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Research Article

The Impact of Asset & Liability Management on Profitability: Evidence from Selected Private Commercial Banks in Ethiopia

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Abstract

This research meticulously investigates the intricate interplay between Asset and Liability Management (ALM) practices and the profitability dynamics of selected private commercial banks in Ethiopia over the period spanning 2011 to 2023. Employing a comprehensive fixed effect balanced panel regression analysis across a time horizon of 13 years and encompassing data from ten meticulously chosen banks, this study sheds light on critical aspects of financial management in the banking sector. Utilizing a quantitative approach and an explanatory design rooted in secondary data extracted from audited financial statements, the study rigorously examines a spectrum of key variables. These variables include income diversification, liquidity, bank size, GDP, asset quality, capital adequacy, loan and advance, and operational efficiency, all meticulously analyzed using E-view 12 econometrics software. The research findings underscore the pivotal significance of certain factors in enhancing bank profitability. Notably, asset quality, liquidity ratio, GDP, loan and advance, and bank size emerge as positive influencers on bank profitability, exhibiting statistically significant impacts. Conversely, operational efficiency and income diversification were found to exert negative effects on profitability. Surprisingly, capital adequacy was established as statistically insignificant in this context. This study accentuates the critical importance of asset quality, operational efficiency, liquidity management, bank size, GDP, income diversification, and loans as fundamental drivers of banks' return on assets. By accentuating the strategic significance of these variables, bank managers are equipped to navigate the complex financial landscape, leveraging effective ALM strategies to optimize profitability and ensure sustained financial viability.

Keywords

Profitability, Commercial Banks, Asset Liability Management, Loan and Advance

1. Introduction

The banking system is a key player in the economic development, serving as the backbone of the financial sector. Asset and liability management (ALM) techniques are crucial for financial institutions in effectively allocating assets, identifying financial opportunities, and assessing uncertainty [4, 41]. ALM ensures liquidity for meeting short-term obligations and provides a safety net during economic downturns. Striking a balance between liquidity and profitability is essential

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for making investment decisions [3, 18, 36]. Within the banking sector, asset and liability management involves tasks such as risk management, project planning, funding, and determining capital size. This process helps in analyzing risks and challenges related to a firm's business to achieve financial objectives and enhance profitability, liquidity, and risk mitigation. Profitability is especially vital for commercial banks as it contributes to the stability of the financial system [8, 10, 40]. In Ethiopia, where the financial sector significantly impacts the country's overall financial health, ensuring the profitability of commercial banks is a major concern for policymakers and industry operators [22, 23, 24]. Financial institutions contribute to the country's economic growth by making funds available for investors to borrow and by deepening the financial landscape [2, 17, 19]. The banking industry in Africa and particularly in Ethiopia serves as a strategic hub of the financial system [38]. Additionally, as an important segment of the economy, the banking industry acts as the backbone of the financial sector, accumulating savings from surplus economic units in the form of deposits and providing them to deficit economic units in the form of advances. Therefore, the banking industry supports the economy in general and industries in particular during times of recessions and economic crises [27, 42, 47]. According to [41], commercial banks in Ethiopia are the backbone of the country's financial system. One of the functions of banking industries is the proper management of assets and liabilities to ensure the smooth and efficient functioning of the banking sector in a manner that accommodates changes in the external environment [1].

Asset and liability management (ALM) plays a crucial role in shaping the profitability of commercial banks, with past studies investigating its impact by considering both internal and macroeconomic variables. Factors like loans, liabilities (especially deposits), GDP, inflation rate, interest rate, nonperforming loans, and bank size have been identified as key determinants of profitability. In Ethiopia, research has explored various dimensions of ALM in relation to commercial banks' profitability, highlighting factors such as capital adequacy, nonperforming loans, income diversification, liquidity, operational efficiency, investments, and deposit types. Despite these efforts, studies have shown inconsistencies in findings and have not always accounted for all relevant variables, with a notable time gap between research endeavors potentially leading to discrepancies due to changes in regulatory frameworks.

Recent findings in Ethiopia, as outlined by [42], suggest that certain variables like deposits in other banks, investments, demand deposits, fixed deposits, and long-term loans have a positive impact on commercial banks' profitability, while short-term loans have a negative effect. Conversely, other studies have indicated that loans and advances, excluding fixed assets, tend to boost profitability, whereas liabilities such as savings, fixed deposits, other liabilities, and credit balances can have a detrimental effect. To address these discrepancies and gaps, a new study aims to investigate the relationship between asset and liability management and the profitability of selected private commercial banks in Ethiopia. By incorporating additional variables such as GDP and loans and advances, which were previously overlooked, and introducing the income diversification ratio as a measure of profitability and ALM dimension, this research seeks to provide valuable insights for effective risk management in the banking sector and pave the way for future exploration of innovative ALM strategies.

Objectives

1. To assess how the profitability of private commercial banks is impacted by factors such as asset quality, revenue diversification, GDP, loan and advance, liquidity, bank size.
2. To be aware of any relationships that exist between asset liability management and profitability.
3. To ascertain the degree to which differences in bank size account for variances in the profitability of a few private commercial banks in Ethiopia.

