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The Effect of Information Technology Investment on Profitability of Selected Ethiopian Commercial Banks

By: Asnake Negash G/Egziabher

Advisor: Abebaw K. (PhD)

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Declaration

Here with I Asnake Negash, declare that this research thesis is papered for the partial fulfillment of the requirements for the Masters of Business Administration entitled “A Study the Effect of Information Technology Investment on Profitability of selected Ethiopia Commercial Banks. This thesis is my original work and has not been used by others for any other requirements in any other university and that all sources of material information in the study have been appropriately acknowledged. I have made it independently with the close advice and guidance of my advisor.

Declared by: Asnake Negash

Signature _____

Date _____

Confirmed by advisor: Abebaw K. (PhD)

Signature _____

Date _____

Place: AUU, Addis Ababa

Addis Ababa University

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By:

Asnake Negash

Approved by board of examiners:

Chairman, Department	Signature	Date
AbebawK.(PHD)	_____	_____
Advisor	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

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LIST OF ACRONYMS AND ABBREVIATIONS

AB: Awash Bank

ATM: Automate Teller's Machine

BB: Buna International Bank

BIB: Berhan International Bank

BOA: Bank of Abyssinia

BZ: Bank Size

CBE: Commercial Bank Ethiopia

CBO: Cooperative Bank of Oromiya

CLRM: The Classical Linear Regression Model.

DB: Dashen Bank

GDP: Gross Domestic Product

INF: Inflation

IT -Information Technology

IT INV: Information Technology Investment.

LIB: Lion International Bank

LP: Labor Productivity

MBA-Master of Business Administration

MOC: Market Concentration

MS: Market Share

NBE: National Bank of Ethiopia

NIB: Nib International Bank

OIB: Oromia International Bank

OLS: ordinary least squares.

PLC: Private Limited Company

POS-Point of Sale

***SPSS*:** Statistical package for social sciences

UB: United Bank

VIF: Variance Inflation Factor

WB: Wegagen Bank

ZB: Zemen Bank

ABSTRACT

Over the years various studies have been made on the relation between technological investments and the performance of commercial banks and contradicting results were observed among researches. The purpose of this study is to evaluate effects of IT Investments on profitability of selected Ethiopian commercial banks. In order to achieve this objective quantitative research methods by using secondary sources of data are applied. Panel data of thirteen (13) Ethiopian commercial banks are selected out of nineteen banks operating in Ethiopia using purposive sampling method for the period 2010 - 2019. The relation between dependent and independent variables was analyzed using multiple regression model by taking banks profitability measure ROA as dependent variable and IT Investment which is not the only determinate of profitability , Bank size, labor productivity, market share, inflation and GDP are considered other than IT as determinate factors for the study as independent variables using Random effect model. The study result showed that IT investment, bank size, labor productivity and inflation have a statistically significant impact on the ROA. The findings of this study revealed that the selected commercial banks have managed to invest a cumulative total of 27,226,381,708.00 birr and an average annual amount of 2,722,638,170.80 birr in the past ten years. The regression analysis findings of the study showed that IT investment and labor productivity have a negative relationship with profitability of commercial banks of Ethiopia. Meanwhile, bank size and inflation rate have a positive relationship with ROA of the commercial banks of Ethiopia. Market share and GDP growth does not have significant relationship with ROA of the banks. Finally, the researcher recommended that IT is not the only determinate of profitability there are also other factors which are not considered in this study liquidity, exchange rate…. Ethiopian commercial banks should not only be concerned about internal structures and policies, but they must consider both significant key internal environment and the macroeconomic environment together in fashioning out strategies to improve their profitability.

Key words*:* IT Investment, performance & ROA

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Internationally, information technology is becoming a vital element in economic development of many countries in the world. In the past years, many information technology innovations have taken place in the world (Meher, 2018). Today's business environment is extremely vigorous and encounters quick changes as a consequence of creativity, universal competition, rapid disseminating of knowledge, continual technology advancement, innovation, increased consciousness and demands from customers (Agbolade, 2011).

Information Technology (IT) is the automation of processes, controls, and information production using computers, telecommunications, software and ancillary equipment such as automated teller machine and debit cards (Johnson, 2005). Irechukwu (2000) lists some banking services that have been revolutionized through the use of ICT as including account opening, customer account mandate, and transaction processing and recording. Communication technology deals with the physical devices and software that link various computer hardware components and transfer data from one physical location to another (Laudon and Laudon, 2001). ICT products in use in the banking industry include automated teller machine, smart cards, telephone banking, electronic funds transfer, electronic data interchange, electronic home and office banking (Johnson, 2005).

The effect of Information Technology (IT) investment on commercial banks is an important issue as this type of investment constitutes a substantial component of costs and exerts a strong influence on bank operations and strategy (Elena, 2005). In order to either sustain or enhance on their competitive advantage in an ostensibly growing industry, banking institutions invest fortune or substantial amounts in IT resources, which could also reveal new means of creating value for both the bank and the customer (Dawit, 2017).

Banks report a significant outlay of its resources in information technology (IT) acquisition and deployment. In fact, for some banks investment in IT constitutes about one-half of their total fixed assets investments for some years. This emphasis on IT deployment suggests that there

may be an important correlation between IT deployment and bank profitability (Wilson, Cosmas & Ikenna, 2014).

To prevail over this perplexing situation, many IT scholars have used more rigorous and scientific research framework; large sample datasets, including additional factors such as a time lag, the information intensity of the industry, new methodology and new theories (Kim, Xiang, Lee, 2009). Moreover, the relationship between IT and firm performance differs from developing countries to developed countries. Because, economic growth, regulation levels, labor costs, IT skills and availability, and heterogeneity, competition, complementary organizational innovations and culture can be different across countries (Kim, Xiang, Lee, 2009). Therefore, the primary purpose of this paper is to investigate the relationship between IT investments and Profitability of selected Ethiopian Commercial Banks.

