Addis Ababa University

College of Business and Economics

Master of Business Administration

Factors impacting the profitability of Ethiopian private banks

Eyosiyas Minasie

A paper submitted to Addis Ababa University, Faculty of Business and Economics in partial fulfillment of the requirements for Masters of Business Administration

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Advisor: Dr. Abebaw Kassie

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Declaration

The undersigned have examined the thesis entitled ‘Factors impacting the profitability of Ethiopian private’ presented by **Eyosiyas Minasie**, a candidate for the degree of Masters of Business Administration, and hereby certify that it is worthy of acceptance.

_____		_____
Advisor	Signature	Date
_____		_____
Internal Examiner	Signature	Date
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External Examiner	Signature	Date
_____		_____
Chairperson	Signature	Date

Undertaking

I certify that the research work “Factors impacting the profitability of Ethiopian private banks” is my work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/referred.

Signature of Student

Eyosiyas Minasie

Abstract

The study's objective was to determine whether there was a correlation between real estate finance and the profitability of the top 10 privately owned commercial banks in Ethiopia. The study's precise goals included figuring out how real estate financing affects commercial banks' financial performance, establishing the link between mortgage ratio and return on assets for these institutions, and establishing the link between their accounting ratios and return on assets. The study's target audience was Ethiopia's top 10 privately owned commercial banks. The Ethiopian National Bank and individual bank reports were used to compile secondary data. The study found that commercial banks in Ethiopia place a strong emphasis on mortgage finance to boost their profits. The study found that real estate financing, in terms of loans issued as well as other activities that increase the overall value of mortgages extended by commercial banks, had substantial impact on the financial performance of Ethiopian private commercial banks. Also, the study found that capital adequacy and cost of operations had a substantial impact on commercial banks' financial performance in Ethiopia. Furthermore, the study finds that the size of a bank has little bearing on its financial success in Ethiopia. Similarly, it was discovered that liquidity ratio and market share had a considerable impact on commercial banks' financial performance in Ethiopia.

Key Words: *Real estate finance, return on asset, Capital adequacy, Cost of operations, Market share, Bank size*

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Table of Contents

List of Figures

List of Tables

List of Acronyms

MPT – Modern Portfolio Theory

EMH – Efficient Market Hypothesis

GDP – Growth Domestic Product

EMT – Efficient Market Theory

ROA – Return on Asset

LR – Liquidity Ratio

REF – Real Estate Finance

BS – Bank Size

CO – Cost of Operation

CA – Capital Adequacy

MS – Market Share

SCP – Structure Conduct Performance

CAR – Capital Adequacy Ratio

VIF – Variable Inflation Factor

CC – Correlation Coefficient

CI – Condition Index

OLS – Ordinary Least Square Regression

CLRM – Classical Linear Regression Model

Chapter One

1. Introduction

In Ethiopia, the real estate sector, which includes the building industry, contributed 12.5% to GDP. The real estate sector alone accounts for around 60% of GDP, with the rest being under the construction sector. When compared to the overall GDP growth rate of 10%, both components of the sector have grown by a total of 25% in the previous three years (NBE, 2018). Investors have significantly sped development in recent years, particularly in highly urbanized cities such as Addis Ababa, Ethiopia's capital. Due to rapid urbanization and rising housing demand, the city's real estate market is growing at a rapid pace, attracting cash from both international and domestic investors.

To make home development practicable, the difficulty, and to a large degree, it is capital demanding character, necessitates good and sufficient financial backing. The house development process is accelerated by the ease of use and trouble-free access to sufficient real estate finance. Investors and profit groups' access to property finance is then critical in assuring enough house delivery (UNCHS, 2019). And Banks play a major role in providing finances.

Many factors impact bank financial performance, including bank size, capital sufficiency, liquidity risk, credit risk, bank structure, inflation, and economic growth, among others. While some of these will have a negative influence on profits, others may have a beneficial impact. The impact of real estate finance on the performance of Ethiopian private banks is examined in this study.

1.1 Background of the study

The providing of finance or capital for the acquisition or construction of housing is known as financing. Real estate finance also refers to the funds needed to build housing, the resources needed to acquire or access housing projects by individuals, and the credit provided by housing finance organizations in exchange for some form of collateral (Dymski, 2007). Commercial banks, mortgage financing corporations, savings and loans cooperatives,

insurance companies, government parastatals, pension funds, trusts, and other real investment organizations are among the institutions involved in lending money for real estate projects on a global scale (Lwali, 2008).

Banks gather surplus funds from savers and distribute them to persons and businesses who are short on cash. They achieve this by channeling cash from savers to borrowers, enhancing economic efficiency by encouraging better resource allocation (Barbara, Claudia, & Philip, 2015). However, banks' central position in the maturity transition of short-term deposits into long-term loans makes them intrinsically vulnerable, both to institution-specific risks and to market-wide risks (Basel, 2008). Banks also alter size and risk in addition to maturities. The size transformation enables the bank to collect funds from savers in small denominations and repackage them into larger loans, while the risk transformation enables the bank to diversify the saver's investment, pool risk screening, and monitor the borrower, while also holding capital and reserve as a buffer for unexpected losses (Barbara et al. 2015). The bank makes money by doing this function. According to Sayers (1976), the bank's profit is produced from the income tied to the asset.

Institutional investors are progressively dominating the commercial real estate market around the world. Individual homes are not bought and sold regularly like stocks and bonds, which makes private real estate investments difficult (Lwali, 2008). Unlike industrialized countries, where stocks and bonds are used to finance real estate, emerging countries mostly use mortgage financing. Real estate is a cyclical industry that is influenced by local and national economic situations.

In general, real estate finance plays a crucial role in bank performance, boosting upswings and amplifying downswings. Falling real estate values create negative pressure on the banking sector, not only because of increased bad debt expenses for non-performing real estate loans but also because the balance sheets of borrowers who utilize real estate as collateral deteriorate (Davis and Zhu, 2004). Real estate price variations can have a substantial impact on commercial banks' financial performance. Commercial banks may face a financial crisis as a result of a substantial reduction in real estate prices in a variety of ways. Directly through increased bad debt costs in real estate loans, deterioration of

borrowers' and banks' financial health, or indirectly through a drop in financial transactions and economic activity (Zhu, 2005).

Because borrowers in most economies utilize real estate as collateral for other sorts of loans, such as non-real estate lending, real estate price variations are likely to have an impact on the banking system via the balance sheet effect. When real estate prices fall dramatically, it limits the borrowing ability of non-real estate businesses who borrow against their real estate, resulting in fewer real estate finance loans being applied to commercial banks, resulting in lower earned income for the banks (Case, Goetzemann and Rouwenhorst, 2000). As a result, their new investments are limited, and as a result, their revenues are diminished, leaving them unable to adequately service their existing commercial bank real estate finance loans. As a result, banks' credit risk exposure to non-real estate loans is increasing. In the end, non-performing loans in both the real estate and other sectors will raise the banking system's vulnerability, resulting in lower financial performance since banks earn lower interest rates on the loans they provide to their borrowers (Davis and Zhu, 2004).

1.2 Statement of the problem

The study of real estate finance is required not only because it is a crucial driver in economic growth, but also because it causes economic harm. It is unknown if a private asset finance loan improves or reduces the rate of return (financial performance indicator) on real estate investments. The failure of a real estate financing loan in a company has far-reaching consequences. This is emphasized by the fact that it is a significant industry that contributes significantly to Ethiopia's economy.

Different scholars in Ethiopia and throughout the world have looked at the topic of financial performance in commercial banks. Some studies, such as Ojiambo (2014) and Tseganesh (2012), carried out their studies on banks located in Africa. The two studies were created to look at the influence of real estate loans on Kenyan and Ethiopian banks' financial performance. In Ethiopia, however, studies conducted in Ethiopia looked at the overall performance of banks and employed different performance metrics. The influence of liquidity risk on the financial performance of Ethiopian commercial banks is an area of research that has yet to be fully explored. As a result, the goal of this study is to close the

gap by examining, exploiting, and investigating the influence of liquidity risk on Ethiopian commercial banks' financial performance.

As a result, there is a gap in the literature in terms of research on the impact of real estate finance on the financial performance of Ethiopian-listed commercial banks. This research will concentrate on privet commercial banks to account for financial market performance. As a result, the following research question was investigated: What impact does real estate finance have on the financial performance of Ethiopian commercial banks?

The major goal of this research was to examine the impact of real estate finance by analyzing financial data from the top ten Ethiopian private commercial banks for the fiscal years 2010 to 2020. Furthermore, to investigate the link between indicators such as capital adequacy, cost of operations, market share, liquidity, and bank size, as well as their influence on bank profitability as assessed by Return on Asset (ROA).

1.3 Research Questions

The thesis' key research topic is: “How do real estate investments affect private bank’s performance?”

The main research question generated as a sub-question from the topic:

- What impact does real estate finance have on the financial performance (indicated by ROA) of Ethiopia's private commercial banks?
- What is the effect of mortgage size on the financial performance of private banks in Ethiopia?
- How do market share, costs of operation, and capital adequacy influence real estate finance in private banks of Ethiopia?

1.4 Research Objectives

1.4.1 General Objective

To assess the impact of real estate finance on the financial performance of Ethiopia's private commercial banks.

1.4.2 Specific Objective

The study will be guided by the following specific objective:

- Determine the impact of real estate finance loan uptake on Privet banks' financial performance (ROA) in Ethiopia.
- To assess the effect of liquidity, bank size, and cost of the operating performance of Ethiopian banks.
- To assess the effect of capital adequacy and market share on the financial performance of Ethiopian banks.

1.5 Research Hypothesis

To answer the research question, the following research hypotheses were established. As a result, to address the influence of real estate finance on commercial bank financial performance in Ethiopia, this study seeks to examine the following hypothesis. These hypotheses were based on financial analysis done by (Ojiambo, 2014) in Kenyan banks.

H01: Real estate finance (ratio of mortgage loan to total loan) has a negative and significant effect on the financial performance of commercial banks.

H02: Liquidity has a negative and significant effect on the financial performance of commercial banks.

H03: bank size has a negative and insignificant effect on the financial performance of commercial banks.

H04: capital adequacy has a negative and insignificant effect on the financial performance of commercial banks.

H05: cost of operation has a positive and significant effect on the financial performance of commercial banks.

H06: market share has a positive and insignificant effect on the financial performance of commercial banks.

1.6 Significance of the study

This report is very useful to Ethiopian banking institutions because it detailed the risk elements involved in mortgage finance. The bank's growth is influenced by several elements, one of which is mortgage finance, which plays a significant part in the present banking sector. Academicians benefit from the outcomes of this study because they will add to the knowledge of researchers on this subject. The findings will also be important to policymakers since they will act as a guide for them when making decisions on real estate financing and investing in the country.