2. An Overview of Asset and Liability Management

Banks utilize ALM, a risk management technique, to lower the risks related to asset and obligation mismatches brought on by fluctuations in interest rates or liquidity problems. The ability of a business to meet its liabilities through borrowing or asset conversion, or to meet its present obligations with its existing assets, is referred to as liquidity. Banks incur extra risk from swings in interest rates since they generally lend money for longer periods of time and borrow it for shorter durations. Asset and liability management, or ALM, is centered on making the best use of assets in order to manage upcoming commitments and accomplish present objectives, according to [5, 27, 35].

The core idea of asset-liability management is the joint evaluation of risks and rewards for assets and liabilities. ALM, to put it simply, is the continuous process of creating, implementing, monitoring, and modifying asset and liability strategies to accomplish business financial goals while accounting for the risk tolerance of the company [37]. Risk and benefit management is a difficulty faced by a number of industries, including banking, insurance, pension funds, and individual families.

In general, assets are conceived of as planned cash inflows and liabilities as expected cash outflows, while each company has its own terminology for assets, liabilities, and risks. Even while it is important to assess and analyze short-term risks related to the possibility that an institution's assets may not be sufficient to meet its short-term obligations, asset-liability management (ALM) is frequently conducted from a long-term perspective. Consequently, ALM is considered a strategic discipline rather than a tactical one [11, 28].

2.1. Importance of Asset and Liability Management for Bank

Companies that have access to the domestic market and banks, in particular, are facing increasingly intricate risks in their operations. To effectively navigate these challenges, bank management now requires strategic oversight. The influx of international banks has intensified competition, leading to greater unpredictability in interest rates and currency fluctuations. Consequently, banks are under pressure to optimize their asset-liability portfolios to reduce portfolio risk. Bank management must delicately balance the gap, profitability, and stability to ensure sustainable operations. Managing risks associated with interest rates and market liquidity is paramount for banks. Therefore, to mitigate these risks and enhance overall performance, banks necessitate a structured framework. Asset and liability management (ALM) emerges as a highly practical and beneficial tool for scrutinizing and improving bank performance in this context. [6, 7, 33, 46].

Mihali suggested necessary criteria and put out a wide supervisory framework to integrate best practices into the banking system's supervision mechanism [29]. Promoting worldwide convergence toward uniform methods and standards for the banking sector was the guiding principle underlying this. This committee also recommended establishing strict guidelines for capital and risk management in order to guarantee a sufficient capital reserve for the range of risks that are exposed during lending and borrowing activities. It suggests that banks must retain more capital in order to take on more risk. This will guarantee stability and solvency. The international standard for the amount of capital that banks must retain as a precaution against various risks they encounter in the banking business was the focus of the Basel II regulations. Basel II suggested establishing strict guidelines for capital and risk management in order to guarantee that a bank maintains capital reserves that are proportionate to the risk that the bank incurs from its investing and leading operations. It implies that the quantity of capital a bank must retain to maintain solvency and stability increases with the level of risk to which the bank is exposed [20, 25, 46].

2.2. Theories of Asset and Liability Management and Financial Performance

2.2.1. Liquidity Preference Theory

The liquidity preference theory, proposed by John Maynard Keynes, explains the demand for money based on its liquidity or convenience. It suggests that individuals and businesses prefer holding liquid assets, such as money, for the flexibility it provides in transactions and to meet urgent financial needs. According to this theory, there is an inverse relationship between interest rates and the demand for money: higher interest rates increase the opportunity cost of holding money, leading to lower money demand, and vice versa. Keynes identified three motives for holding money: the transactions motive (for everyday transactions), the precautionary motive (as a safeguard against unexpected needs), and the speculative motive (to capitalize on potential investment opportunities or future changes in interest rates). Changes in the money supply, controlled by central banks, affect interest rates and thereby influence investment and economic activity, impacting overall macroeconomic stability. The liquidity preference theory thus informs monetary policy decisions, helping central banks adjust the money supply to manage interest rates and economic conditions [9, 35, 16].

2.2.2. Portfolio Theory

Portfolio theory, particularly in the realm of asset-liability management (ALM), is geared towards maximizing an organization's profitability by effectively managing the interplay between risk and return concerning its assets and liabilities. ALM revolves around crafting a well-rounded asset mix that yields returns surpassing the liabilities' costs. This assortment may encompass a range of financial instruments like bonds, stocks, derivatives, or real estate. On the liability front, ALM entails skillfully handling the expenses and terms of borrowings, including the strategic allocation of short-term and long-term debt. Efficient management of interest rate risk is critical, involving the use of hedging techniques to shield against adverse interest rate fluctuations. Moreover, ALM strategies must adhere to regulatory guidelines related to capital adequacy, liquidity ratios, and risk management. A cornerstone of ALM is portfolio diversification, which mitigates financial risks by striking a balance between high-risk, high-return assets such as stocks and low-risk, low-return assets like bonds, thereby optimizing the organization's financial performance.

2.2.3. Commercial Loan Theory

Commercial loan theory serves as a guiding framework for financial institutions when extending loans to businesses, encompassing critical aspects such as risk assessment, loan structuring, credit analysis, and loan pricing. Financial institutions conduct comprehensive credit analyses to evaluate the creditworthiness of borrowers, considering factors like financial statements, collateral, industry conditions, and other relevant aspects. Accurate risk assessment is paramount, taking into account risks associated with the borrower, industry dynamics, and prevailing economic conditions. Loan structuring involves crafting terms and conditions that align with borrower requirements while effectively managing risk, and loan pricing is set based on credit risk and market conditions to ensure profitability.