Osei and Harvey (2011) cited in Adekunle (2014) in their study (covering 15 banks over a period of 10 years) on investments in ICT and bank business performance in Ghana find that investment in ICT tend to increase profitability (ROA and ROE) for high ICT level banks than for lower ICT level banks. Bilkisu (2015) found that there was a significant relationship between investment in IT and financial performance of Nigerian banks when measured by ROA. Kyompaire (2011) found that there is established IT system in the bank and it indicates a positive relationship between the level of implemented IT and profitability of the bank. Taddesse (2015) in his study in investment on accounting information system effect on performance private commercial banks in Ethiopia indicates that investment on AIS has positive significance impact on performance of Private commercial Banks in Ethiopia. Also Rahel (2015) studied on the same topic taking into consideration only private commercial banks those studies in Ethiopia recommend further investigation considering all banks in Ethiopia. To the extent that these facts are concerned my research aims to contribute some knowledge about the effect on performance of banks in Ethiopia.

Financial statements of banks operating in Ethiopia both public and private reveal that their profitability is increasing from year to year. A number of researches have examined that factor that contributed to or that determined the profitability of the banks. As both the internal and external environments in which the banks operate change from time to time, so do the factors that result in profitability.

Hence, the current study aims to fill the existing empirical research gap by analyzing the effects of IT investment on profitability of selected commercial banks in Ethiopia. The research studied thirteen selected commercial banks based on their annual financial report and that have been operating for the last ten years. This is owing to the fact that the research covers a period of 10 years from 2010 – 2019. In this first chapter statement of the problem, general and specific objectives of the study, research hypothesis formulation, significance of the study and scope and limitations of the study are discussed in detail.

1.2. Statement of the Problem

In a world of increasing globalization, competition and customer awareness, IT creates a competitive advantage by increasing organizational performance. It helps banks manage resources, technical expertise and capital; hence, banks seek to enhance their financial performances with increased use of IT (Hussam, Torki&Yaser, 2016).

However, it has been difficult to determine the relationship between IT investment and the financial performance or productivity gains of businesses. Therefore, some authors questioned the effect of IT on productivity in the banking industry. This question began as a major literary trend in 1987 when Robert Solow, winner of the Nobel Prize in Economics, proposed his famous "productivity paradox" during his Nobel speech. "You can see the computer age everywhere but in the productivity statistics!" This statement led to countless studies in the United States and Europe and gave birth to varied explanations. Research assessing the effect/impact of IT investment had begun (Syrine, 2013). The effect of IT investments on firm performance has been the subject of active research in recent years. However, findings of almost all studies are based on data collected in the United States. Little work has been done elsewhere (Gideon, 2011). Similarly studies about effect of IT investments on banks' business value and performance have received massive attention in Europe, the Americas and Asia with mixed results. Nevertheless, the focus on Africa and West Africa, for that matter, tends to be parsimonious in comparison with the theoretical and empirical evidences from the developed economies. Whether the level of investment done in IT actually brings real benefits to the banks, is still a matter of debate in academic circles. Researchers and practitioners have agreed to the fact that traditional analysis – focused only on financial or technological aspects is not complete. Different alternative methods have been suggested to complement evaluation of IT investment (Kar Yan Tam, 1998).

The return from IT investment has been studied by academic researchers, economists, and business practitioners in recent years. On the other hand, research findings about the impact of IT on firm performance have shown conflicting results across studies. Early empirical studies found that there was either no relationship, or a slightly negative relationship, between firm performance and IT investments (D.Wilson, 1993). However, in the late 1990s, several studies indicated a positive relation between IT investments and firm performance, such as productivity or profitability (A. Bharadwaj, S. Bharadwaj, and B. Konsynski, 1999).

Eyob (2010) has investigated the impact of IT on profitability and cost efficiency in six private commercial banks and Rahel (2016) researched on impact of IT investment on private commercial banks with a single variable of interest which is IT capital and with other four (labor, capitalization, market concentration, and inflation as independent variables. The methodology selected and the size gap between private and public banks limited the researchers to focus on private banks respectively. Accordingly, as per the knowledge of the researcher and those studies recommended further investigation considering all banks in Ethiopia as well as methodology and size gap limitation, no knowledge exists that defines clearly the impact of investment in IT on the financial performance in respect of the whole commercial banks in Ethiopia except both studies that were conducted on private banks only.

To fill this gap this study focused on thirteen Ethiopian commercial banks due to obtaining available information and further describe their activities from 2010 to 2019 were the last ten years micro and macro-economic data that IT investment is not the only determinate of profitability other bank specific, sector specific and macroeconomic variables are considered. Taking six domains of explanatory variables IT Investment which is not the only determinate of profitability and other variables are consider for this study labor productivity, market share, inflation and by adding bank size and GDP as a determinant of profitability which are not included in previous study.

1.3. Objective of the Study

1.3.1. General Objective

The major objective of the study is to investigate the effects of Information Technology Investment on the profitability of commercial banks in Ethiopia.

1.3.2. Specific Objectives of the Study

Specifically, the study has covered the following objectives:

1. To identify the relationship between independent variables and dependent variables
2. To examine the effect of IT investment on the profitability of commercial banks in Ethiopia.
3. To evaluate the effect of bank specific, sector specific and macroeconomic variables.

1.4. Research Hypothesis

The following hypotheses are formulated based on theories related to IT investment on bank's profitability that has been developed over the years by banking area researchers. The hypotheses of the study are derived from literature and internal and external factors that determine bank profitability to be taken into account in this study. Thus, the researcher has developed the following hypothesis:

H0: There is positive relationship between IT investment (IT) and banks profitability of commercial banks in Ethiopia.

H0: Bank Size has positive effect on commercial bank's bank profitability.

H0: Labor productivity has negative effect on commercial bank's bank profitability.

H0: There is positive relationship between bank market share and bank's profitability.

H0: Inflation has negative effect on commercial bank's bank profitability.

H0: Economic growth has negative effect on commercial bank's bank profitability.

H0: Economic growth has positive effect on commercial bank's bank profitability.

1.5. Significance of the Study

The study's basic significance is in its contribution to the shortage of empirical research in the area of information technology investments in Ethiopia and its profitability. This is one of the factors that motivated the researcher to study; this area has lack of sufficient study made on the topic. In doing so, the study provides a practical benchmark reference on IT investment patterns, by showing the investment focused of banks. On the other hand, it gives the reader a

comprehensive idea about the importance of infrastructure on IT Investment and performance of profitability in commercial activities.

Moreover, the study's finding also help commercial banks to capture the impact and pay off the investment they made on Information Technology. Finally, this study serves as an input and foundation for further works who would like to undertake research on related area of study.