1.7 Scope and Limitation of the study

The research in this field focuses on real estate finance, which is heavily reliant on banks. To make this study comprehensible, the researcher concentrated on the top ten private banks functioning in Ethiopia. The data is gathered for the study covers 11 years (2010-2020). This geographic scope limitation was chosen due to time, access, and expense constraints.

1.8 Organization of the Study

This thesis is organized into five chapters. The first one is an introduction, relevant literature is reviewed and presented in chapter two. Chapter three describes the methodology which contains a description of the program, description of the study area, data sources and data types, and the analytical tools. Chapter four describes the results and discussion of the study using both descriptive statistics and econometric models. Finally, chapter five presents the summary, conclusions, and real estate finance cultural implications of the study.

Chapter Two

2. Review of Literatures

2.1 Introduction

Various empirical evidence implies that internal and external variables influence the profitability of financial institutions, particularly banks. According to Andreas and Gabrielle (2009), bank profitability is often quantified as a function of internal and external drivers and represented as a function of return on average assets. Bank-specific characteristics are among the internal determinants. The external factors are environmental variables that are expected to have an impact on bank profitability. Internal drivers of bank profitability include capital adequacy ratio, bank size, capital adequacy, net worth, liquidity, earnings quality, loan performance, business risk, management quality, people, technology, and operational environment. Effective tax rate, real GDP growth, inflation, regulation, and bank concentration are examples of external macroeconomic and industry-specific factors. An empirical review of the literature is discussed in this chapter.

2.2 Theoretical Background

2.2.1 The Pecking-Order Theory of Capital Structure

Myers and Mailuf (1984) introduced the pecking order hypothesis of capital structure. According to the hypothesis, corporations favor internal finance over external financing and debt over equity financing. The idea goes on to say that the greater knowledge asymmetry there is, the higher the costs of funding sources will be (Brounen et al., 2003). According to this idea, debt financing is promoted when a company's earnings are insufficient, as well as when stock is undervalued. Financial leverage, according to Myers and Mailuf (1984), is the concept of using debt to support investment. In general, projects, including real estate developments, are funded via the use of debt and equity. Unfavorable financial leverage occurs when the cost of borrowing exceeds the return on investment, causing a drop in the return on equity and financial risk. According to this view, leverage raises the investor's equity position, making capital structure irrelevant (Clauretie & Sirmans, 2010). As a result,

the pecking order hypothesis is critical in understanding the extent to which real estate enterprises should use debt financing to achieve favorable financial results.

2.2.2 Portfolio Theory

Markowitz (1952) was a proponent of portfolio theory. "When assets are integrated to form a portfolio, the anticipated return on the portfolio is equal to an average of the expected returns on the individual assets, weighted by the proportionate quantity of each asset included in the portfolio," according to this theory. After a private asset financing loan has been provided, a portfolio of various assets has an expected return and an expected risk (as assessed by the variation in returns). A portfolio can help reduce the risk associated with a single item without sacrificing projected rewards. Diversifying real estate assets through portfolio creation has a bigger advantage. For optimal profit, properties of various sorts (hotels, warehouses, office buildings, and farms) and/or geographical locations are merged. Geographic diversity, in which areas are defined in terms of their economies, reduces the risk the most (Clauretie & Sirmans, 2010). However, because a big amount of cash is required, this theory favors major developers over individuals, such as life insurance companies and pension funds. Messah (2011) conducted a descriptive survey to determine the link between real estate owners' income, demand for real estate, and the location of real estate properties, as well as the extent to which the realtor's contribution to real estate pricing. Modern Portfolio Theory (MPT) is becoming more widely accepted as a preferred strategy for diversifying pools of real estate assets sensibly. MPT was long and widely utilized in the development of portfolios in and across the public markets, but it wasn't until the late 1990’s that it found a place in private real estate investing. Since then, real estate investors have recognized the importance of cycles in the performance of individual assets and asset portfolios, and MPT has become a widely used paradigm for constructing and rebalancing real estate portfolios.

MPT posits that investors are risk-averse, which means that given two assets with the same anticipated return, they would choose the less risky one. As a result, an investor will only take on more risk if the additional risk is matched by greater predicted profits. It is feasible to build a real estate portfolio that will produce the required return while posing the least

amount of risk. The main disadvantage of using MPT in private real estate portfolios is that it utilizes market returns rather than actual asset level returns. Actual returns on individual properties in a market might change (for better or worse) depending on occupancy, rollover schedule, tenant quality, location, and other factors, according to Messah (2011). However, due to market pressures on rentals, occupancy, and pricing, a major percentage of an asset's performance is impacted by the market in which it is located.

2.2.3 Efficient Market Theory

This is the idea that an asset trades in a market where its value reflects all of the knowledge known about it. As a result, the asset is priced "efficiently" in the sense that no single person may profit from trading based on information available to all other market players. The concept of an efficient market precludes an investor from making abnormal returns by taking advantage of information that is widely available to all investors. Market flaws, asymmetric information, and the high fixed cost of small-scale lending do, nevertheless, exist, resulting in system failures, which are a major cause of poverty and financial market failures (Stiglitz, 2006).

In his research, Ebrahim (2009) aimed to create a paradigm for increasing the affordability of formal housing. His motivation stemmed from an ad hoc practice in Oman where clans employ interest-free loans to fund the purchase of dwellings for their needy brethren. According to Ebrahim (2009), an informal financial system focusing on supporting homes by reducing adverse selection, moral hazard, administrative costs, and transaction costs is expected to boost development by allowing many people who are excluded from the official system access to financial services.

The efficient-market theory (EMT) posits that asset prices completely represent all relevant information. This theory argues that stocks constantly move at their fair value, making it impossible for real estate developers to grant financial assets long or short term. The EMT's semi-strong version asserts that interest rates imposed on loans reflect all publicly available information and that prices alter instantaneously to reflect new public information. Emmons and Mueller (1997) concur with this. According to Callier (2003), informal finance systems

are dominant because they address basic issues that are not well addressed by most financial institutions in developing countries.

A market is a venue where individuals and businesses may exchange financial securities and commodities at low transaction costs at prices that reflect supply and demand. More specifically, a property market is a location where individuals and businesses exchange real estate at prices that reflect supply and demand. Efficient market theory, often known as an efficient market hypothesis (EMH), is a theory that assumes market players get and act on all relevant information as quickly as feasible. Markets, according to EMH, are informationally efficient, i.e., they represent the total of accessible information as well as the decisions made by traders and investors. EMH's foundation is mainly based on the theory of homo economics. The complexity and unpredictability of human behavior is the driving force behind the creation of homo economics.

2.3 Conceptual Framework

The conceptual framework was created based on the related literature review. The framework depicts the study's factors, which include real estate finance, market structure, cost of operations, capital adequacy, bank size, and liquidity as independent variables influencing financial performance (dependent variable). These variables are chosen based on previously reviewed articles.

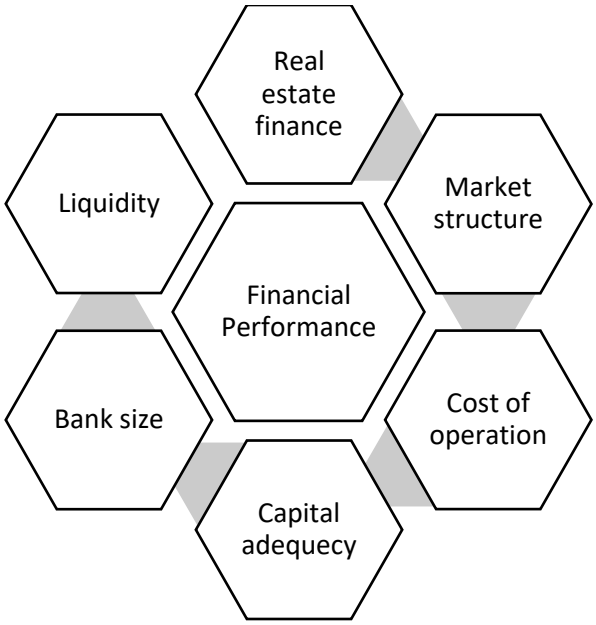

Figure 2-1. Independent variable and references extracted from

Table 2-1. Independent variables and source of reference

No.	Independent Variables	References
1	Real estate finance	(Ojiambo, 2014).
2	Market structure	(Ojiambo, 2014).
3	Cost of operations	(Swarnapalia, 2014)
4	Capital adequacy	(Ayele, 2012), (Swarnapalia, 2014), (Macharia, 2013)
5	Bank size	(Haas et al.,2009), (Ayele, 2012), (Swarnapalia, 2014)
6	Liquidity	(Ayele, 2012), (Swarnapalia, 2014)

The independent variables are selected based on their yield in previous empirical studies. In other countries' experiences, these were the variables that were affecting the banks in terms of real estate finance.

2.4 Variables Affecting Banks Performance

Under this section, theoretical and empirical pieces of evidence about the internal determinants that affect a bank's performance are discussed. The theoretical and empirical literature of major internal determinants of performance of bank; Real estate finance, Capital

Adequacy, Liquidity, Bank Size, Cost of Operation, and Market Share are presented in this section.

Real estate finance

Some commercial banks provide real estate financing, which is typically viewed as a diversification strategy aimed at reducing the risk of loss from non-performing loans, particularly unsecured loans. Commercial banks are likely to perform better as a result of this risk reduction (Lipunga, 2014). Banks that provide mortgage loans have varied portfolios of mortgage loans, which allows them to distribute risk in ways that would be impossible if individuals made mortgage loans directly. Commercial banks benefit from economies of scale because of their size and quantity. They also have greater experience than people in assessing credit, setting up loans, collecting debts, lowering loan processing costs, and, as a result, boosting the availability of real estate loans. Borrowers who use mortgage financing must put money aside to fund a portion of the property's cost by paying a down payment. As a result, the bank's nonperforming loan to total loan portfolio ratio falls (Kimeu, 2008).

Capital Adequacy

The ability of a bank to endure operating and extraordinary losses is measured by capital adequacy. In addition to the statutory necessity for banks to maintain a certain level of capital, capital adequacy also reflects a bank's capacity to take on more business. Banks with a high capital ratio, according to Indranarain (2009), make greater profit by converting the safety advantage into a profit. The amount of capital a bank or financial organization has allowed them to be more flexible financially. It outlines the many financial choices available to the company. Given the funding mix, the quantity of capital has an impact on the bank's profitability in terms of return on assets, return on capital employed, and return on shareholders' funds.

Capital strength has a favorable and significant effect on commercial bank profitability in Ethiopia, according to Abebaw and Depaack (2011). According to the risk-weighted capital ratio framework, a bank should have enough capital to sustain its risk assets. It is now

widely accepted that capital sufficiency is more closely linked to asset structure than to liability volume.

Liquidity

To satisfy payment commitments to depositors and creditors, a bank or financial institution must be liquid. Liquidity analysis examines a bank's capacity to satisfy its commitments and is essential for a bank to continue operating. A bank's collapse might be caused by a lack of liquidity. It also takes into account the percentage of liquid assets in total assets as well as the deposit renewal rate. In their studies, Pak (1995) and Huh (2001) employed the loan to deposit ratio to determine the degree of liquidity. Commercial banks' liquidity conditions were also reliable in all situations, albeit some safeguards should be taken by individual banks according to their circumstances (Habtamu, 2004).