Continual monitoring and management of loans are vital for early identification and resolution of potential issues, while maintaining strong relationships with borrowers aids financial institutions in understanding their businesses and supporting their financial needs. Compliance with regulatory

mandates concerning capital adequacy, loan classifications, and risk management is a foundational element of commercial loan theory, ensuring sound and responsible lending practices within the financial sector.

2.2.4. Liability Management Theory

Liability management theory is centered on overseeing a financial institution's liabilities to optimize its funding structure, bolster capital adequacy, and enhance overall financial well-being. This practice entails aligning the durations of liabilities with asset durations to mitigate interest rate risk and utilizing hedging instruments to safeguard against unfavorable shifts in interest rates or credit spreads. Effective liquidity management guarantees that institutions possess ample liquidity to fulfill short-term obligations and unforeseen requirements. Managing the cost of funds strives to minimize financing expenses through advantageous interest rates and diversified funding channels.

Adherence to regulatory stipulations regarding capital adequacy, liquidity, and risk management is crucial, as is maintaining an optimal capital framework by harmonizing equity and debt. Liability management further encompasses a strategic approach to borrowing from money and capital markets, acknowledging the significance of both assets and liabilities in meeting liquidity demands and ensuring sustained financial stability and profitability.

2.3. Empirical Studies

Westport carried out a study to examine the effects of asset and liability management on financial outcomes, utilizing secondary financial statement data. Descriptive statistics were employed to analyze the data using a cross-sectional design. The study established a correlation between asset and liability management practices and the financial performance of Swedish micro firms. Utilizing data spanning ten years from a secondary source, researchers investigated how asset and liability management influenced the financial health of Kenyan commercial banks. Unlike previous studies, this research utilized the CAMEL approach to assess the impact of ALM on the financial performance of commercial banks in terms of capital adequacy, asset quality, managerial efficiency, operational efficiency, and liquidity. The study found that all CAMEL components had a statistically significant impact on financial performance, based on the results of the descriptive study conducted using SPSS software [45].

Another study focused on asset liability management and the profitability of listed banks in Ghana, conducted by [31]. To evaluate the influence of asset liability management on profitability, a random effect model was employed. Asset return was used as the dependent variable, while the combined value of all 28 assets and liabilities, along with macroeconomic variables like interest rate and gross domestic product, were considered as independent variables. The study concluded that total assets had a positive impact on bank profitability, while total liabilities, particularly savings and fixed-term deposits, had a negative impact on profitability. Surprisingly, the macroeconomic variable, interest rate, did not exhibit a discernible impact on bank profitability. [4, 15, 26, 44] also conducted on Assets and liability management (ALM) effect on profitability of banks and it is evident that banks performing satisfactorily in terms of credit deposit ratio, quick ratio, other income to total income and interest spread because these ratios show increasing trend of yes bank.

Evans study on asset liability management on profitability. From the findings, majority of the reviewed studies indicated that asset liability management affects profitability of commercial banks and similar results were obtained between capital regulation and profitability [16]. Also study sought to examine the effect of asset and liability management on profitability of commercial banks in Tanzania. Specific objectives of the study were: to assess the effect of capital adequacy, asset quality and liquidity on profitability of the commercial banks in Tanzania. The study adopted a cross sectional research design. The target population was commercial banks listed at Dar es Salaam stock exchange. The findings from correlation and multiple linear regression coefficients indicated that capital adequacy, asset quality and liquidity management as components of assets liability were statistically significant and positively related to profitability of commercial bank. Therefore, the study concludes that capital adequacy, asset quality and liquidity affect profitability of commercial banks in Tanzania [14].

Sheela and Bastray form India conduct its paper on Asset Liability Management in Indian banking sector. Earlier banks focused on asset allocation, but now the management of assets and liabilities is equally essential. Asset liability management targets the optimum distribution of funds in assets and managing liabilities so that banks can earn higher profits and minimize risk. In this paper, the optimization of assets and liabilities of Indian banks has been concentrated using mathematical models' The findings show that OBC bank has the scope of improving its assets and liabilities position to increase its profit and minimize the risk [39].

Darush was conducted to examine the impact of assets liability management on the financial performance of the licensed commercial banks. Capital adequacy ratio (CAR), Non-performing loan ratio (NPR), Income diversification ratio (IDR), Liquidity ratio (LR) and Operational efficiency ratio (OER) were used as assets liability indicators while return on assets (ROA) and Return on equity (ROE) used as the financial performance indicators. It was found that there is a significant impact from the operational efficiency, income diversification and liquidity ratios on the financial performances and also significant negative impact from the NPL ratio and CAR ratio on the financial performances of the licensed commercial banks in Sri Lanka. The findings will be useful for shareholders, creditors, depositors, manag-

ers and further investors to choose the best opportunity for their investment and regulators to make and govern the policy and regulations [12].

Gikonya collected data was from six listed commercial bank's audited financial statements covering the period of four years from 2016-2019 and employing descriptive statistics, correlation and multiple linear regression models. The findings from correlation and multiple linear regression coefficients indicated that capital adequacy, asset quality and liquidity management as components of assets liability were statistically significant and positively related to profitability of commercial bank. Therefore, the study concludes that capital adequacy, asset quality and liquidity affect profitability of commercial banks in Tanzania. The study recommends that bank embed effective asset and liability management policies to enhance profitability [20].