1.6. Scope of the Study

Specifically, the study intends to investigate the effect of information technology investment on profitability of selected commercial banks in Ethiopia. In this study the researcher was only consider ten (10) fiscal years i.e., from 2010 to 2019; for the IT investment analysis of the following thirteen selected commercial banks; Awash International bank, Bank of Abyssinia, Berhan International Bank, Buna International Bank, Commercial Bank of Ethiopia, Cooperative bank of Oromia, Dashen Bank, Lion International Bank, Nib International Bank, Oromia International Bank United Bank, Wegagen Bank and Zemen Bank. The reason that the study was not include very recent data of 2020 is that information for all commercial banks is not available and didn't end of fiscal year. Thus, this paper was show the trend of commercial banks but not become whole mirror for a wide period that is why they considered ten fiscal years data.

IT investment is part of assets of commercial banks, only one dependent variable was selected which is ROA (return on asset) compared to ROE (return on equity) and NIM (net interest margin) as used in different literatures. Rivard and Thomas (1997) as cited by Melaku (2016) suggested that bank profitability is best measured by ROA in that ROA is not distorted by high equity multipliers and ROA represents a better measure of the ability of a firm to generate returns on its portfolio of assets.

1.7. Limitations of the study

The study was limited with explanatory variables which are mentioned on the statement of the problem above profitability of commercial banks as control variables that are frequently described in conventional banking studies and literatures, because it is not significant to use more bank profitability determinants on the current study objective.

1.8. Organization of the Study

The paper is organized into five chapters: the first chapter gives us introduction including background of the study, problem statement, and objective of the study, significance of the study, scope and limitation of the study in effect of IT investment on profitability of commercial banks in Ethiopia. The second chapter explains review of related literature including theoretical and empirical study working together in relative to IT Investment and profitability in the bank. The third chapter deals with research methodology; the fourth chapter shows data representation, Analysis and findings of discussion. Finally, the last chapter brings the study to an end with findings, conclusion and recommendation obtained from the analysis and discussion research findings.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

Under this chapter the theoretical and empirical evidences focusing on the effects of Information Technology investment on profitability of commercial bank service is presented and has three sections. Accordingly, the first section presents overview of banking service in Ethiopia. The theoretical review part discusses the theories that states about Information technology and the banking sector, Information technology investments and the variables that are claimed to affect bank profitability. The empirical literature part reviews past studies that were conducted on the area of effect of IT investment on profitability of commercial banks.

2.2. Theoretical review

2.2.1. Information Technology

Information technology (IT) is the use of computers and telecommunications equipment to store, retrieve, transmit and manipulate data. The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several industries are associated with information technology, such as computer hardware, software, electronics, internet, and telecom equipment and computer services (Berger, 2003).

Information Technology which is synonymous with computer communication technology in everyday language can be defined as technologies that facilitates the information cycle, comprising gathering, processing, disseminating and storing of information and as such information technology encompasses a wide range of technologies such as telephone, computer, word processing application, web browser, servers, ATM, full text document, database and main frame computers (Irechukwu, 2000).

IT, therefore, produces information that supports the management functions of an organization. In recent years, the utilization of information technology has been magnificently increased in service industries, particularly, the banking industry, which by using Information Technology related products such as internet banking, electronic payments, security investments, information

exchanges can deliver high quality services to clients with less effort, thereby enhancing their financial performance (Laudon and Laudon, 2006).

2.2.2. Role of Information Technology in commercial banks

Banking environment has become highly competitive today. To be able to survive and grow in the changing market environment banks are going for the latest technologies, which is being perceived as an enabling resource that can help in developing learner and more flexible structure that can respond quickly to the dynamics of a fast changing market scenario. It is also viewed as an instrument of cost reduction and effective communication with people and institutions associated with the banking business.

IT enables sophisticated product development, better market infrastructure, implementation of reliable techniques for control of risks and helps the financial intermediaries to reach geographically distant and diversified markets. Internet has significantly influenced delivery channels of the banks. Internet has emerged as an important medium for delivery of banking products and services. The customers can view the accounts get account statements, transfer funds and purchase drafts by just punching on few keys. The smart cards i.e., cards with microprocessor chip have added new dimension to the scenario (Tulasi&Lokeswara, 2015).

The general advantages IT brings are as follows and listed in the literature by (Nadire&Dambudzo, 2015):

1. Globalization: Information Technology has brought the world closer and allowed for information to be shared easily, quickly and effectively. Allowing for transactions to be performed regardless of where an individual or businesses are located. Information Technology has broken down geographical boundaries making the global village so small.
2. Communication: Information Technology has made communication easier, quicker, cheaper and more efficient. People are now able to communicate with each other from anywhere around the world. For example, through video conferencing, email, texting, instant messaging, social networking, radio on the go, television on the go, voice calls and VoIP.

3. Cost Effectiveness and Operational Excellence: Automation of processes for individuals and businesses means our daily lives have been transformed. Our daily lives have been made so much easier and economically effective. Cost effectiveness gives rise to profits realized and better pays for employees. Making daily lives easier and less strenuous working conditions. Transactions are achieved in the less amount of time compared to the days before automation. Fewer errors are made by the use of IT.
4. Bridging the Cultural Gap: People from different nationalities and cultures are able to communicate amongst themselves and this allows for exchange of views and opinions which could better their lives, increase awareness and decrease prejudice.
5. Longer Working Hours: Business hours are extended from the normal Monday to Friday and 8-5 working days. The business is virtually open 24 hours and 7 days a week. This applies to all businesses around the globe. The extended hours allows for business transactions to be conducted from anywhere and anytime of day. People are now allowed to purchase anytime and anywhere.
6. Creation of New and Exciting Jobs in the Field of IT: Creation of new and interesting jobs within the Information Technology field. For example, would have computer programmers, system administrators, system analysts, technical specialists of hardware and software, web development, computer engineering and network administration.
7. Business Intelligence: IT in banking gives competitive lead amongst other rivals. Crucial and essential information obtained will be used in making strategic business decisions. Information attained from competitors, individuals, business environment, internal operations and business partners.
8. Customer satisfaction and retention: new products witnessing the changing customer needs were being devised as customer analytics, customer data integration and efficient delivery channels and the banks focus was gradually changing from not only tapping new customers but also retention of old customers.
9. Competitive advantage: Strategic use of Information Technology as to support sufficient everyday operations. Information technology serves as a major competitive differentiation in business so their strategies should be based on the use of Information Technology when they are developing services and products.