To preserve public trust, a bank must constantly remain liquid to satisfy the demands of depositors and creditors. Because liquidity and profitability have an inverse connection, banks must achieve a balance between the two. In contrast, Bourke (1989) finds the opposite finding, claiming that credit risk has a definite negative impact on bank profitability. The typical trade-offs between return and liquidity risk are proven by the fact that moving from short-term assets to long-term securities or loans boosts a bank's return while simultaneously increasing its liquidity risks, and vice versa. Thus, management of liquidity level for the banks because it affects the bank’s profitability (Tobias and Themba, 2011).

Bank Size

The bank's total assets are used to determine its size. Commercial Bank of Ethiopia and Development Bank of Ethiopia are excluded from this analysis to decrease the size impacts. The bank's size is included as an independent variable in this analysis to account for size-related economies and diseconomies of scale. The total assets of banks are used as a proxy for bank size in most financial literature. However, because total assets deflated the model's dependent variable (Return on Asset), it would be more consistent to take the natural logarithm before putting it in the model. The term "size" refers to the notion that larger banks are better positioned than smaller banks in terms of leveraging economies of scale in

transactions, resulting in higher profits. As a result, a positive link between size and profit is predicted (Indranarain, 2009).

How to find an appropriate bank size to optimize bank profitability is one of the most significant problems in the literature. Larger banks, according to Andreas and Gabrielle (2009), are more likely to diversify their products and loans than smaller banks. A bigger size can also result in economies of scale, in addition to greater diversification potential. Diversification lowers risks, but economies of scale improve operational efficiency. Bank profitability is inversely proportional to the size of the bank. They also claimed that because of agency expenses, bureaucratic processes, and other factors associated with high company size, banks that have become exceptionally large have a negative link between size and profitability.

Cost of Operation

The cost of operations is one of the primary firm-specific elements that influence commercial banks' financial performance. The running expenses of a bank are often reported as a percentage of earnings, and they are expected to harm the bank's financial performance. The number of operational expenditures is usually looked at as a measure of gauging the effectiveness of a firm's management in financial performance literature. Another aspect of operating costs is that bank expenses are thought to have an impact on commercial bank financial performance. This is supported by studies conducted by Bourke (1989), which found a negative relationship between commercial bank financial performance and expense management. In cost management, efficiency is usually expressed as a ratio (operating costs to assets income). Because only operational expenditures can be directly linked to the outcome of bank management, this is the case (Athanasoglou, Brissimis & Delis, 2008). Because better management of bank expenditures leads to higher efficiency and consequently improved profitability ratios, this has resulted in a negative connection.

Market Share

One of the primary strands of study on the drivers of commercial bank financial performance has focused on the impact of industry-specific factors like market structure and bank-specific variables on explaining disparities in commercial bank financial performance across nations. Many studies in the banking literature have looked at whether the financial sector's structure, which is defined as the relative significance of commercial banks, has a significant influence in determining commercial banks' financial performance. "Financial development and structure determinants are particularly essential in determining the financial performance of commercial banks," according to Demirguc-Kunt & Huizinga (2000). The study's findings reveal that commercial banks in nations with more competitive banking sectors, where bank assets account for a significant portion of the country's GDP, have narrower profit margins and are hence less lucrative. Improved financial development would lead to increased banking sector efficiency, indicating that the banking industry's market structure has a substantial impact on the financial performance of commercial banks in the industry.

According to another study by Wood (2004), "industry concentration has a beneficial influence on commercial bank financial performance". The SCP hypotheses have been tested in many studies by various academics, with the findings demonstrating a positive association between market concentration (measured by concentration ratio) and commercial bank financial performance (measured by profits). Furthermore, the assumptions revealed that small banks (with a small market share) have a limited competitive advantage over large banks (with a high market share) due to the positive association between market concentration and financial performance (profitability) of these large banks (Goddard et al., 2004).

2.5 Empirical Review

Researchers about the Ethiopian real estate market and its all-around effect is studied quite a few. Eyerusalem. A, (2021), investigated factors influencing real estate investment in Ethiopia to identify and analyze the most relevant elements influencing real estate investment in Ethiopia. The study used secondary data with time series variables across 26 years, from 1994 to 2019. The author tried to analyze major influential variables that affect

investment in the real estate sector of Ethiopia. The independent variable studied were GDP (growth domestic product), urban population growth, lending interest rate, inflation, and exchange rate. The findings reveal that, in the long run, urban population growth, GDP, and exchange rate all have a positive substantial impact on real estate investment capital growth, whereas interest rate has a large negative impact on real estate investment capital growth.

(Ojiambo, 2014) set out to assess the impact of real estate finance on the financial performance of Kenya's publicly traded commercial banks. A descriptive research design was used in this study. The study's participants were all of Kenya's 11 publicly traded commercial banks. Only secondary data was used for the objectives of the study. Since most other research has employed a comparable time frame, data were collected for five years, from 2009 to 2013. The study indicates that real estate finance has an impact on the financial performance of Kenya's publicly traded commercial banks. Commercial banks should be mindful of how mortgage lending impacts their financial performance, according to the report.

Factors that potentially explain the financial success of bank lending operations were empirically studied by Ewert, Schenk, and Szczesny (2000). They also look at how each bank assesses the risk of a loan. The study makes use of a shared data collection from the Center for Financial Studies in Frankfurt's research project on credit management in Germany. Over seven years, a randomly selected cross-section of 260 borrowers was employed as the sample. The method used includes observing the data acquired from secondary sources and describing the relevant components. They used their results to test theoretical hypotheses on the impact of certain parameters on credit terms and distress probabilities. The study found that ratings act as an important factor in the bank’s lending policy.

In transition nations, Haas, Ferreira, and Taci (2009) investigated how bank characteristics and the institutional environment impact the makeup of banks' loan portfolios. They rely on a new and unique data collection derived from the Banking Environment and Performance Survey, which included 220 banks from 20 transition nations. Primary data were also employed in the study, which was gathered through the use of questionnaires. To assess the association, the researchers utilized a correlational design and performed regression analysis

on the variables. The findings suggest that bank ownership, bank size, and legal creditor protection are major predictors of bank loan portfolio composition. In particular, the results show that foreign banks play an active role in mortgage lending. Moreover, banks that perceive pledges and mortgage laws to be of high-quality choices to focus more on mortgage lending.

Using panel data from seven private commercial banks from 2002 to 2011, Ayele (2012) explored the factors of private commercial bank profitability in Ethiopia. The study took a quantitative approach to its investigation. The effects of capital sufficiency, asset quality, management efficiency, liquidity, bank size, and real GDP growth rate on important bank profitability measures were investigated using a fixed effect regression model. Aside from that, the study conducted primary data analysis to get managers' perspectives on the factors that influence the profitability of private commercial banks. The empirical results show that bank-specific factors; capital adequacy, managerial efficiency, bank size, macro-economic factors; level of GDP, and regulation have a strong influence on the profitability of private commercial banks in Ethiopia.

Swarnapali (2014) looked at the influence of bank-specific characteristics such as operating expenditures, credit risk, liquidity risk, capital strength, and bank size on the financial performance of Sri Lankan Licensed Commercial Banks, as assessed by return on assets (ROA) and return on equity (ROE). Only secondary data was used in this investigation, which used a survey methodology. The necessary information was gathered from the licensed commercial banks' annual reports for the time under consideration.

The data were subjected to regression analysis to identify the influence of the independent factors on commercial bank financial performance. According to the data, operational expenditures and bank size are the only factors that influence bank performance in Sri Lanka. In both models, the computed regression coefficients for credit ratio, liquidity ratio, and capital strength ratio are not statistically significant and do not contribute to the performance of Sri Lanka's licensed commercial banks. As a result, the performance of Sri Lankan banks is influenced by two firm-specific determinants: operational expenditures and bank size. Overall, the findings suggest that the firm-specific characteristics examined in this study had little impact on Sri Lankan banks' financial performance.

Macharia (2013) looked at how the global financial crisis affected the financial performance of Kenyan commercial banks that provide mortgage financing. In addition, the study intended to examine the impact of inflation, interest rates, capital flow, and foreign currency rates on the financial performance of commercial banks in Kenya that provide mortgage financing. The study used a semi-structured questionnaire to obtain primary data, which was mostly quantitative. The financial performance of commercial banks supplying mortgage loans in Kenya was influenced by capital flow as a result of the global financial crisis, followed by foreign exchange rates, inflation, and interest rates, according to this study. This study recommends that financial institutions should avoid a high level of debt.

2.6 Article Summary

Commercial banks should be mindful of how mortgage lending impacts their financial performance, according to the report. Factors that potentially explain the financial success of bank lending operations were empirically studied by Ewert, Schenk, and Szczesny (2000). Moreover, banks that perceive pledges and mortgage laws to be of high-quality choices to focus more on mortgage lending. Using panel data from seven private commercial banks from 2002 to 2011, Ayele (2012) explored the factors of private commercial bank profitability in Ethiopia.

Swarnapalia (2014) looked at the influence of bank-specific characteristics such as operating expenditures, credit risk, liquidity risk, capital strength, and bank size on the financial performance of Sri Lankan Licensed Commercial Banks, as assessed by return on assets (ROA) and return on equity (ROE). Overall, the findings suggest that the firm-specific characteristics examined in this study had little impact on Sri Lankan banks' financial performance. Macharia (2013) looked at how the global financial crisis affected the financial performance of Kenyan commercial banks that provide mortgage financing. The financial performance of commercial banks supplying mortgage loans in Kenya was influenced by capital flow as a result of the global financial crisis, followed by foreign exchange rates, inflation, and interest rates, according to this study.

2.7 Research Gap

In the article review, many theories have been assessed. These theories are crucial in describing how commercial banks' financial performance is influenced. It is crucial to highlight, however, that the theories have not concentrated on the implications of real estate finance on commercial bank financial performance. Various research on the factors of commercial bank financial performance as well as the impact of real estate finance on commercial bank financial performance was also addressed in the review. According to the research, relatively few recent studies have directly focused on how real estate finance influences financial markets. According to the analysis, relatively little recent research has particularly focused on how real estate financing affects commercial bank financial performance in Ethiopia. These are the gaps that this research aims to fill.

Chapter Three

3. Research Methodology

3.1 Introduction

Quantitative research methods are used for this study because a quantitative study generates detailed statistical knowledge of the financial performance of banks. The research design, the target and study populations, the unit of analysis determined using a census design, the data collection instrument, pilot testing capturing both validity and reliability tests, the data collection procedure, and how data were analyzed and the results presented are all covered in this chapter.