Moore form Indonesia study on commercial Bank based on Group of Business Activities (BUKU). The methodology of this research is a quantitative and qualitative approach. The result of the study indicates a statistically significant relationship for most asset and liability management primary variables, such as Capital Adequacy Ratio (CAR), Cost to Income Ratio (BOPO) and Loan to Deposit Ratio (LDR). Net Interest Margin (NIM) does not have a significant relationship toward Return on Asset (ROA). This study will contribute as an empirical analysis to highlight the relationship of capital adequacy, operational efficiency, and liquidity management with profitability of commercial Bank Indonesia [31].

Ongore This study focused on asset and liability management policies in a company. However, the concept of the ALM framework and the management procedure is described in this study. Apart from that, the importance of this ALM in the organization is described in this study which is essential to mitigate the possible risks of the company. The entire study highlights the application of the ALM in both theoretical and practical aspects. In addition to that, mitigation strategies that are applied by bankers in reducing the impact of risk have also been discussed in this study [35].

2.4. Empirical Literature in Ethiopian Context

Tamiru conducted research in the effects of asset and liability management on the profitability of selected commercial banks in Ethiopia by taking a sample of eight commercial banks for the period 2005-2014. the research had a quit difference from other studies conducted in this area categorize variables in to asset side and liability side variables rather than risk measurement variables and she found that deposit in other banks, investment, demand deposit, fixed deposit and long-term loan has statistically significant and positive effect on commercial banks profitability in Ethiopia. Where as short term loan has negative effect on profitability of commercial banks in Ethiopia [41].

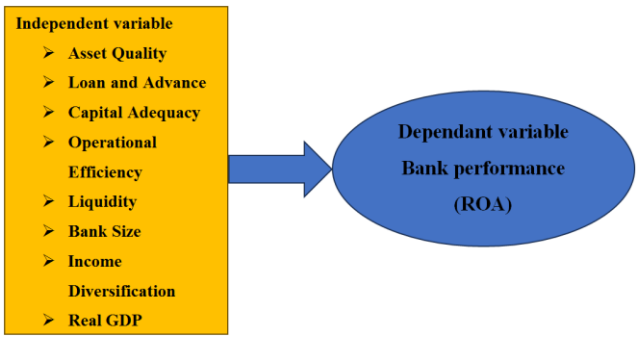
Fiseha investigate that the effect of asset liability management on profitability of private commercial banks in Ethiopia by using panel data of seven private commercial banks in Ethiopia from year 2005 to 2017 G. C. Fixed effect regression model was applied to investigate the effects of Asset Liability factors on banks, by employing statistical Cost Accounting model for the sampled banks. To conduct the study quantitative research method was employed and explanatory research design was used in trying to establish the causal effect relationship between profitability and asset liability management variables. The study revealed that loan and advances, deposit in foreign banks, and investment in security had a statistically significant and positive except loan and advance effect on net interest income, while demand deposit had a statistically significant positive effect on net interest income. Whereas saving deposit and fixed deposit from the liability part, don't have statistically significant positive effect on profitability as measured by net interest income [17].

Belete examined the impact of asset and liability management on profitability of selected private commercial banks in Ethiopia for the study period 2010 to 2019. The researcher used explanatory research design to examine the impact of asset–liability management on profitability of selected private commercial banks in Ethiopia. Eleven private commercial banks were selected based on purposive sampling technique; quantitative data collected from each selected private commercial banks. Profitability was used as dependent variable, whereas. Income diversification, liquidity, bank size, funding cost, asset quality, capital adequacy and operational efficiency. The collected data analysed using descriptive statistic, correlation analysis and multiple regression analysis with the help of EViews statistical software. The finding of the study shows that income diversification, liquidity, bank size and funding cost statistically significant and positive effect on banks profitability. On the other hand, variables like asset quality, capital adequacy and operational efficiency has a negative and statistically significant effect on banks profitability [3].

Madiri investigate determinants of commercial banks profitability in Ethiopia a study on internal factor by using panel data of thirteen commercial banks from year 2010 to 2018. The study employed an explanatory type of research and secondary financial data were used. On this study Return on Asset (ROA) has been used as a proxy variable for the dependent variable. The fixed effect regression model was applied to investigate the effect of bank size, capital adequacy, liquidity risk, operation efficiency, debt management, funding cost, and loan to asset ratio on profitability. The major findings of the study show that, operation efficiency, capital adequacy and bank size have statistically significant and positive relationship with banks' profitability. However, the relationship for liquidity risk, debt management, funding cost, and loan to asset ratio were found to be statistically insignificant [27].

2.5. Conceptual Framework

According to [6], a conceptual framework is a framework made up of a number of big ideas and theories that aid researchers in correctly defining the issue they are researching, framing their research questions, and locating relevant material. The independent variables in the study's conceptual framework are capital sufficiency, asset quality, operational effectiveness, liquidity, income diversification, bank size, and funding cost, whereas the dependent variables are profitability (ROA). The following conceptual Framework illustrating the relationship between asset liability management variable and Profitability was developed based on the learnings from the literature review.



Source; Compiled by the researcher

Figure 1. *Conceptual Framework Source.*

3. Methodology

This study employs an explanatory research design to investigate the cause-and-effect relationship between independent and dependent variables, as described by [6, 7]. A quantitative research methodology was chosen for its effectiveness in examining variable connections, testing theories, and identifying outcome predictors. The target population consists of sixteen private commercial banks in Ethiopia, with ten banks selected through purposive sampling based on specific criteria. Secondary panel data, combining time series and cross-sectional data, was gathered from the National Bank of Ethiopia (NBE) and the Ministry of Finance and Economic Development (MoFED) for the period 2011 to 2023. Data analysis involved descriptive and inferential statistics using the Eviews 12 software package, including diagnostic tests to ensure model adequacy before conducting correlation and regression analyses.