10. Creation of new markets: Information Technology has opened up new markets, new products, new services and sufficient delivery channels from the banking sector.

    It has helped the banking industry to deal with the challenges the new economy poses and for that matter it has been a cornerstone of recent financial section reform aimed at increasing the speed and reliability of financial operations and of initiatives to strengthen the banking sectors by meeting high expectations of the customers who are more demanding for example the introduction of new delivery channels in the form of automated teller machines, net banking and the like. All these have reduced the cost of global funds transfer.

2.2.3. Information Technology Investment

Investment in Information Technology has become important for both public and private organizations, and studies confirm the importance of spending to create and establish IT because of the benefits achieved for companies and the economy in general (Becchetti, Bedoya &Paganetto, 2013). To increase the benefits of IT, an organization should consider the factors related with in investment, in order to own the suitable IT.

Keen (1995) views IT investment as a term applies to investing in equipment, application, service and basic technologies. Others, such as Weill and Oison (1989) view IT investment as the expanse associated with acquiring computers, communication, software, networks and personnel to manage and operate a management information system.

According to Ayanda et al. (2011) it is imperative for bank's management to intensify investment in Information Technology products to facilitate speed, convenience and accurate services, or otherwise they may lose out customers to other competitors. Agrawal and Jain (2013) also agreed that, intense competition among the banks has redefined the concept of the entire banking system; the banks are looking for new ways not only to attract but also to retain their customers and gain competitive advantage over their competitors. They continued that, while banks are striving to strengthen customer relationship and move towards relationship banking customers are increasingly moving away from the confines of traditional branch banking and seeking the convenience of remote electronic banking. Information technology and the communication networking systems have revolutionized the working of banks and financial entities all over the world.

Organization investment decision on information technology is one of the most critical and enormous amount of fund requiring investment. Most organization currently depending on information technology to be competitive on ever increasing sophisticated world. Eyob (2010) defined IT capital investment as any acquisition of computer hardware, network facilities, or pre-developed software, or any "in-house" systems development project, that is expected to add to or enhance an organization's information systems capabilities and produce benefits beyond the short term.

Investment on Information technology and performances in terms of economic profitability, financial profitability and value added. Investing in staff training, improving the quality of products and internal processes and increasing IT investment will be the leverage for achieving a stronger, more flexible corporate culture to face continual changes in the environment. Innovation is the incentive with which a virtuous circle will be put in place, leading to better firm performance and a reduction in the financial and organizational obstacles, while making it possible to access capital markets (Menachemi, Burkhardt, Schewchuk, Burke, & Brooks, 2006).

Information technology has become the heart of banking sector while banking industry is the heart of every economy (Alhaji &Rosmaini, 2012). The recent economic crisis in the world raised from banking industry can be seen as proof for the influence of the industry on the world. Technology is now a day's becoming key element to overcome challenges in modern banking business such as performance improvement, customer's satisfaction and quality of service delivered. Through the introduction of IT related products in internet banking, electronic payments, security investments, information exchanges Berger (2003) banks now can provide more diverse services to customers with less manpower. Seeing this pattern of growth, it seems obvious that IT can bring about equivalent contribution to profits.

2.2.4. Investment in IT and Bank Profitability

Ranganathan and Brown (2006) as cited in Dawit (2017) firms are making considerable amounts of investments in IT resources presuming that these investments result in payoff. In many firms, IT expenditures and spending are approximately 3% of the total sales and roughly 40% of the firm's total capital expenditures.

Information Technology offers benefits for a wide range of business processes and improves information and knowledge management within the firm, leading to better profitability. Firms can manage their processes more efficiently and, as a consequence, they increase their operational efficiency. Moreover, IT reduces the coordination costs of the firm because of lower procurement and inventory costs and closer coordination with suppliers (Tachiki, 2004 &OECD, 2004). In addition, communication based on IT and the Internet can also improve external communication, reducing the inefficiencies resulting from lack of co-ordination between firms, and increasing the speed and reliability of information processing and transfer.

The relation between information technology and Banks profitability is dependent on many factors simply investing large amount of money on information technology do not create value. IT investments alone cannot be taken as a sole factor for the profits of a firm.

2.3. Bank Profitability

Like all financial institutions, banks profit by earning more money that what they pay in expenses. The major portion of bank's profit comes from the fees that it charges for its service and the interest that it earns on its assets. Banks major expense is that interest paid on its liabilities. Commercial banks are important financial institutions in the financial system and the economy. They have played an important role in the tremendous economic development that has taken place in the region in recent years. Banks mobilize, allocate and invest the greatest part of the economic agent's savings. In addition, their performance has important consequences on capital allocation, firm expansion, industrial growth and economic development. Therefore, profitability of banks is very important not only at the individual bank level, but also in the macroeconomic level. Profitability is a reflection of how banks are run, given the environment in which they operate. Profitability is vital in maintaining the stability of the banking system and contributes to the state of the financial system (Goddard et al., 2004).

Various theoretical relationships exist between the several types of performance. Studies on the performance of banks started in the late 1970s and early 1980s with the application of two industrial organizations models: the Market Power and Efficiency Structure theories (Athanasoglou et al., 2006). Moreover, the balanced portfolio theory has also contributed into the study of bank profitability (Nzongang&Atemnkeng, 2006).

According to Bami (2014) stated that market power indicates that performance of bank is influenced by the market structure of the industry. There are two different approaches within the market power theory: the Structure-Conduct-Performance (SCP) and the Relative Market Power (RMP) hypotheses. In SCP approach, banks in more concentrated market are more willing to raise their profitability, by the opportunity to lower the deposits rates and to charge higher loan rates as a result of the monopolistic environment, rather than firms operating in less concentrated markets. While, RMP hypothesis implies that bank profitability is influenced by market share. It supposes that only banks with differentiated products can influence prices, exercise market power and earn non-competitive profits (Bami, 2014).