3.2 Research Design

The overall method adopted to combine the many components of the study cohesively and logically, guaranteeing that the researcher efficiently addresses the research challenge, is known as research design. The research was conducted using a descriptive research approach. Descriptive research identifies and describes things as they are, to provide statistical data on topics of interest to policymakers and educators (Mugenda, (2003).

3.3 Population and Sampling

According to Mugenda (2003), the target population describes the aggregate of entities, subjects, or individuals sharing similar or related characteristics. In this prospect, the target population is comprised of all private banks in Ethiopia. Under the target population, is the study population which is defined as the population that the researcher can access given prevailing logistical and time constraints. As such, according to the NBE, 16 listed private Banks have operated for at least 10 or more years. Amongst them, the top ten banks according to NBE classification for the fiscal year 2020 were sampled.

Table 3-1. Ethiopian Banks and Year of Establishment

No.	Name of the Bank	Year of Establishment
1*	Commercial Bank of Ethiopia የ ኢትዮጵያ ንግድ ባንክ	1963
2*	Development Bank of Ethiopia የ ኢትዮጵያ ልማት ባንክ	1909
3	Awash International Bank አዋሽ ኢንተርናሺናል ባንክ	1994
4	Dashen Bank ዳሽን ባንክ	1995
5	Bank of Abyssinia አቢሲኒ ያ ባንክ	1996
6	Wegagen Bank ወጋገን ባንክ	1997
7	United Bank	1998

	ሕብረት ባንክ	
8	Nib International Bank ንብ ኢንተርናሺናል ባንክ	1999
9	Cooperative Bank of Oromia ኦሮሚያ ሕብረት ስራ ባንክ	2005
10	Lion International Bank አንበሳ ኢንተርናሺናል ባንክ	2006
11	Oromia International Bank ኦሮሚያ ኢንተርናሺናልባንክ	2008
12	Zemen Bank ዘመን ባንክ	2009
13	Bunna International Bank ቡና ኢንተርናሺናል ባንክ	2009
14	Berhan International Bank ብርሃን ኢንተርናሺናል ባንክ	2010
15	Abay Bank አበይ ባንክ	2010
16	Addis International Bank አዲስ ኢንተርናሺናል ባንክ	2011
17	Debub Global Bank ደቡብ ግሎባል ባንክ	2012
18	Enat Bank እናት ባንክ	2013

* *Government-owned banks*

3.4 Data Collection Procedure

The majority of the data for this study was acquired from secondary sources. Secondary data was gathered through annual reports available on the bank's website, the Ethiopian Investment Commission's website, and the National Bank of Ethiopia's website. Financial performance, costs of operations, Bank size, capital adequacy, and liquidity level data were taken from commercial banks' financial statements. Data on the market structure was gathered from government agencies. Since most previous research has employed a comparable time frame, data was collected for 10 years from 2010 to 2020. This study used cross-sections of 10 banks for eleven years with a total of 110 observations.

3.5 Data Analysis

Descriptive statistics, correlations, and multiple linear regression analysis were used to examine the acquired data. The STATA V16 for Windows software suite was used to

examine secondary data. The overall patterns of the data from 2010 to 2020 for the variables included in the research are analyzed using mean, minimum, maximum, and standard deviation values. To analyze the multicollinearity problem between variables, a correlation matrix was utilized to assess the link between the dependent variable and explanatory factors.

To examine the relative impact of each independent variable in determining bank profitability, a multiple linear regression model was utilized. The hypotheses were tested using the p-values of explanatory variables at significance levels of 1%, 5%, and 10%. The equation below depicts the multiple linear regressions model for ROA. STATA V16 software was used to run these models. The profitability of private banks in Ethiopia was examined using the financial statements of 10 private commercial banks. The following are the regression models that were used:

$$Y = \alpha + \sum_{6}^{n=1} \beta n X n$$

Where: α = constant expression weight, X = independent variables, Y = dependent variable and β = regression coefficient.

3.5.1 Variable Definition and Hypothesis

Dependent Variable

Financial Performance /Return on Asset (ROA)

For example, many scholars utilize a return on asset (ROA) and return on equity (ROE) to assess financial success Samuel (2001) and Ross (2003). The return on asset (ROA) is computed by dividing net income by average total asset. The ROA ratio is calculated by dividing a company's net, after-tax income by all of its assets (Samuel, 2013). It's crucial to remember that because banks are so heavily leveraged, even a ROA of 1 to 2% may still imply sizable revenues and profits for a bank. According to Samuel (2013) and Ross (2003), ROA removes total assets off-balance sheet items, resulting in an understatement of asset value, even though most real-world enterprises have a negative.

$$ROA = \frac{Net\ Income}{Average\ Total\ Assets}$$

Independent Variables

Real estate Finance

Real estate finance is often considered as a diversification strategy aimed at lowering the risk of loss from non-performing loans, especially unsecured loans, by commercial banks. As a result of the risk reduction, commercial banks are anticipated to perform better (Lipunga, 2014). The mortgage loan-to-total-loan-portfolio ratio is the most often used metric in real estate finance. The outstanding principal amount of all construction and real estate loans are included in the portfolio.

$$REF = \frac{Loan\ to\ Mortgage\ and Construction}{Total\ Loan\ Portfolio}$$

Liquidity Ratio

Liquidity risk refers to the possibility that a bank or firm may be unable to convert short-term assets to cash without incurring a capital loss or incurring extra costs. Liquidity ratios are a type of financial indicator that is used to assess a debtor's capacity to pay off current debt commitments without having to raise additional funds. As a measure of liquidity risk, several studies employ financing gap, short-term funding, liquid asset to customer, and a liquid asset to deposit. This study uses the liquid asset to total asset ratio to gauge bank liquidity, as presented by Tseganesh (2013). The liquidity ratio assesses a bank's capacity to repay short-term loans from its cash reserves. Given that market, liquidity is the same for all banks in the sample Tseganesh, the larger the fraction of liquid assets in total assets, the stronger the capacity to absorb liquidity shock (2013).

$$LR = \frac{Liquid\ Asset}{Total\ Asset}$$

Bank Size

Bank size is measured as the natural logarithm of the value of total assets in the Ethiopian birr (ETB).

$$BS = natural\ logarithm\ of\ total\ asset\ of\ the\ bank = \ln(Bank\ Size)$$

Capital Adequacy

Commercial banks' capital adequacy ratio (CAR) is a measure of capital adequacy based on the ratio of gross capital to total assets (Tseganesh (2012). Bank management and investors use the capital adequacy ratio to analyze a bank's risk of defaulting on its loans.

$$CA = \frac{Gross\ Capital}{Total\ Asset}$$

Cost of operation

Employee salary and benefits, information technology, legal fees, consulting services, postage and stationery, directors' fees, and expenditures related to buildings and other fixed assets are all examples of operating costs spent by banking organizations. Because large enterprises may spread overhead over a wider revenue or asset base, lower operational expenses are a possible source of scale economies in banking (Anna, 2014).

$$CO = \frac{Non\ Interest\ Expense}{Gross\ Revenu}$$

Market Share

The nature of the link between market share and financial performance has been an important issue of economics research since the first published study demonstrating a positive market share–profitability association (Gale, 1972). It determines the extent to which the bank has an impact on the market in which it operates.

$$MS = \frac{Bank\ Asset}{GDP}$$

Table 3-2. Operationalization of Variables

Symbol	Definition	Measurement
Y	Financial Performance	The ratio of net income to total assets
X1	Real estate finance	The ratio of mortgage loans over the total loan portfolio
X2	Market structure	The ratio of bank assets to GDP
X3	Cost of operations	Natural logarithm of costs of operation
X4	Capital adequacy	The ratio of bank's gross capital to total assets
X5	Bank size	The natural logarithm of the book value of total assets at the end of the year
X6	Liquidity	The ratio of banks' liquid assets to total assets

3.5.2 Model Specification

The panel/longitudinal data model was employed in this investigation. Gujarati (2009) uses panel data from the same cross-sectional unit studied throughout time to derive conclusions. Brook (2008) lists the following advantages of panel data in research: first, and probably most importantly, panel data may address a larger variety of topics and solve more difficult problems than pure time series or pure cross-sectional data alone.

To check that the data fulfills the fundamental assumptions of the linear regression model, the following diagnostic tests were performed.

Normality: Descriptive statistics were used to look at the data distribution. The Bera-Jarque (BJ) test is used to determine the property of a regularly distributed random variable, which is that the whole distribution is defined by the first two moments, the mean and variance.

Multicollinearity: several empirical research present various arguments in support of the multicollinearity problem. When the correlation coefficient among variables is more than 0.75, according to Mashotra (2007), multicollinear difficulties emerge. Hair et al. (2006) claimed that a correlation value of less than 0.9 does not always indicate a major multicollinear issue. A correlation matrix is a tool for ensuring that explanatory factors are related. Then, to adjust for multicollinearity, balanced panel data models are used.

Chapter Four

4. Finding and Discussions

4.1 Introduction

The preceding three chapters established the problem, stated the goals, and examined the literature on the subject. The research design utilized in the study was also explained to accomplish the research aim and test research hypotheses. The obtained data is presented and examined in this chapter.

4.2 Descriptive Statistics

Before beginning a regression analysis, descriptive analysis is necessary to learn more about the associations between the dependent and independent variables. The descriptive study of Ethiopia's top 10 commercial banks is shown in Table 4-1. The mean, minimum, maximum, and standard deviation are all included in this study. The arithmetical average of the variables in the research is reported by the value of the mean. The lowest and greatest values of the variable are shown by the minimum and maximum values. The standard deviation shows how far away from the mean there is variation or dispersion. A low standard deviation implies that the data points are skewed toward the mean, whereas a high standard deviation suggests that the data set is spread out over a wide range of values. The descriptive analysis in this part is mostly dependent on the summary data offered below.

Table 4-1. Descriptive statics of collected data

	Mean	Standard Deviation	Maximum	Minimum	Observation
ROA	0.030	0.009	0.067	0.004	110
REF	0.110	0.054	0.223	0.004	110
LR	0.275	0.129	0.579	0.107	110
BS	9.427	0.980	11.400	6.962	110
CA	0.132	0.028	0.195	0.079	110
CO	0.375	0.091	0.753	0.178	110
MS	0.047	0.024	0.095	0.013	110

The average Return on Asset (ROA) was 3 %. This means that commercial banks in Ethiopia make an average profit of 3 cents for every birr in asset. The standard deviation was found to be 0.9%. This suggests that there is a good level of ROA dispersion among Ethiopian commercial banks. The highest and lowest ROA values were 6.7 % and 0.4%, respectively. This shows that the private banks in Ethiopia under study generated profit. The profit generated is quite high when compared to most African banks (Return on Asset in Africa | TheGlobalEconomy.com, 2021). This might be in part due to the exclusion of foreign banks.