The multiple regression model incorporates both cross-sectional and time series components, allowing for the control of individual heterogeneity and reduced multicollinearity. The regression equation used to test the study hypotheses examines the relationship between profitability (measured by Return on Assets) and various financial ratios and macroeconomic indicators, such as Capital Adequacy Ratio, Asset Quality, Operational Efficiency, Liquidity Ratio, Income Diversification, Bank Size, GDP, and Loan and Advance Ratio. The regression model is specified as:

$$ROA=\beta0+\beta1CAi,t+\beta2AQi,t+\beta3OEi,t+\beta4LIQi,t+\beta5IDi,t+\beta6 BSi,t+\beta7GDPi,t+\beta8LOAi,t+\epsilon i,t \quad (1)$$

where ROA represents profitability measured by Return on Assets, CA is the Capital Adequacy Ratio, AQ is Asset Quality, OE is Operational Efficiency, LIQ is the Liquidity Ratio, ID is Income Diversification, BS is Bank Size (log of total assets), GDP is Gross Domestic Product, LOA is Loan and Advance Ratio, $\beta0$, $\beta1$,…, $\beta8$ are parameters to be estimated, and ϵ is the error term. This comprehensive model helps identify the impact of explanatory variables on bank profitability, providing valuable insights into the financial performance of Ethiopian private commercial banks.

Operationalization of the Study Variables

The measurement of the variables used in the study is shown in this section. In addition, the expected sign of each explanatory variable is shown, taking into consideration its impact on the dependent variable.

4. Analysis

4.1. CLRM Assumptions and Model Diagnostic Test

4.1.1. Test of Heteroskedasticity

A conventional linear regression model makes the assumption that the variables should be homoscedastic. This suggests that the variance ought to be constant and stable. The homoscedasticity condition for regression would be violated and the data would be heteroskedastic if the variance of the residuals was not constant [11, 13, 21]. To determine whether this was the case, the White and Breusch Pagan-Godfrey tests were utilized. The study used White's tests to check for heteroskedasticity problems, and the results are shown below.

The findings of the study's Breusch Pagan-Godfrey tests to check for heteroskedasticity issues are displayed below.

The following formulation of the heteroskedasticity test's hypothesis was used:

H0: There is no heteroskedasticity problem in the model.

H1: There is heteroskedasticity problem in the model.

$\alpha = 0.05$

Decision Rule: Reject H0 if p-value less than significance level. Otherwise, do not reject H0.

Table 1. White Test of Heteroskedasticity.

Heteroskedasticity Test: White			
F-statistic	1.222063	Prob. F (44, 85)	0.2130
Obs*R-squared	50.37227	Prob. Chi-Square (44)	0.2360
Scaled explained SS	43.64692	Prob. Chi-Square (44)	0.4867

Source: Own computation on Eviews 12.

As it can be seen from table 1. above, both F-static and Chi-Square versions of the test statistic gave the same conclusion that there is no evidence for the presence of heteroskedasticity, since the p-values of 0.2130 and 0.2360 respectively were in excess of 0.05, so the study failed to reject null hypothesis. So, this implies that there is no significant evidence for the presence of heteroskedasticity in this research model.

4.1.2. Test of Autocorrelation

Autocorrelation is also another CLRM assumption. If the errors are not uncorrelated (correlated), they are said to be 'auto correlated' or 'serially correlated.' The Breusch– Godfrey test, which allows simultaneous assessment of the connection between the error term and multiple of its lagged values, was employed to check for autocorrelation in this work. The hypothesis for the autocorrelation test was formulated as follow:

H0: There is no autocorrelation problem in the model.

H1: There is autocorrelation problem in the model.

$\alpha = 0.05$

Decision Rule: Reject H0 if p-value less than significance level. Otherwise, do not reject H0

Table 2. Breusch-Godfrey Test for the Absence of Serial Autocorrelation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	33.41700	Prob. F (2, 119)	0.0675
Obs*R-squared	46.75367	Prob. Chi-Square (2)	0.0545

Source: Own computation on Eviews 12.

As it can be seen from table 2 above, since the p-values of both F version and a $\chi 2$ version 0.0675 and 0.0545 respectively were greater than the significance level of 5%, hence, the study failed to reject null hypothesis of no autocorrelation at 5 percent of the significance level. This means that there isn't enough data to believe that autocorrelation exists in this model. As a result of the LM test, it may be determined that the covariance between residuals is zero, the data is normal, and there is no autocorrelation problem.

4.1.3. Test of Multicollinearity

Multicollinearity, which is defined as a linear relationship between explanatory variables, may lead to bias in the regression model [11]. Perfect collinearity is when one independent variable is an exact linear combination of all the other independent variables, and the model cannot be estimated using OLS [6]. When independent variables are multicollinear, their predictive power overlaps or is shared. This can lead to a paradoxical situation in which the regression model accurately predicts the dependent variable while none of the explanatory variables (taken individually) have any discernible effects on the data [7].

Table 3. Correlation matrix of independent variables.