The efficiency theory assumes that banks earn high profits because they are more efficient than others. The efficiency theory has two different approaches such as: the X-efficiency and Scale-efficiency hypothesis. Efficient firms are more profitable because of their lower costs due to X-efficiency. Larger firms can gain lower unit cost and higher profits through the economies of scale. Such firms tend to have large market share, which can provide higher concentration and profitability (Athanasoglou et al., 2006).

The balanced portfolio is the most significant and plays an important role in bank performance studies). According to the Portfolio theory, the optimal holding of each asset in a wealth holder's portfolio is a function of policy decisions determined by a number of factors such as the vector of rates of return held in a portfolio, a vector of risks associated with the ownership of each financial assets and size of the portfolio. They stated that the ability to receive maximum profits depends on the feasible set of assets and liabilities determined by the management and the unit costs incurred by the bank for producing each component of assets (Nzongang&Atemnkeng, 2006).

Also, balance sheet structure could influence bank's profitability; therefore, the equity-to-asset-ratio is an important balance sheet ratio. According to Modigliani and Miller (1958) theorem, there exists no relationship between the capital structure (debt or equity financing) and the market value of a bank. Financing theory suggests that increasing risks, by increasing leverage and lowering the equity-to-asset ratio, leads to a higher expected return as entities will take more risks when expected return will increase. This theoretical explanation is known as the risk-return trade off (Ommeren, 2011).

The profitability of a bank may be also influenced by certain factors. Some of these factors may have a positive impact on the bank's profitability while the others could have a negative impact. From the point view of controllability, some of the factors that affect the profitability of a bank could be under the control of the bank's management and the others could be beyond its control. Those factors over which a bank's management has control are referred in the banking literature as bank specific or internal factors. They are so called bank specific or internal factors because depending on the likely impact they have on the profitability of the bank they can be reinforced (positive treatment) or weakened (negative treatment) by the management of the bank (Rao & Tekeste, 2012).

Generally, these factors may relate to a bank's overall managerial practices on capital structure, liquidity management, credit risk, loan portfolio management, expense management and diversification of a bank's line of products or activities. Those factors over which the management of a bank lacks control are external to the bank. These factors generally relate to the industry and macroeconomic variables within which the bank operates. The external factors may include factors related to the level of competition in the industry to which the bank belongs (concentration), barriers related to entry to and exit from the industry, the pace of economic growth, the nature of the regulation and supervision of the banking industry, inflation, financial deepening, and monetary and physical policies, among others. Thus, apart from the management of a bank, knowledge of the underlying internal and external factors that affect the financial performance of a bank is vital for policy makers and bank supervisors and regulators in framing future policies aimed at improving the profitability of the banking sector (Rao & Tekeste, 2012).

2.3.1Determinants of Bank Profitability

2.3.1.1. Internal Determinants

The internal determinants of commercial banks profitability are those management controllable factors which account for the inter-firm differences in profitability, given the external environment. Vong and Chan (2008) define internal determinants of bank profitability as factors that are influenced by a bank's management decisions. As stated by Rasiah (2010) internal determinants can be broadly classified into two sub-categories namely financial statement variables and non-financial statements variables. The financial statement variables are

determining factors which are directly driven from items in a balance sheet and profit & loss accounts of the bank.

The most frequently used bank profitability determinants which are driven from financial statement include;

1) Capital: it is measured by the ratio of equity capital to total asset. Bank equity capital can be seen in two ways. Narrowly, as stated by Aburime (2008), it can be seen as the amount contributed by the owners of a bank (paid-up share capital) that gives them the right to enjoy all the future earnings. More comprehensively, it can be seen as the amount of owners' funds available to support a bank's business. The later definition includes reserves, and is also termed as total shareholders' funds. No matter the definition adopted, a bank's capital is widely used as one of the determinants of bank profitability since it indicates the financial strength of the bank.

   However, authors who have studied the issue (Berger, 2003). Try to summarize here the main explanations given by the authors to justify their results: A high level of capital reduces the risk (bankruptcy) incurred by banks. They can therefore afford to maintain the same level of risk of investing in riskier assets whose expected return is of course higher. This results in better performance.
2) Bank Size: In most literatures the effect of size on banks profitability are represented by total asset. Ramlall (2009) indicated that **s**ize is used to capture the fact that larger banks are better placed than smaller banks in harnessing economies of scale in transactions and enjoy a higher level of profits. One of the most important questions underlying bank policy is which size optimizes bank profitability.

   Stiroh (2006) show that effects of the size and emphasize that the more a bank is, the more difficult it is to manage. Additionally, the authors point out that the size may result from aggressive growth strategy, obtained at the expense of margins and performance.
3) Asset Composition: which is explained by total loans divided by total asset, provides a measure of the main income source of the bank assets transferred to debtors' (Ana P. I. Vongand Hoi Si Chan, 2008). Traditionally, banks are intermediaries between lenders and borrowers. According to Abreu and Mendes (2002), other things assumed constant, the more

the deposits that are transformed into loans bank performance, the higher the level of profit will be.

4) Liquidity: The liquidity of a bank is measured by the ratio of liquid assets to deposits. This ratio shows the capacity of a bank to meet payments as and when its depositors and other suppliers of funds require. The lower ratio of this reveals that the bank will face difficulty in meeting payments in the right time and hence its liquidity low. A lower ratio of this, then, would mean that the bank will not effortlessly get funds or else it will have to incur an extremely high rate of interest which will mount the cost of funding and eventually impinge on the profitability of the bank unfavorably. On the other hand, an extremely higher ratio of this would mean that the bank has kept excess liquid assets inactive and hence losing interest income (Mohana & Tekeste, 2012).

   The vast majority of authors found a positive relationship between this ratio and performance therefore a negative relationship between liquidity and performance. This result is surprising, especially in the worst case. Authors obtain results depend on result of Berger (2003) which explain in detail the positive impact of liquidity on the value of banks.

5) Deposit Fund: Commercial banks mainly depend on the funds deposited by their clients (the public) in order to lend it out and earn interest income. It is also the number one expense item for a banking sector because there is interest payment for different types of deposits. Two arguments can be opposed on the one hand, a high level of deposits can increase performance, because they are more stable funding and less expensive than borrowed funds. On the other hand, such deposits require large teams and specialist departments to manage, causing many expenses. It seems that only many researchers were interested in this issue. Their results support the second argument that the high costs generated by these deposits lead to weigh negatively on the performance of banks.