Real estate financing, which describes the share of capital in real estate funding in terms of loans, was the other independent variable. REF had a mean value of 11%, representing the average real estate finance provided by private banks during the last ten years (2010-2020). REF has a maximum and minimum value of 22.3 % and 0.4 %, suggesting that all private banks have participated in real estate finance. Even though the number seems quite high, when compared with the population of Ethiopia the real estate sector is quite underfinanced. In addition, people eligible for mortgage finance out of the whole population is less than 1% (*Financial Inclusion in Ethiopia: 10 Takeaways from the Latest Findex*, 2018).

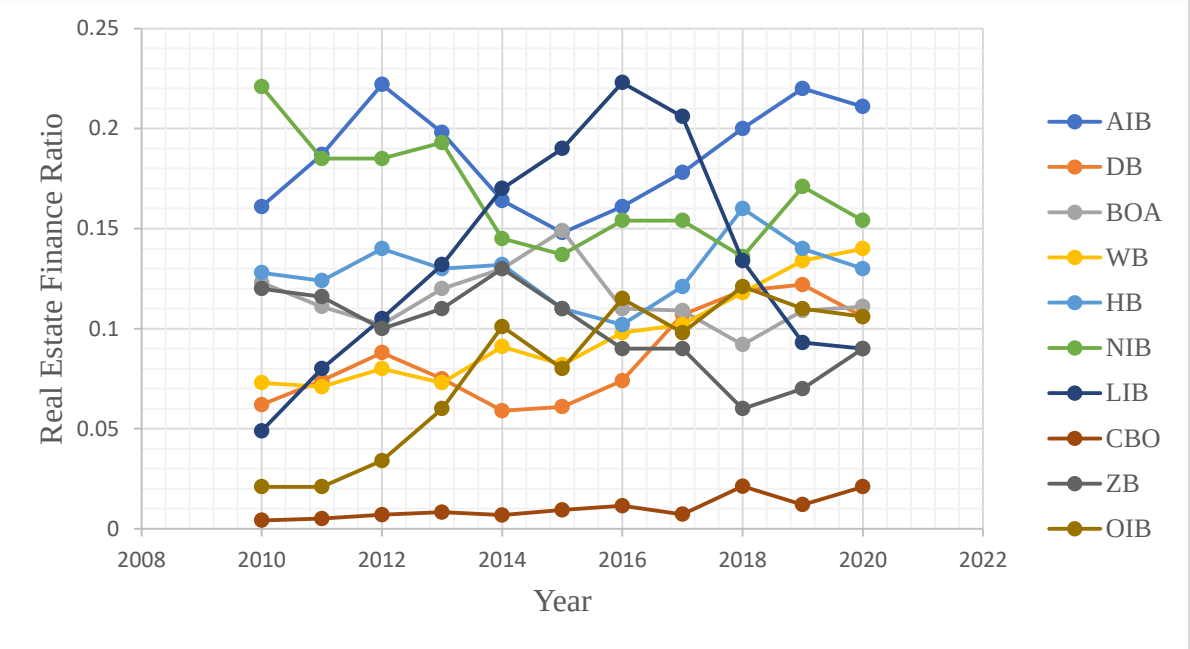

Figure 4-1. Ethiopian banks real estate finance for the last 20 years. (*Source: annual reports of banks*)

The average liquidity Ratio (LR) of Ethiopian commercial banks was 27.5 %, with a standard deviation of 13.76 %, indicating the level of cash and short-term debit in the financial system. LR had a minimum value of 10.7% and a maximum value of 57.9%, respectively. This means that 27.5 percent of Ethiopian commercial banks' total assets are liquid assets that can be converted into cash quickly. In the case of commercial banks in Ethiopia, the standard deviation of 12.9 percent indicates that there was moderate dispersion from the mean value of the liquidity ratio. The mean value of liquidity reveals that Ethiopian private commercial banks were extremely liquid, two times higher than the statutory minimum liquidity ratio of 20% set by the National Bank of Ethiopia (NBE) in January 2012.

The size of a bank plays a significant role in maintaining its market position. Among the bank-specific independent variables are the following: The standard deviation of 42.5 percent was found to be considerably distributed from the mean value of 2.31 antilog of bank size. 2.39and 2.19 were the maximum and minimum numbers, respectively. Awash International Bank (AIB) had the highest value, while other private banks had the lowest. This is due to the fact that Ethiopian privet banks industry was established after 1992 GC after the down fall of the communist regime which no privet bank existed during its rule.

There are a few statistics to highlight when it comes to the model's explanatory variables. For the research period, the average capital adequacy, defined as the ratio of equity to total assets, was 13.2 percent for commercial banks. This means that capital accounts for 13.2 percent of total assets for the institutions studied. The data set has a minimum value of 7.9% and a maximum value of 19.5 percent. Only 7.9% of the total assets of the bank with the lowest capital is capital. The capital of the top capitalized bank in the sample accounts for 19.5 percent of total assets. The standard deviation of the data set is only 2.8 percent, which is quite low. Having a high capital adequacy ratio indicates that you have more capital to hedge against risk. This is due to the high interest rates and regulations of loan financing of the banks.

The mean value of bank operation costs was 37.5 percent, with a range of 75.3 percent, the variable with the most variability. The variable's standard deviation is 9.1%, which is the third greatest variance among the explanatory variables. The Ethiopian private commercial banks have a modest value, according to the mean value of operation costs. But there is quite the disparity between the maximum and minimum amount. Which can be attributed to the market orientation of the bank.

The raw data for market share reveals a mean of 4.7 percent, with a range of 9.5 percent to 1.3 percent, indicating moderate variability, and a moderate standard deviation of 2.4 percent when compared to other independent variables. The standard deviation figure is not far from the mean value, indicating that the data was consistent. The results of market share value reveal that most private banks share the market quite evenly.

4.3 Correlation

The degree to which two or more variables are linked with or related to each other is measured by correlation. Correlation analysis' main goal is to determine the strength or degree of a linear relationship between two variables (Gujarati, 2009). The Pearson product-movement coefficient, sometimes known as the Pearson correlation, is the most generally used bi-variant correlation statistic, and it was utilized in this investigation. The correlation coefficient between two variables can vary from +1 (perfect positive association) to -1 (i.e., perfect negative relationship). Because the study's sample size was 110, the correlation coefficient was employed.

Table 4-2. Correlation coefficients between dependent and independent variables

	ROA	REF	LR	BS	CA	CO	MS
ROA	1						
REF	0.1450	1					
LR	0.3889	-0.2014	1				
BS	-0.3693	-0.2555	-0.7806	1			
CA	0.3176	0.0971	0.2263	-0.4523	1		
CO	-0.5508	-0.3353	-0.2384	0.0693	-0.1099	1	
MS	0.1333	0.3080	-0.0403	0.3864	0.0100	-0.3515	1

If y and x are connected, according to Brooks (2008), it signifies that they are being addressed in a perfectly symmetrical manner. Thus, it is not implied that changes in x cause changes in y, or that changes in y cause changes in x; rather, it is simply stated that there is evidence for a linear relationship between the two variables and that their movements are on average related to the extent determined by the correlation coefficient.

Capital adequacy is one of the primary results of variables of interest. For the period under consideration, capital sufficiency, as measured by equity to total assets, was determined to be a critical driver of commercial bank profitability in Ethiopia. The findings reveal that commercial bank capital strength has a positive and statistically significant influence on bank performance as assessed by return on assets. The outcome is not in line with the hypothesis. According to capital theory, a good explanation for the positive sign is that Ethiopian commercial banks efficiently use or manage their capital. The result contradicts with (Berger and Mester, 1997) and (Ayanda, 2012) findings, and it alignes the beneficial influence of (Pasiouras and Kosmidou, 2006) findings. Well capitalized banks, according to Berger and Mester's findings, are better at-risk absorption than less capitalized banks; yet, well capitalized banks have a lower probability of profiting per share. The instance of Ethiopian commercial banks follows the same logic as Berger and Mester's conclusion.

Another important factor of commercial bank performance in Ethiopia is liquidity risk. Total loan to total asset and total loan to total bank deposit are used to calculate it. The ratio of total loans to total bank deposits had a negative influence on profitability, whereas the ratio of total loans to total assets had no effect. The finding of total loan to total bank deposit contradicts the hypothesis' premise. The research highlights the trade-off between liquidity (total loan to total bank deposit) and profitability, demonstrating that the more resources a bank has committed to meeting future liquidity demands (lower liquidity risk), the lower its profitability. The higher the percentage (more liquidity risk), the less profit the bank makes (liquidity trap). This could be due to the high proportion of defaulted loans (non-performing loans). It is backed up by research from (Krama M. and Tekeste B., 2012). The empirical result revealed that there is less liquidity risk (higher ratio) in the industry, and Ethiopian

commercial banks should manage their liquidity to increase profits. This finding is refuted by the findings of (Ayanda, 2012).

Unfortunately, bank size was shown to be statistically insignificant and adversely connected to profitability, as assessed by total asset growth and banks size. Despite its insignificance, it was one of the elements that the researcher was interested in. As a consequence, the findings refute the hypothesis and back up Berger et al. (1997), Ayanda (2012), and Panayiotis et al... (2005) findings that there is no link between bank size and profitability. This shows that Ethiopian commercial banks have not reaped the benefits of economies of scale, or that diseconomies of scale have occurred as a result of huge asset ownership and increasing branch networks. In terms of asset ownership and branch network, this suggests inefficiency; theoretically, smaller banks in Ethiopia are more profitable than larger banks.

Return on Asset has a positive association with real estate finance, liquidity ratio, capital adequecy, and market share, as seen in Table 4-2. Return on Asset, on the other hand, has a negative relationship with bank size, and operating costs. The cost of operations has a negative 0.5508 coefficient with ROA, indicating that cost of operations has the greatest impact on ROA among the other explanatory factors. The smallest market share, as measured by the natural logarithm of total assets, has the least significant link with ROA (a coefficient of 0.1333), indicating that private banks' proclivity to expand capital investment is low as their net profit per birr of equity capital rises. Capital adequecy and Liquidity ratio has a coefficient of 0.3176 and 0.3889, meaning it has a positive relation with ROA. Cost of operations, on the other hand, harm real estate finance. Capital adequacy has a major positive correlation with real estate finance. Because comparatively large banks tend to be less liquid, bank size is directly related to its liquidity ratio.

The correlation between ROA and REF was positive but statistically insignificant. This contradicted the study's hypothesis. The study hypothesis was that retaining liquid assets yields lesser revenue and bears large opportunity costs for the bank. However, LR exhibited a positive linear connection with ROA but was statistically insignificant/not different from zero.

4.4 Diagnosis Test

Test for an average value of the error term is zero (E (ut) = 0)

CLRM requires the first assumption that the average value of the mistakes is zero. This assumption, according to Brook (2008), will never be violated provided a constant term is included in the regression equation. But what if finance theory dictates that there should be no intercept for a certain application, forcing the regression line to pass through the origin? Several negative results could arise if the regression did not contain an intercept and the average value of the errors was nonzero. However, the regression equation includes a constant term (i.e., α); the average value of the error term in this study is expected to be zero.