Correlation	OER	LR	LOA	ID	GDP	CAR	BS	AQR
ROA								

Correlation	OER	LR	LOA	ID	GDP	CAR	BS	AQR
OER	1.000000							
LR	-0.272701	1.000000						
LOA	-0.275044	0.280667	1.000000					
ID	0.399929	0.068604	0.038357	1.000000				
GDP	0.029195	-0.060887	0.085455	0.154819	1.000000			
CAR	0.138450	-0.010724	0.174002	0.042035	0.005378	1.000000		
BS	-0.189625	-0.010416	0.543449	-0.413808	-0.146836	0.032663	1.000000	
AQR	0.495468	-0.076288	-0.093117	0.798422	0.165804	0.008915	-0.457582	1.000000

Source: Own computation on Eviews 12

According to [7], inter-correlation among independent variables more than 0.80 may be a sign of a multicollinearity issue. Asset quality and Income Diversification have the strongest link, with a value of 0.798422, as seen in the correlation matrix table 3 above. This is also because of bank with a more diversification income stream tends to have better asset quality as they are less vulnerable to the risks associated with any single business line or geographic market. Therefore, we discover that all components have low correlation powers of less than 0.80, indicating that there is no significant multicollinearity issue with the explanatory variables selected to explain banks' profitability in commercial banks in Ethiopia. Gujarati claims that there is no correlation more than 0.8 in this study from 2003.

4.2. Model Specification Test

The benefit of employing a well-described econometric model in analysis is that it proves there are no errors in the model or equation specifications. As a result, adding unnecessary variables to the model makes the projected variances larger than they should be, which leads to less accurate parameter estimate. The researcher therefore chose a suitable approximated model and checked the model specification using the Ramsey RESET test. The following formulation of the model specification test's hypothesis was used:

H0: The model specification is incorrect.

H1: The model specification is correct.

$\alpha = 0.05$ Decision Rule:

Reject H0 if P value is less than significant level. Otherwise, do not reject H0.

The study of the findings for each explanatory variable and its significance in influencing profitability in private banks in Ethiopia are covered in detail in this part. The discussion also compares and contrasts the study's statistical conclusions with earlier empirical evidence. Thus, the interpretation of the results of the fixed effects model regression and the connection between the explanatory factors and profitability are presented in the following talks.

Table 4. *Regression result.*

Dependent Variable: ROA				
Method: Panel Least Squares				
Date: 05/22/24 Time: 13: 03				
Sample: 2011 2023				
Periods included: 13				
Cross-sections included: 10				
Total panel (balanced) observations: 130				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AQR	0.599960	0.176995	3.389699	0.0010
BS	0.017367	0.004796	3.621480	0.0004

Dependent Variable: ROA				
CAR	-0.074123	0.037877	-1.956916	0.0528
GDP	0.485452	0.065227	7.442510	0.0000
ID	-0.351433	0.170247	-2.064250	0.0413
LOA	0.399792	0.058037	6.888528	0.0000
LR	0.324035	0.043485	7.451580	0.0000
OER	-0.158150	0.045291	-3.491865	0.0007
C	0.019748	0.049802	-0.396534	0.6925
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.901066	Mean dependent var		0.505277
Adjusted R-squared	0.886050	S.D. dependent var		0.099912
S.E. of regression	0.033727	Akaike info criterion		-3.813164
Sum squared resid	0.127399	Schwarz criterion		-3.416121
Log likelihood	265.8557	Hannan-Quinn criter.		-3.651832
F-statistic	60.00415	Durbin-Watson stat		1.801753
Prob (F-statistic)	0.000000			

Source: Own computation on Eviews 12
Note: Coefficient significant at 1% significance level.

Empirical model: As presented in chapter three, the empirical model used in the study in order to determine the relationship between explanatory variable and banks' banks profitability were provided as follows:

$$ROA = 0.599960*AQR+ 0.017367*BS - 0.074123*CAR + 0.485452*GDP - 0.351433*ID + 0.399792*LOA +0.324035*LR+0.158150 *OER+\mu$$

4.3. Hypothesis Testing and Summary of Findings

The analysis of the regression results, their implications, and further discussion of each sign and significant link between the dependent variable (profitability) and the explanatory variables were the study's main objectives. The relationship between explanatory variables and their effect on profitability (ROA) is therefore explored in the following sections. The results are interpreted using the imaginary relationship of the researcher. The bank particular variables, which are used to establish private commercial bank profitability amounts, were reviewed as capital adequacy, asset quality, liquidity ratio, operational efficiency, bank size Income diversification, GDP, Loan and advance ratio as Independent Variables and ROA as dependent variables.

4.3.1. Asset Quality (AQ) and Profitability (ROA)

The study result of table 4. showed that fixed asset ratio has a positively and statistically significantly with a p-value of 0.0010 and coefficient of -0.599960 which is statistically significant at 1% of significant level, holding other independent variables constant at their average value, when asset quality (Total nonperforming loans /Total loans and advance) increased by one, profitability (ROA) of sampled Ethiopian private banks will increase by (60%). Therefore, the study rejects the null hypothesis stated that Asset quality has no effect on profitability of bank and accept alternative hypothesis which is stated that asset quality has a positive and significant effect on Profitability of commercial banks in Ethiopia. The finding of the study is matched with [3, 18, 12, 29], applied a linear regression model showed a positive significant impact of asset quality to bank profitability. [9, 35, 41, 42] on the other hand, found a negative link between probability.