6) Credit Risk: Credit risk can be defined as the potential loss of all or part of interest owed, or the original loan, or both together. There are lots of factors for credit risk to influence the performance of banks, poor loan management, poor legal environment failed to exercise banks right, macro-economic factors, lack of adequate information about borrowers and others can be mentioned. According to Vong & Chan (2008), if banks operate in more risky environments and lack the expertise to control their lending operations, it will probably result in a higher loan-loss provision ratio.

7) Number of Bank Branches: Heaster and Zoellner (1966) as quoted by Rasiah (2010) considered number of branches as one of the explanatory variables in their profitability study. They found that the number of branches had no effect on profitability and also it can be captured by other variables such as the amount of deposit received or the amount of loan provided. Emery (1971), again as quoted by Rasiah (2010) studied the relationship between the status of the branch categories namely unit branch, limited branch and state –wide branch. Using analysis of variance, Emery (1971) found that there was a significant difference in terms of returns among these three categories of branches.
8) Labor productivity: posited the rate of change in labor productivity (Real Gross Total revenue over number of employees). In recent years banks have faced severe competition due to the lowering of barriers to entry and the globalization of the industry, which has forced them to reorganize (Athanasoglouet al., 2005). They have been targeting high levels of efficiency and productivity growth both by keeping the labor force steady and by increasing overall output. Hence a positive relationship is expected between efficiency and productivity as well as profitability of the bank. Empirical evidence from Athanasoglouet al.(2005) shows that labor productivity growth has significant effect on bank profitability.
9) Regulation: Commercial banks are stringently regulated by the central bank to prevent failures because of fraud, mismanagement etc. Commercial banks must comply with all applicable laws, such as statutory reserve requirements, liquidity requirements, laws relating to taxation and accounting procedures, opening of new branches, mergers, etc. Frame et al. (1994) as cited by Rasiah (2010) showed that the banking industry is among the most heavily regulated industries in the world. Theoretically, regulation in banking is based on standard assumption that banks are profit maximizing units.
10) Market Share: The impact of market share has mainly been studied by (Liu, 2010). These authors show that, at least in Japan, a negative relationship between market share and performance (measured by NIM), and regardless of the type of bank. These loans are riskier, they will match the higher interest rates, which will increase their performance and their NIM (Martinez-Peria, 2004) result in the short term, reduce the NIM and the performance of these banks.
11) IT Investment: The effect of Information Technology (IT) investment constitutes a substantial component of costs and exerts a strong influence on bank operations and strategy.

Most financial products and services use IT at some point in the production and delivery process, and a bank's information system places strong constraints on the type of products offered, the degree of customization possible and the speed at which banks can respond to competitive opportunities or threats (Elena, 2005).

2.3.1.2 External Determinants

1) GDP Growth Rate: This is measured by the real annual GDP growth rate, is expected to impact banking profitability positively. Economic growth can enhance bank's profitability by increasing the demand for financial transactions i.e., the household and business demand for loans. During periods of strong economic growth, loan demand tends to be higher, allowing banks to provide more loans. Strong economic conditions are also characterized by high demand for financial services, thereby increasing the bank's cash flows, profits and noninterest earnings. Accordingly, fewer loans would be defaulted during strong economic conditions (Belayneh, 2011, Demirguc-kunt& Huizinga, 1999).

2) Inflation Rate: This is one of important environmental condition which may affect both costs and revenues of most organizations including the banking institutions. Inflation is the rate at which the general level of prices for goods and services is rising in economy overtime. Kutsienyo (2011) in his study pointed out that inflation used as a signal that bank managers are able to forecast accurately inflation and are proactive in managing anticipated inflation. By making accurate forecast of inflation, the manager can increase the rates on loan faster than the rate at which operating cost is increasing so that inflation favorably impacts on profitability. In line with the Bourke (1989), Molyneux et al. (1992), Athanasoglou et al. (2005) & Tesfaye (2014) they indicated that inflation is anticipated by bank which give opportunity for the bank to adjust the interest rate according to the expected inflation rate, therefore it enables the revenue to be increased faster than the costs.

2.3.2. Measures of Bank Profitability

Net interest margin (NIM), return on average assets (ROA) and return on average equity (ROE) are the most frequently used ratios in measuring bank profitability in the baking literature. Studies that explore the factors that influence the profitability of banks use one or a combination of these ratios alternatively as measures of bank profitability in their analysis.

Ratios (net profit to total asset, net profit to equity, and NIM) instead of the real value of profits are used in measuring bank profitability because ratios are not influenced by variations in the general price level (Guru et al., 1999). To recap Guru et al., while ratios are time invariant, the real value of profits may be affected by the time varying inflation rates. That is, ratios are time invariant because both the numerator and the denominator in the period-t would be measured in monetary terms based on period-t price levels.

The choice of the profitability ratios (ROA, ROE, and NIM) depends on the objective of the profitability measure since the end of each of the profitability measures differ. The return on assets (the ratio of net profit to total assets) measures the capability of bank's management to make profits from its assets. It is a good indicator of how well a bank's management is managing the assets of the bank. According to Rivard and Thomas (1997) bank profitability is best measured by ROA for two primary reasons. According to them, one of the primary reasons is that ROA is not distorted by high equity multipliers and the second is that ROA reflects a better measure of a bank's ability to generate returns on its assets. Moreover, ROA takes account of the disparity in the absolute magnitude of the profits that may be related to size (Guru et al., 1999). In contrast, the return on equity (ROE), the ratio of net profit to equity, measures the extent to which the bank's management is generating returns using the equity of the bank's shareholders. And, that of the net interest margin, which is computed as a percentage of earning assets, reflects the extent to which a bank's earning assets are profitable.

Another problem related to ratios particularly with ROA and ROE is that the total values of assets and equity may not remain constant overtime. Thus, taking only the ending balance of a given year may be problematic. To account this problem, average values of consecutive year-end balance sheet figures are normally used. Thus, following the footpaths of previous studies (Kosmidou, 2008, Wanzenried, 2009, & Fu and Heffernan, 2010) and taking into account the profitability measures of commercial banks ROA will be used to measure the profitability of the commercial banks in the study.