Test for homoscedasticity

So far, the variance of the mistakes has been believed to be constant. The assumption of homoscedasticity is what this is called. The mistakes are considered to be heteroscedastic if their variance is not constant. The white test was used to test this assumption, with the null hypothesis of heteroskedasticity as the null hypothesis. The F-statistic and the chi-square (χ) 2 tests were both utilized. Table 4-3 shows that the P-value for the model is more than 0.05, or 0.4992, and we were unable to reject the null hypothesis of homoscedasticity.

Table 4-3. Coefficients for white's test of heteroskedasticity

Source	chi2	df	p
Hetroskedasticity	19.35	20	0.4992
Skewness	7.23	5	0.2041
Kurtosis	0.16	1	0.6867
Total	26.74	26	0.4229
	Chi2(20)	19.35	
	Prob>Chi2	0.4992	

Test for Multicollinearity

This assumption is based on the existence of a link between explanatory factors. Perfect collinearity occurs when an independent variable is an exact linear combination of the other independent variables, and the model cannot be estimated using OLS (Brooks 2008). When there is a high, but not perfect, the correlation between two or more explanatory factors, this is known as multicollinearity (Hair et al., 2006). When there is multicollinearity, according to Churchill and Iacobucci (2005), the amount of information about the effect of explanatory variables on dependent variables reduces. As a result, many explanatory variables may appear to be unrelated to the dependent variables while they are in reality related.

The independent variables can be correlated under this premise; nevertheless, they cannot be fully correlated. Multiple regressions would be useless for econometric research if we didn't allow for any correlation between the independent variables. However, it is unclear how much correlation generates multicollinearity. Hair et al. (2006) contends that a correlation coefficient of less than 0.9 does not necessarily indicate a major multicollinearity problem. When the correlation coefficient between variables is more than 0.75, according to Malhotra (2007), a multicollinearity problem emerges. Any correlation coefficient above 0.7, according to Kennedy (2008), might produce a major multicollinearity problem, resulting in wasteful estimation and less trustworthy results. This shows that there is no consensus on the level of correlation that leads to multicollinearity.

Table 4-4. Correlation coefficients for checking multicollinearity

	REF	**LR**	**BS**	**CA**	**CO**	**MS**
REF	1					
LR	-0.2014	1				
BS	0.2555	-0.7806	1			
CA	0.0971	0.2263	-0.4523	1		
CO	-0.3343	-0.2384	0.0693	-0.1099	1	
MS	0.3080	-0.0403	0.3864	0.0100	-0.3515	1

According to Gujarati (2009), examining the explanatory variables correlation coefficients (CC), condition index (CI), and variance inflation factor is the usual statistical strategy for

testing data for multicollinearity (VIF). As a result, the correlation matrix for six of the independent variables listed above in Table 4-4 was computed in this investigation. The largest correlation of 0.781, as seen in the accompanying correlation matrix, is between liquidity ratio and bank size. According to Hair et al (2006), there is no correlation above 0.9, so we can conclude that multicollinearity is not a concern in this study.

Table 4-5. Variable inflation factor

Variable	VIF	1/VIF
BS	5.55	0.1803
LR	3.84	0.2602
MS	1.88	0.5317
CA	1.55	0.6450
CO	1.23	0.8099
REF	1.32	0.7556
Mean VIF	2.81	

The variance inflation factor is another method of detecting multicollinearity (VIF). If your predictors are correlated, VIF gauges how much the variance of an estimated regression coefficient increases (multicollinearity). When VIF exceeds 10, the regression coefficients are under-estimated, resulting in imperfect multicollinearity. As a result, multicollinearity was not an issue in this investigation because the average VIF was 2.81.

Test for Normality Assumption

Finally, assumption five requires that the disturbances be checked to see if they are normally distributed. The Bera-Jarque (BJ) test is one of the most regularly used tests for normalcy, according to Chris Brooks (2008). BJ employs the property of a normally distributed random variable, which states that the first two moments, the mean and variance, characterize the entire distribution. The histogram should be bell-shaped if the residuals are normally distributed, and the Bera-Jarque statistic should not be significant. To avoid rejecting the null of normality at the 5% level, the p-value presented at the bottom of the normality test screen should be greater than 0.05.

Table 4-6. Normality test coefficient

Variable	observation	Skewness (Pr)	Kurtosis (Pr	adjusted Chi2 (2)	Prob> Chi 2
Constants	110	0.0998	0.5069	3.23	0.1993

This shows that the Jarque-Bera test's p-value is larger than 0.05, indicating that no indication of irregularity in the data was found. As a result, because the p-value was greater than 0.05, the null hypothesis that the data is normally distributed failed to reject.

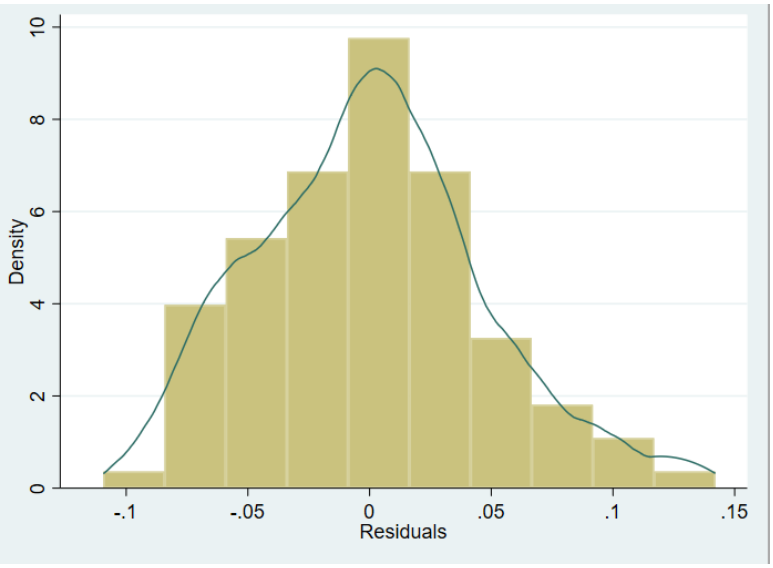

Figure 4-2. Skewness test

Hausman Test of Hypothesis

The results of the CLRM assumption testing show that it is not violated. As a result, the researchers used OLS (ordinary least square regression). Due to the use of panel data in this study, there are two types of panels estimator models: fixed effect and random effect. Fixed effects models allow the regression model's intercept to vary cross-sectionally but not over

time, whereas all slope estimates are constant both cross-sectionally and over time. Whereas, in the random-effects model, separate intercept terms are proposed for each entity, and these intercepts remain constant across time, with the correlations between the explanatory and explained variables considered to be the same both cross-sectionally and temporally (Brook, 2008).

According to Gujarati and Porter (2009), many academics are unsure whether a model is better: the fixed effect model (FEM) or the random effect model (REM). However, there are several clues that you should use FEM or REM. For example, if T (the amount of time series data) is big and N (the number of cross-sectional units) is small, the values of the parameters predicted by FEM and REM are likely to be similar. As a result, the decision is based on computing efficiency. There is also a formal test called the Hausman test that may be used to choose between FEM and REF (Gujarati and Porter, 2009). For this test, the null hypothesis is that the unobservable heterogeneity term is not associated and that the random effect model is adequate.

The Fixed Effects technique will be used if the null hypothesis is rejected (Brooks, 2008).

Hausman Test of Hypothesis

H0: Random effect model is appropriate

H1: Fixed effect model is appropriate

Table 4-7. Hausman Coefficients

	Coefficients			
	(b) FE	(B) RE	(b-B) Difference	X
REF	0.0245	0.0086	0.0159	0.0182
LR	-0.0035	0.0003	-0.0038	-
BS	-0.0035	-0.0029	-0.0005	-
CA	-0.0137	0.0293	-0.0429	0.0284
CO	-0.0386	-0.0450	0.0064	0.0038
MS	0.1156	0.0319	0.0836	0.0579

The P-value of models in the Hausman specification test is 0.4267 (Appendix B), which is less than the 5% level of significance. As a result, the random effect model's null hypothesis is rejected at a 5% significance level. As a result, the fixed effect model is preferable to the random effect model.

4.5 Regression Analysis

For the regression analysis aforementioned equation was utilized. To describe the model beta coefficients and bank internal variables were used. The beta coefficient may be negative or positive in the following regression results; beta reflects the amount of effect each variable has on the dependent variable. The positive beta coefficient indicates that the variable has a positive effect on the dependent variable, whereas the negative beta coefficient indicates that the variable harms the dependent variable. It contains a message that indicates that if the independent variable grows by 1%, the dependent variable will increase by beta, but the independent variables must have a statistically significant effect on the dependent variable. The P-value reveals the significance of each variable at a given percentage or precession threshold. R2 values reflect the model's explanatory power, or how well the regression model fits the data, and modified R2 values, which account for the loss of degrees of freedom associated with adding more variables, were calculated to determine the models' explanatory powers. The operational panel regression model was used to determine the influence of real estate finance on financial performance by examining the major components that explain financial performance as evaluated by Return on asset (ROA).

$$ROA\,i,t = \alpha + \beta 1\,(REFi,t) + \beta 2\,(LRi,t) + \beta 3\,(BSi,t) + \beta 4\,(CAi,t) + \beta 5\,(COi,t) + \beta 6\,(MSi,t)$$

$$ROA = 0.52 + 0.02(REF) + 0.12(LR) - 0.003(BS) - 1.07(CA) - 0.43(CO) + 0.96(MS)$$

Table 4-8. Regression Coefficients

ROA	Coefficient	Std. Err	t	P.|t|	[95% conf. Interval]	
REF	0.0245	0.0236	1.04	0.302	-0.0223	0.0713
LR	-0.0034	0.0094	-0.37	0.714	-0.0221	0.0152

BS	-0.0034	0.0015	-2.29	0.024	-0.0065	-0.0005
CA	-0.0137	0.0422	-0.32	0.746	-0.0974	0.0701
CO	-0.0386	0.0093	-4.15	0	-0.0571	-0.0201
MS	0.1155	0.0703	1.64	0.104	-0.0242	0.2552
Constant	0.0717	0.0200	3.58	0.001	0.0319	0.1115

4.6 Inferential Statistics

The above model has good explanatory power, with an adjusted R2 of 36 percent (Appendix B8) and no first-order autocorrelation. This means that the variance in those factors that can explain the variation in financial performance can account for 36% of the variation in ROA. Three explanatory factors that affect the financial performance of Ethiopian commercial banks were statistically significant: liquidity ratio, bank size, capital sufficiency, and cost of operation, all of which harmed financial performance. Real estate financing and market share were the other two explanatory factors that showed a favorable relationship with financial performance.