4.3.2. Bank Size (BS) and Profitability (ROA)

Company bank size is computed as logarithm of total assets of banks. The regression results of this study show that

this variable has positive coefficient (0.017367) and p value (0.0004) related to Profitability. That means if the size of the company increases by one unit, ROA will also increase by (0.017367) unit considering that other independent variables remain constant. It also statistically significant (p-value=0.0004) at a 1% level of significance. This indicates that large volume of total asset has a significant effect on private banks financial performance. because large banks normally have greater capacity for dealing with adverse market fluctuations than small banks and have more economies of scale, complex information systems and better expenses management. The finding is consistent with [18, 35, 39, 41] study show that positive relationship between bank size and profitability of bank. However, [30] resulted that negative relationship between bank size and profitability. Hence, this study supports the hypothesis that bank size has a positive and significant effect on Profitability of commercial banks" in Ethiopia.

4.3.3. Capital Adequacy (CAR) and Profitability (ROA)

The term "capital adequacy" refers to a measure of a bank's financial strength. The coefficient of capital adequacy, as evaluated by total equity over total asset, is -0.07367, with a p-value of 0.052, according to the model results. It means that holding other independent variables constant at their average value if capital adequacy increased by one percent, total profitability of private commercial banks would increase by 7.3 percent, which is statistically insignificant at the 5% percent level of significance. Therefore, the study failed to rejects the null hypothesis that capital adequacy has no significant effect on Profitability of privet commercial banks in Ethiopia, this means, there is no sufficient evidence to reject null hypotheses and accepting alternative hypotheses which stated that there is positive relationship between capital adequacy and profitability. The findings are inconsistent with those of [3, 17, 36] who discovered that bank capital adequacy has a beneficial impact on profitability of banks'. However, consistence to [16, 41] discovered a there is no relation between bank capital on bank profitability.

4.3.4. Gross Domestic Product (GDP) and Profitability (ROA)

GDP Growth Rate (R): This study justified that a positive and significant impact of Ethiopia real GDP growth and banks profitability in terms of return on asset. This results about GDP support the argument of the positive association between economic growth and the financial sector performance that revealed by the numbers of researchers [20]. It is indicated that GDP had a positive relationship with profitability with statistically significant (p-value = 0.0000) at 1% significance level. It indicates that every 1% change (increase or decrease) in real GDP ratio keeping the other thing constant has a resultant change of 0.48 % (Coeff. = 0.485452) on the return on asset in the same direction. As a result, the null hypothesis which state there is no significant relationship between GDP and profitability of core business operations of commercial banks in Ethiopia was rejected and accept alternative hypotheses. This study supported by [8, 17, 41] who exposed that GDP has positive effect on profitability of banks. But, inconsistent with the study of [3, 5] discovered a there is negative relation between GDP and profitability.

4.3.5. Income Diversification (ID) and Profitability (ROA)

The coefficient of income diversification which is measured by non-interest income to total income was (-0.351433) and p value (0.0413) which means income diversification have statistically significant at 5% significance levels over the study period. Based on the statistical value null hypothesis stated that income diversification has no significant effect on Profitability of commercial banks was failed to rejected by the researcher, because of obtaining significant statistical p-value less than 5%. The finding of the study is consistent with both [2, 3, 30], that obtained negative relationship between income diversification and profitability. But inconsistent with [34, 42] that were found a positive relationship between Profitability ratio (ROA) and income diversification.

4.3.6. Loan and Advance (LOA) and Profitability (ROA)

For commercial banks, the primary source of income is interest from loans and advances. Because loan interest rates are significantly higher than deposit interest rates, banks that convert more deposits into loans are more profitable. As a result, over the analyzed period, the sample banks' loans to total asset ratio demonstrated a positive and statistically significant impact on profitability. It is indicated that Loans and advances had positive relationship with profitability with strongly statistically significant (p- value = 0.0000) at 1% significance level. This finding is similar [17] who explained that more deposits are transformed into loans for earning interest incomes from borrowers. Consequently, the null hypothesis which argues that there is no meaningful correlation between the profitability of privet commercial banks' core business activities in Ethiopia and ALM, as measured by the Loans & Advances to Asset ratio was rejected. This suggests that, with everything else being held constant, a 1-unit (birr) change in the bank's loans-to-advance ratio will result in a 39-cent (Coeff. = 0.399792) change in the asset's return in the same direction. This study also demonstrates that the profitability of Ethiopia's banking sector is positively impacted by an increase in the number of loans advanced to consumers based on deposits. One explanation might be that the interest revenue from loan advances exceeded the expenses or interest given to the depositor.

4.3.7. Liquidity (LIQ) and Profitability (ROA)

The coefficient of liquidity which is measured by total loan and advance to total deposit was (0.324035) and p value (0.0000) which means statistically significant at 1% of significant level, With the remaining independent variables held constant at their average value, it is reasonable to conclude that if liquidity (LIQ) increased by 1%, total profitability of sampled private commercial banks would increase by 32%. These results provide reasonable evidence to the consistent view that, the higher the liquidity, the better the financial performance. Bargains to cover immediate cash need thus reducing financial performance. Therefore, the study fails to reject the alternative hypothesis stated Liquidity has a positive and significant effect on Profitability of commercial banks' in Ethiopia. The finding of the study is in line with, [3, 18, 41] support the outcome of a favourable relationship between liquidity and profitability of bank. But [32, 42] resulted that liquidity ratio have negative relationship with bank profitability. On the anther hand, [17], found that insignificant result between bank profitability and liquidity.

