, reliance on secondary financial data excludes qualitative factors such as governance quality, managerial practices, and organizational culture.

5.6. Further Areas of Research

Future studies should examine the moderating roles of governance, technological innovation, and regulatory frameworks in shaping the relationship between risk management and performance. Comparative studies across Sub-Saharan Africa could offer broader insights, while qualitative research could explore managerial decision-making and organizational adaptability.

Disclosure statement

There is no conflict of interest to disclose. The authors declare that there is no competing interest regarding the publication of this article.

Author contributions

[ATK]: Conceptualization, Methodology, Investigation, Formal analysis and writing original draft

[CN]: Supervision, validation, Visualization, and, writing-review and editing

Data Availability Statement

The data supporting the findings of this study are publicly available from the published annual reports and financial statements of Ethiopian commercial banks and the National Bank of Ethiopia and are available from the corresponding author upon reasonable request.

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Declarations

Ethics Statement

This study was conducted in full compliance with the University of South Africa's Research Ethics Policy and the principles outlined in the Declaration of Helsinki. Ethical approval was granted by the Ethics Review Committee of the College of Economic and Management Sciences, Department of Finance, Risk Management, and Banking, University of South Africa (Ethics Approval No. 3299; valid from 26 August 2024 to 25 August 2029). The study exclusively utilized publicly available secondary data obtained from the published financial statements of Ethiopian commercial banks and reports from the National Bank of Ethiopia. Consequently, no human participants were

involved, informed consent was not required, and no personally identifiable information was collected or analyzed. Clinical trial number: not applicable.

Consent to Participate

Not applicable. This study used exclusively publicly available secondary data from the published annual reports and financial statements of Ethiopian commercial banks and the National Bank of Ethiopia. No human participants were involved.

Consent for Publication

Not applicable. The manuscript does not contain any individual person's data, images, or other identifiable information requiring consent for publication.

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