Real Estate Finance and Financial Performance

With a p-value of 0.302 and a coefficient value of 0.0245, the real estate finance ratio had a positive and statistically significant influence on the financial performance of Ethiopian commercial banks. The coefficient data show that a 1-birr increase or decrease in liquidity coverage ratio results in a 0.302-birr increase or decrease in Ethiopian commercial banks' financial performance. The real estate financial ratio coefficient sign in the model equation matches the hypothesis. Because the coefficient was statistically significant. This study aligns with Ndururu (2012) and Ojiambo (2014), who found that the real estate finance ratio had a negative and substantial influence on bank financial performance.

Liquidity Ratio and Financial Performance

The liquidity ratio was calculated by dividing the total liquid asset of the top 10 private Ethiopian commercial banks by the total asset in this study. With a p-value of 0.714 and a coefficient value of -0.0034, the coefficient sign of the return on equity to liquidity ratio was

negative and statistically insignificant. The coefficient data show that a change in liquid assets of one birr causes a change in the financial performance of Ethiopian commercial banks of 0.0034 birr. As a consequence of the aforesaid findings, the researcher rejects the null hypothesis that the liquidity ratio has a detrimental influence on Ethiopian commercial banks' financial performance. This finding contradicts Maqbool's (2014) conclusion that there is a link between liquidity ratio and profitability, and that the investment on total assets forecasts that if a bank invests more in assets, liquidity would be low and profitability will be high.

Bank Size and Financial Performance

The study looked at the impact of bank size on the financial performance of Ethiopia's privately owned commercial banks. The study employed bank size as a control variable. The findings revealed that bank size has insignificant negative impact on listed banks' financial performance, with a P-Value of 0.024 and coefficient value of -0.003. As a result, the size of listed commercial banks in Ethiopia has no bearing on their financial success as measured by total assets. This contradicts Goddard et al.'s (2004) findings but is in line with Ojiambo's (2014) findings.

Capital Adequacy and Financial Performance

The research investigates the impact of capital adequacy on the financial performance of Ethiopia's publicly held commercial banks. In the regression model, this was an independent control variable. The findings also revealed that capital adequacy had a considerable negative impact on listed banks' financial performance (ROA). This suggests that the degree of capital adequacy affects the return on asset of Ethiopian privately owned banks. This conclusion is in line with Sangmi and Nazir's results (2010). However, it differs from Ojiambo’s (2014) results.

Cost of Operations and Financial Performance

The study looked at the impact of the cost of operations on the financial performance of Ethiopia's publicly traded commercial banks. In the model, the cost of operations was employed as a control variable. The findings revealed that the cost of operations had a

significant negative impact on the financial performance of Ethiopia's top 10 private commercial banks. According to the findings, a unit rise in the cost of operations resulted in a 0.0386 unit drop in the financial performance of publicly traded banks. As a result, the cost of operations appears to have an impact on commercial banks' financial performance. This is in line with the findings of Abreu & Mendes (2001), who discovered a negative connection. The paper implies that as operation costs increase the Ethiopian banks must have been acquiring substantial equity growth.

Market Share and Financial Performance

The research looked at the impact of market share on the financial performance of Ethiopia's publicly traded commercial banks. In the study, market share depicts the banks' effect on the market. The findings revealed that market structure had a minimal positive impact on the financial performance of Ethiopia's top 10 private banks. As a result, the financial performance of Ethiopia's publicly traded commercial banks is unaffected by market share. This is in line with Wood's (2003) and Ojiambo's (2014) results. Which implies no matter the market share of the bank, the return on asset always stays the same.

Table 4-9. Comparison of hypothesis and findings

No	Variables	Hypothesis	Results
1.	Real Estate Finance	Negative & Significant	Positive & Significant
2.	Liquidity Ratio	Negative & Significant	Positive & Insignificant
3.	Bank Size	Negative & Insignificant	Negative & Insignificant
4.	Capital Adequacy	Negative & Insignificant	Negative & Significant
5.	Cost of Operation	Positive & Significant	Negative & Significant
6.	Market Share	Positive & Insignificant	Positive & Insignificant

Chapter Five

5. Conclusion and Recommendations

5.1 Introduction

The following debates, conclusions, and suggestions were drawn from the analysis and data gathered. The analysis was based on the study's goals. To determine how real estate financing and other bank parameters affects the financial performance of private Ethiopian banks, to establish the relationship between mortgage loans and commercial banks' return on asset, and to establish the relationship between bank variables and commercial banks' financial performance in Ethiopia. The research indicated that real estate finance, cost of operation and capital adequacy are the three critical factors of Ethiopian commercial banks' financial performance. According to this, capital adequacy and operating costs have a considerable negative impact on a bank's ROA, whereas real estate finance has a significant positive impact. Whereas liquidity ratio, and market share have an insignificant negative impact. On the other hand, the size of the bank has no bearing on the ROA.

5.2 Conclusion

The empirical findings on the drivers of commercial bank financial performance in Ethiopia imply the following conclusions for the sample. The primary goal of this research was to identify the most critical internal factors impacting Ethiopian financial commercial banks from 2010 to 2020. Secondary sources were used to gather the essential information. Financial ratios were produced, and statistical methods such as percentages, averages, the natural logarithm, correlation, descriptive analysis of variance, and regression analysis were used to evaluate the hypotheses and compare and contrast the banks based on their various features. As a consequence, from 2010 to 2020, this article looked at the effects of internal drivers of financial performance (ROA) on Ethiopia's top ten private commercial banks.

For financial performance, a balanced correlation and regression analysis was performed. The models were evaluated for the classical linear regression model assumptions before performing OLS regression. All of the CLRM's assumptions are met by the models. Based on the results of the test, the random effect model (REM) was utilized. Only two of the available explanatory factors turned out to be statistically significant. The other four explanatory variables, real estate financing, liquidity ratio, bank size, and market share, are statistically insignificant. We may draw the following conclusions based on the regression findings using the conventional linear regression model.

The study found that real estate financing, in terms of loans issued as well as other activities that increase the overall value of mortgages extended by commercial banks, had substantial impact on the financial performance of Ethiopian private commercial banks. Also, the study found that capital adequacy and cost of operations had a substantial impact on commercial banks' financial performance in Ethiopia. Furthermore, the study finds that the size of a bank has little bearing on its financial success in Ethiopia. Similarly, it was discovered that liquidity ratio and market share had a considerable impact on commercial banks' financial performance in Ethiopia.

5.3 Study Implications

The goal of this study was to discover predictors of commercial bank financial performance in Ethiopia utilizing data from 2010 to 2021. As a consequence, the study discovered variables that may have an impact on bank performance.

The outcome has several implications for investors and the banking industry. More significantly, banks should understand which factors are enhancing their profitability. Then banks compete on that issue, increasing competition among commercial banks and resulting in lower loan pricing, which benefits all stakeholders. Overall empirical data show that commercial bank profitability is impacted by bank specific characteristics that may have a direct link with bank variables as well as macroeconomic factors that are not a direct result of bank variables such as inflation. In general, there are issues that this article has not yet addressed and that will be addressed by future scholars in the field. Low-income people in the nation have limited access to credit. In terms of credit availability, the government

favors the middle and higher classes. The biggest current concerns include corruption, regulatory policy flaws, and weak legal institutions in situations of borrowers' inability to fulfill commitments; loan write-off (commercial banks report). This necessitates training and competency development among commercial bank and regulatory professionals. Prudent credit risk management and technology, as well as a strong internal resource management plan, would most likely be the focus of policies.

Commercial banks should be mindful of how mortgage lending impacts their financial performance, according to the report. Mortgage finance at current levels has not improved bank financial performance, hence it may be required to investigate how mortgage finance might be utilized to improve bank financial performance in Ethiopia. The report also advises banks to examine their liquidity ratios, as current ratios have a detrimental impact on performance. As a result, lower liquidity ratios are sought in order to provide better financial performance for Ethiopia's listed commercial banks.

5.4 Recommendations

Recommendation for Policy

Commercial banks should be mindful of how mortgage lending impacts their financial performance, according to the report. Mortgage finance at current levels has not improved bank financial performance, hence it may be required to investigate how mortgage finance might be utilized to improve bank financial performance in Ethiopia. The report also suggests that banks assess their real estate finance, capital adequacy and operating costs, as current ratios have a detrimental impact on financial performance. As a result, lower operating costs and enough capital would be preferable to provide improved financial performance for Ethiopia's listed commercial banks.

Recommendation for Further Research

More research in this area is needed, according to the report, with a focus on additional banks in Ethiopia (17 banks are functioning as of 2021), as well as other financial

organizations such as microfinance that provide mortgage loans. This may be accomplished by targeting all Ethiopian commercial banks or medium-sized microfinance institutions. Studies on the issue should also be done over longer periods (over 10 years), since these studies may be valuable in demonstrating patterns as well as the long-term link between mortgage finance and commercial bank financial performance in Ethiopia. Further research into the relationship between mortgage financing and financial performance should be conducted utilizing a mixed methodological approach that includes both primary and secondary data sources. Some concerns that can't be addressed using secondary data can be correctly represented this way.

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Appendixes

A. Banks financial data.

Source: National Bank of Ethiopia Summary report.

Real estate loan to total loan percentage (%)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	16.1	18.7	22.2	19.8	16.4	14.8	16.1	17.8	20	22	21.1
2	DB	6.2	7.4	8.8	7.5	5.9	6.1	7.4	10.7	11.9	12.2	10.6
3	BOA	12.3	11.1	10.2	12	13	14.9	11	10.9	9.2	10.9	11.1
4	WB	7.3	7.1	8	7.3	9.1	8.2	9.8	10.2	11.8	13.4	14
5	HB	12.8	12.4	14	13	13.2	11	10.2	12.1	16	14	13
6	NIB	22.1	18.5	18.5	19.3	14.5	13.7	15.4	15.4	13.6	17.1	15.4
7	LIB	4.89	8	10.5	13.2	17	19	22.3	20.6	13.4	9.3	9
8	CBO	0.42	0.51	0.7	0.83	0.68	0.94	1.15	0.72	2.12	1.2	2.1
9	ZB	12	11.6	10	11	13	11	9	9	6	7	9
10	OIB	2.1	2.1	3.4	6	10.1	8	11.5	9.8	12.1	11	10.6

Liquidity Ratio percentage (%)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	50.88303	40.02	26.48	22.21	25.27	16.26	19.56	16.68	21.05	15.23	16.17
2	DB	42.54184	42.47	32.96	30.69	29.79	22.33	24.04	15.18	15.5	10.83	12.81
3	BOA	47.16907	39.79	30.62	23.82	24.35	45.9	18.44	13.58	14.04	11.38	11.17
4	WB	52.8693	51.37	33.43	26.7	26.08	17.84	19.13	18.64	14.78	14.38	16.68
5	HB	55.53962	46.07	32.58	20.65	28.5	18.96	16.9	14.55	16.15	10.72	12.37
6	NIB	51.38719	51.24	36.02	24.66	17.83	13.56	18.81	15.61	14.56	11.66	12.57
7	LIB	54.30542	50.48	42.19	33.43	31.27	26.2	22.59	24.34	21.08	17.7	21.69
8	CBO	48.15409	48.67	33.67	52.41	23.91	21.26	19.97	19.67	27.14	22.43	13
9	ZB	57.89399	43.82	37.59	34.58	38.06	23.68	29.95	31.82	32.46	17.2	23.61
10	OIB	56.20122	43.32	39.72	30.72	30.31	17.57	19.04	20.37	24.41	16.11	15.72