2.4. Empirical Review

The analysis of the literature emphasizes the existence of a significant number of empirical studies that focused on investigating the factors that affect IT investment on bank profitability.

Empirical study has been conducted by considering different variables that affect IT investment on profitability of commercial banks.

Beth (2015) establish the level of IT investment in commercial banks in Kenya, to determine the level of integration of IT into business functions of commercial banks in Kenya, to determine the relationship between IT investment and performance of commercial banks in Kenya. The study uses a sample of all of the population as a sample size of 43 banks in Kenya in the year 2014. The study findings established that, Investment in information Technology is inevitable. Organizations are increasingly recognizing the importance of an effective IT infrastructure. The banks IT infrastructure enables the bank to accommodate required changes and maximize the advantages provided by their existing resources more effectively.

An and Choi (2004) as cited in Daoud and Arabyat (2016) perform empirical analyses to understand the effects of ITI on bank profitability, employing pooled ordinary least squares (OLS) random and fixed effects models, and the panel Generalized Method of Moments (GMM) model on panel data on 26 domestic banks. Their results show that ITI has positive effects on bank profitability in all models. A greater regional gross domestic product (GDP) growth rate of the local bank and a higher total loan ratio led to an improvement in bank profitability, but total asset sizes and the deposit/loan rate spread are estimated to be statistically insignificant.

Abdulrahman and Loai (2015) investigated the relationship and the magnitude of investment in information technology and bank profit by using the basic model of Cobb-Douglas production function that was used by Weslely Shu and Paul A.Strassmann (2005), after changing and making some modification in the independent variables used. The researchers used two measures of profit: ROA and ROE as dependent variables for this purpose, depending on the annual reports of the sample Jordanian commercial banks as a source for the raw data that was used in the analysis for the period between 2006- 2013. And found that there is a positive effect of investment in information and technologies on the profitability and performance of the sample Jordanian commercial banks used in this research.

Gideon (2010) using panel data seeks to ascertain and document the extent to which investment in IT by banks in Ghana can impact on their profitability using the Balanced Scorecard (BSC) framework. The study uses the extensive set of 15 banks sampled from the Ghanaian banking industry over a 10-year period (1998-2007). The study finds that banks which maintain high

levels of investments in IT increased return on assets (ROA) and return on equity (ROE). However, the entire industry is not able to increase their profitability through the investments in IT. This may be due to the fact that generally the industry is becoming keenly competitive and returns are thus declining and without the investment in IT, banks would be worse off.

Elena (2006) examined the impact of increased information technology investment on the profitability performance of banks in France, Germany, Italy, Spain and United Kingdom. Utilizing data from 737 banks covering the period from 1993- 2000. Study uses ROA and ROE as performance variables and hardware cost, software costs and services cost as the investment variables. It shows no significance relationship between total information technology expenditure and improvement in profitability.

Daneshvar and Ramesh (2012) used panel data of two public banks to examine impact of IT investments on profitability and productivity of Indian public sector banks. It uses correlation analysis and multiple regression analysis to measure the strength of inter-relationships between the IT variables (amount of IT investments and number of ATMs) and banks' performance indicators. And used four independent variables in terms of number of ATMs, number of employees, number of branches and staff costs as percentage of total expenses and predicted three dependent variables in terms of deposits, ROA and profit per employee as banks performance variables. The results indicate that investments on IT contributed to increased amount of deposits and return on assets (ROA) as profitability, profit per employees as productivity indicator and decreased the net NPA ratio and staff cost.

The study from Kyompaire G. (2011) attempted to establish the relationship between Information Technology and profitability of the banks. It uses associational research design to establish the relationship between the variables. The research found that there is established IT system in the bank and it indicates a positive relationship between the level of implemented IT and profitability of the bank. It indicates that IT alone cannot be used to explain the profitability of banks but other variables like increase in working hours, reduction of interest rates may exhaustively explain the profitability of banks.

2.4.1 Empirical Studies on Ethiopian Banks

Eyob (2010) studied on Capital Investment Decisions on IT and Its Impact on Corporate value maximization the case of Ethiopian Financial Institutions and reviled that there was no significant difference between banks with high IT capital and banks with relatively low IT capital in Ethiopian commercial banks. Despite the fact that, in three of the four financial performance measures the banks with high IT capital have shown a slightly better financial performance, the difference when it is statistically measured was not significant. As a result, the study concluded that high IT capital did not produce a superlative rate of return and did not help the banks with high IT capital to have a significant cost advantage over their counter parts with a relatively lower IT capital.

Rahel (2015) on her study by using panel data of 6 private commercial banks for period of ten years starting from 2005- 2014. The relation between dependent and independent variables is analyzed using multiple regression model by taking banks profitability measure ROA as dependent variable and IT capital, labor, capitalization, market concentration, and inflation as independent variables using OLS random effect model on EViews. From the study result, except for IT capital the rest of explanatory variables show statistically significant impact on the ROA.

On his study, impact of IT investment on performance of Ethiopian commercial banks, Dawit (2017) using a purposive sampling method for the period 2006 to 2015. The study employed a multivariate regression model using Return on Asset (ROA), as dependent variable for measuring the financial performance of the selected Banks and six independent explanatory variables of which three IT investment variables (hardware, software, and IT service) three control variables (employee efficiency, market concentration, and inflation).Based on a balanced panel constructed ordinary least squares (OLS) and fixed effects, the overall results revealed that IT investment have negative significant impact on the financial performance of commercial Banks in Ethiopia.

2.5. Conclusions and Knowledge Gap

The empirical literatures that are discussed so far showed that, IT investment has both negative and positive impact on financial performance. However, most of the literatures that are discussed so far appeared to have focused on studies that were conducted in the banking sector of different

countries outside Ethiopia. This is because only few studies have assessed the impact of IT investment, despite the fact that the studies conducted by the researchers on the Ethiopian Banking sector. In most of the studies the IT investment is considered as a single independent variable called IT capital. Consequently, the Banking sectors in Ethiopia have so far received inadequate attention in the literature review IT investment.

In the context of Ethiopia, the related studies conducted by Tadesse (2015), Rahel (2015), and Eyob (2010) assessed the impact of capital investment decision and accounting information system investment. Accordingly, as per the knowledge of the researcher, all the studies conducted in Ethiopian banking sector clearly failed to identify bank IT investment.