4.3.8. Operational Efficiency (OE) and Profitability (ROA)

The coefficient of operational efficiency which is measured by operating cost to operating income was (-0.158150) and P value (0.0007) which is statistically significant at 1% of significant level. Holding other independent variables constant at their average value, when operational efficiency (operating cost /operating income) decrease by one, profitability (ROA) of sampled Ethiopian private banks will be decreased by (15.81%) and statistically significant at 1% of significant level. Therefore, the study fails to reject the alternative hypothesis that operational efficiency has negative and significant effect on profitability of commercial banks in Ethiopia. The finding of this study is corresponding with [31, 35, 39] also were found a negative relationship between Profitability ratio (ROA) and operational efficiency. However, they optioned that operational efficiency has a positively relationship with the profitability of selected banks.

5. Conclusion and Recommendations

This project paper also tried to examine the effects of asset quality, bank size, operational efficiency, GDP, loan and advance, income diversification, liquidity and capital adequacy on performance of Ethiopian commercial banks. The study employed panel data analysis methodology and quantitative approaches to meet its goals. Over the course of the years 2012–2023, the panel data were gathered from audited financial statements, specifically the income and balance sheets of ten banks. Using the statistical program Eviews 12, a fixed effect model was applied to the acquired data for analysis. Taking into consideration the nature of bank operations, one dependent variable and eight independent variables were chosen and employed in the empirical study. Loan and advance, GDP, asset quality, bank size, capital adequacy, income diversification, operational efficiency and liquidity ratio were used as surrogates for asset liability management while return on asset (ROA) were used to proxy performance. With the use of fixed effects model the regression data estimation technique, the study produced a significant relationship between loan and advance, Bank size, GDP, asset quality, income diversification, operational efficiency, liquidity ratio and performance indicators of return on asset (ROA). But capital adequacy and performance of the bank have no significant relationship.

GDP is one of external explanatory variable that affect bank performance positively. When GDP grows, it indicates an expanding economy and increased economic activity. This leads to higher demand for loans from businesses and individuals, as they seek to finance investments, expansions, and personal consumption. Banks can benefit from this increased loan demand, as it allows them to grow their loan portfolios and generate more interest income. Furthermore, during periods of economic growth and expansion (high GDP), borrowers are generally in a better financial position, with higher incomes and stronger balance sheets. This leads to lower default rates and better asset quality for banks, as their loan portfolios perform better.

Bank loan and advance also other independent variable that used as dimension asset & liability management to measure profitability. Accordingly, the result of this paper is obtained positive and strongly significant relationship between loan and profitability. Also, Loans and advances are the primary revenue-generating assets for banks. Therefore, as the volume of loans and advances increases, it directly contributes to the bank's interest income, which is a significant component of its overall profitability. Banks aim to grow their loan and advance portfolios to maximize their interest income and overall profitability. While increasing the volume of loans and advances can boost profitability, banks must also manage the associated credit risk effectively. Consequently, poorly managed credit risk, leading to higher non-performing loans (NPLs) and loan loss provisions, can significantly impact the bank's profitability. Effective credit risk management, including thorough borrower assessment, collateral management, and timely recovery of NPLs, is crucial for maintaining profitability.

Finally, the finding also suggests that asset quality, bank size, operational efficiency, income diversification and liquidity, are the most important factors that affect the financial performance of Ethiopian private commercial banks since they are significant at 1% significance level. From this asset quality, liquidity, and bank size have positive effect. But Income diversification and operation efficiency have negative effect. Capital adequacy found to be statistically insignificant.

Based on the findings, it is recommended that Ethiopian private commercial banks focus on enhancing asset quality

management through robust credit risk practices to mitigate non-performing loans. They should optimize loan and advance portfolios cautiously to maximize interest income while effectively managing credit risk. Additionally, banks should pursue growth strategies to achieve economies of scale, improve operational efficiency by implementing stringent cost-control measures, and reevaluate income diversification strategies to minimize negative impacts on profitability. Maintaining optimal liquidity levels to meet short-term obligations and capitalize on profitable investment opportunities is crucial. Future research should explore the impacts of macroeconomic variables like exchange rates and inflation rates on profitability, as well as other potential bank-specific factors influencing financial performance. These steps will support Ethiopian banks in achieving sustainable profitability and fostering stability in the financial sector.

6. Direction for Future Studies

Future research in the context of Ethiopian commercial banks should aim to explore the dynamic effects of asset and liability management (ALM) on profitability over time, integrating micro and macro factors to provide a comprehensive understanding of determinants of bank profitability while focusing on the role of ALM in mitigating risks. Comparative analyses with banks in other regions could offer insights into unique challenges faced by Ethiopian banks. It is crucial to address limitations related to data availability and quality, temporal considerations, variable selection and measurement, generalizability, and methodological rigor to enhance the robustness and applicability of research findings, ensuring valuable insights for bank managers, policymakers, and industry stakeholders.

Author Contributions

Hussein Abdulkadir Roba: Conceptualization, Data curation, Formal Analysis, Methodology, Resources, Supervision, Writing – original draft

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Conflicts of Interest

The authors declare no conflicts of interest.

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Research Fields

Hussein Abdulkadir Roba: Accounting and Finance, Auditing, Cost Management, Financial Management, Banking and Finance, Small and medium enterprises

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