Market Share (% out of 1)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	0.015424	0.014	0.014	0.015	0.015	0.015	0.017	0.023	0.028	0.022	0.021
2	DB	0.023983	0.02	0.02	0.019	0.017	0.016	0.017	0.019	0.023	0.017	0.016
3	BOA	0.012191	0.01	0.01	0.01	0.009	0.009	0.01	0.014	0.016	0.012	0.013
4	WB	0.011148	0.011	0.01	0.01	0.009	0.009	0.009	0.011	0.014	0.009	0.009
5	HB	0.011447	0.01	0.01	0.009	0.009	0.009	0.01	0.012	0.014	0.011	0.01
6	NIB	0.011591	0.01	0.01	0.009	0.008	0.008	0.009	0.011	0.013	0.01	0.01
7	LIB	0.002647	0.002	0.003	0.003	0.003	0.004	0.005	0.006	0.007	0.006	0.007
8	CBO	0.003433	0.003	0.004	0.006	0.006	0.007	0.006	0.01	0.015	0.012	0.012
9	ZB	0.002049	0.002	0.003	0.003	0.003	0.003	0.004	0.005	0.006	0.004	0.004
10	OIB	0.002172	0.003	0.003	0.004	0.005	0.006	0.007	0.009	0.012	0.009	0.008

Bank Size (ln)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	8.9803	9.222	9.387371	9.685	9.905	10.08	10.3	10.64	10.92	11.22	11.4
2	DB	9.4217	9.593	9.771101	9.891	9.997	10.12	10.26	10.45	10.72	10.94	11.13
3	BOA	8.7451	8.893	9.016696	9.226	9.33	9.523	9.731	10.14	10.37	10.58	10.95
4	WB	8.6556	8.995	9.029675	9.249	9.353	9.526	9.692	9.95	10.22	10.3	10.55
5	HB	8.6821	8.952	9.081012	9.209	9.382	9.572	9.757	9.994	10.24	10.48	10.67
6	NIB	8.6946	8.869	9.021078	9.121	9.282	9.492	9.67	9.953	10.19	10.43	10.66
7	LIB	7.2179	7.5	7.809147	7.987	8.192	8.676	9.002	9.303	9.569	9.923	10.37
8	CBO	7.4778	7.824	8.208145	8.785	8.903	9.347	9.277	9.783	10.31	10.64	10.87
9	ZB	6.9619	7.386	7.78082	8.086	8.275	8.492	8.906	9.177	9.433	9.595	9.825
10	OIB	7.0198	7.582	7.932861	8.272	8.724	9.163	9.331	9.698	10.08	10.37	10.43

Return on Asset (%)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	0.0345	0.04	0.035771	0.031	0.034	0.029	0.028	0.028	0.031	0.038	0.032
2	DB	0.0293	0.033	0.040523	0.033	0.034	0.031	0.027	0.024	0.023	0.02	0.025
3	BOA	0.0239	0.027	0.02788	0.029	0.025	0.023	0.024	0.027	0.02	0.022	0.018
4	WB	0.0411	0.047	0.040985	0.037	0.029	0.028	0.025	0.029	0.033	0.022	0.024
5	HB	0.0331	0.034	0.036077	0.03	0.025	0.021	0.021	0.019	0.023	0.024	0.023
6	NIB	0.0373	0.038	0.037204	0.034	0.03	0.028	0.027	0.024	0.022	0.024	0.027
7	LIB	0.0345	0.028	0.03531	0.041	0.029	0.032	0.028	0.028	0.031	0.031	0.025
8	CBO	0.018	0.022	0.033062	0.037	0.049	0.033	0.004	0.015	0.018	0.018	0.025
9	ZB	0.0277	0.067	0.063477	0.043	0.033	0.051	0.035	0.033	0.029	0.024	0.036
10	OIB	0.0267	0.029	0.020852	0.02	0.031	0.028	0.015	0.021	0.036	0.027	0.026

Capital Adequacy (% out of 1)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	0.1184	0.129	0.134906	0.125	0.126	0.129	0.129	0.111	0.088	0.094	0.101
2	DB	0.0909	0.095	0.104332	0.104	0.118	0.118	0.118	0.115	0.129	0.122	0.122
3	BOA	0.0932	0.091	0.11003	0.109	0.136	0.132	0.126	0.115	0.133	0.126	0.1
4	WB	0.1832	0.166	0.192177	0.176	0.186	0.176	0.173	0.16	0.14	0.144	0.134
5	HB	0.1081	0.117	0.125382	0.12	0.133	0.117	0.12	0.115	0.105	0.108	0.125
6	NIB	0.1535	0.165	0.184631	0.182	0.183	0.164	0.159	0.141	0.127	0.131	0.136
7	LIB	0.1773	0.195	0.179342	0.184	0.174	0.14	0.132	0.132	0.126	0.126	0.11

Cost of Operation (%)

		Year										
No	**Banks**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
1	AIB	26.34974	22.96	26.58	33.39	32.12	34.81	37.4	39.83	36.35	32.32	38.73
2	DB	26.74253	25.51	24.45	28.29	28.64	35.15	38.12	44.33	41.85	40.12	41.03
3	BOA	30.98428	31.71	31.26	29.48	34.09	38.3	43.66	44.16	44.35	40.97	49.11
4	WB	30.43655	31.49	29.64	34.26	39.72	43.92	46.44	45.18	41.63	45.09	47.67
5	HB	31.07615	25.88	27.23	31.41	38.62	44.22	42.97	44.13	39.69	38.34	47.3
6	NIB	32.62444	29.42	28.71	32.26	32.37	38.67	38.21	37.75	38.2	35.73	33.53
7	LIB	37.09821	36.93	34.05	30.48	41.19	48.04	49.27	43.26	40	41.14	43.07
8	CBO	50.61404	42.12	34.53	38.04	34.7	49.56	75.35	62.25	51.92	51.47	48.32
9	ZB	31.38111	25.49	28.95	44.62	26.43	32.82	32.21	32.63	30.96	26.27	25.81
10	OIB	62.14334	59.46	46.61	41.27	40.12	38.95	26.39	39.04	33.46	25.74	17.77

B. STATA V16 Data Analysis Results

1. Correlation of both dependent and independent variables

```
. correlate roa ref lr bs ca co ms
(obs=110)
```

	roa	ref	lr	bs	ca	co	ms
roa	1.0000						
ref	0.1450	1.0000					
lr	0.3889	-0.2014	1.0000				
bs	-0.3693	0.2555	-0.7806	1.0000			
ca	0.3176	0.0971	0.2263	-0.4523	1.0000		
co	-0.5508	-0.3353	-0.2384	0.0693	-0.1099	1.0000	
ms	0.1333	0.3080	-0.0403	0.3864	0.0100	-0.3515	1.0000

2. Regression (first round)

```
. regress ref lr bs ca co ms
```

Source	SS	df	MS	Number of obs	=	110
				F(5, 104)	=	6.73
Model	.078582466	5	.015716493	Prob > F	=	0.0000
Residual	.242952205	104	.002336079	R-squared	=	0.2444
				Adj R-squared	=	0.2081
Total	.321534671	109	.002949859	Root MSE	=	.04833

ref	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lr	-.0756685	.0703782	-1.08	0.285	-.2152311	.0638942
bs	.0096806	.0111275	0.87	0.386	-.0123857	.0317469
ca	.3471225	.2055177	1.69	0.094	-.0604268	.7546719
co	-.197227	.0566082	-3.48	0.001	-.3094832	-.0849707
ms	.2613094	.2645801	0.99	0.326	-.2633628	.7859816
_cons	.0553984	.1343385	0.41	0.681	-.2109999	.3217967

3. Test for Heteroskedasticity

```
. estat imtest,white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(20)     =     19.35
         Prob > chi2  =    0.4992

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	19.35	20	0.4992
Skewness	7.23	5	0.2041
Kurtosis	0.16	1	0.6867
Total	26.74	26	0.4229

4. Correlation of independent variables

```
. correlate ref lr bs ca co ms
(obs=110)
```

	ref	lr	bs	ca	co	ms
ref	1.0000					
lr	-0.2014	1.0000				
bs	0.2555	-0.7806	1.0000			
ca	0.0971	0.2263	-0.4523	1.0000		
co	-0.3353	-0.2384	0.0693	-0.1099	1.0000	
ms	0.3080	-0.0403	0.3864	0.0100	-0.3515	1.0000

5. Variable Inflation Factor

```
. vif
```

Variable	VIF	1/VIF
bs	5.55	0.180323
lr	3.84	0.260283
ms	1.88	0.531735
ca	1.55	0.645046
co	1.23	0.809942
Mean VIF	2.81	

6. Data Skewness Test

```
. predict myResiduals,r

. sktest myResiduals
```

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
myResiduals	110	0.0998	0.5069	3.23	0.1993

7. Hausman Test for Random Effect Regression

```
. hausman fixed random
```

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ref	.0245062	.0085653	.0159408	.0182161
lr	-.0034645	.0003128	-.0037774	.
bs	-.0034968	-.0029189	-.0005779	.
ca	-.0136939	.0292964	-.0429903	.028381
co	-.0386553	-.0450207	.0063654	.0037838
ms	.115538	.0319105	.0836275	.057944

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 5.97
Prob>chi2 = 0.4267
(V_b-V_B is not positive definite)

8. Regression Coefficients

```
. xtreg roa ref lr bs ca co ms, fe

Fixed-effects (within) regression               Number of obs      =       110
Group variable: bank0                           Number of groups   =        10

R-sq:                                           Obs per group:
     within  = 0.3904                                         min =        11
     between = 0.2892                                         avg =      11.0
     overall = 0.3555                                         max =        11

                                                F(6,94)            =     10.03
corr(u_i, Xb)  = -0.1328                        Prob > F           =    0.0000
```

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ref	.0245062	.0236004	1.04	0.302	-.022353	.0713653
lr	-.0034645	.0094294	-0.37	0.714	-.0221868	.0152577
bs	-.0034968	.0015284	-2.29	0.024	-.0065315	-.0004621
ca	-.0136939	.0422055	-0.32	0.746	-.0974939	.070106
co	-.0386553	.0093227	-4.15	0.000	-.0571657	-.020145
ms	.115538	.0703821	1.64	0.104	-.0242073	.2552832
_cons	.0716912	.0200389	3.58	0.001	.0319034	.1114789
sigma_u	.00422578					
sigma_e	.00633324					
rho	.30805724	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(9, 94) = 2.95                     Prob > F = 0.0039
```