In general, the lack of sufficient research on the impact of IT investment on performance of commercial banks and the focus of the existing studies being on the Ethiopian commercial banks initiates this study. Hence, the purpose of this study is to investigate the effect of IT investment in Ethiopian commercial banking sector profitability by utilizing an econometrics model so as to estimate both the IT investment variable and bank specific variables effect on profitability of commercial banks in Ethiopia which is proposed to fill the existing knowledge gap.

In examining the relation between IT investment and profitability /performance as stated above a number of variables were used by different authors. In the context of Ethiopia, the studies conducted by and Rahel (2015), Eyob (2010) and Dawit (2017) also used different variables as discussed above. In this regard the researcher also added two variables (Bank Size and GDP) to the study of effect of IT investment on profitability of commercial banks in Ethiopian that has not been tested in the previous researches.

2.6. Conceptual Framework

The conceptual framework is the blue print of the research work that guides the researcher to conceptually understand the research and outline and operationalize the dependent and the independent variables so that the measurement, processing, analysis of the data and interpretation of the result been easy and meaningful. A conceptual framework depicts a relation that exists between study variables.

Empirical evidences point out that performance of commercial banks is measured mainly by ROA, ROE and NIM. The study selected ROA as profitability measure for commercial banks in

Ethiopia. On the other hand there are bank, industry and macro-economic specific factors specified as determinants of performance of commercial banks among them the researcher used six major determinates of commercial banks performance as control variables, Bank size, GDP,LP,MC,INF and IT investment as study variable. Based on this the following relation is expected on the study.

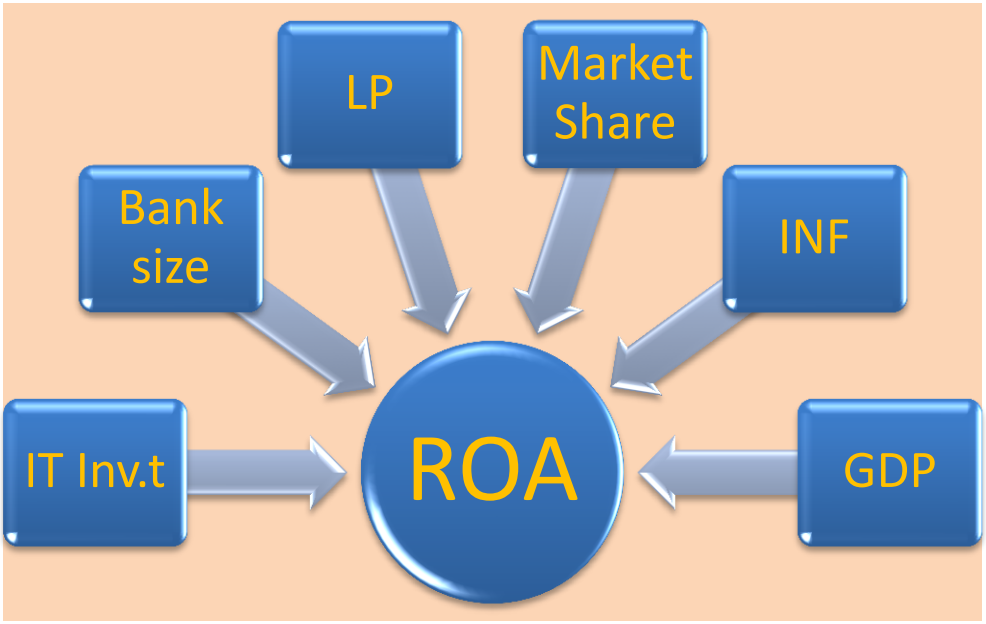

Figure 2.1- Conceptual frame work-Relation between variables and its profitability (ROA).

Source: Developed for the research by adopt from (Rahel, 2015)

In this study Return on Asset (ROA) is considered a dependent variable the profitability in commercial banks of IT Investment, Bank Size, Labor Productivity, Market Share, Inflation and GDP are taken as independent variables.

CHAPTER THREE

3.1. Research Design and Methodology

According to Leedy et al. (2005) research methodology is a means to extract the meaning of data. Data and methodology are highly interdependent. Therefore, the methodology to be used for a particular research problem must always take into consideration about the nature of data that was collected to resolve the research problem. All the elements in this chapter is constructed based upon the purpose of the research which are assess and identify the effects of IT Investment on as the profitability of selected commercial banks in Ethiopia.

3.1.1. Research Design

The study employs explanatory type of research design to establish causal relationship between variables. The researcher used panel data (both time series and cross-sectional data) of thirteen commercial banks operating in Ethiopia. To examine the effect of IT Investment on as the profitability of commercial banks in Ethiopia and other independent variables (Bank Size, Labor Productivity, Market Share, Inflation and GDP) over the dependent variable (Return on Asset) for the period 2010-2019.

The objective of the study is to examine the Effect of ITI on selected Ethiopian Commercial Banks Profitability. Schindler and Cooper (2003) discussed that explanatory studies unlike descriptive studies, go beyond observing and describing the condition and tries to explain the reasons of the phenomenon. Explanatory research is devoted to finding causal relationships among dependent and independent variables. It does so from theory-based expectations on how and why variables should be related. Hypotheses could be basic (i.e., relationships exist) or could be directional (i.e., positive or negative). The quantitative data gathering methods are useful especially when a study needs to measure the cause-and-effect relationships evident between pre-selected and discrete variables (Addisu, 2011). The justification for this method is that it will assist the researcher to explain the reasons behind the observable fact of IT investment in selected Ethiopian Commercial Banks. This explanatory method allows the researcher to use theory-based expectations on how and why variables should be related.

3.2. Population and Sampling Design

The target population of this study includes all commercial banks registered by NBE and operating in Ethiopia. According to NBE 2019/20 reports, currently, the number of banks declined to 18 from 19 due to the merge of Construction & Business Bank with Commercial Bank of Ethiopia. Out of the total 18 banks 16 were private and 2 public. Since the study considers ten (10) years, that shows the trend of commercial banks but not become whole mirror for wide period banks that were established before 2010 are selected for the study. As a result, the total numbers of sample banks selected for the study is thirteen (13).

3.2.1 Sampling Technique

There are two major alternatives on how to select appropriate sample: probability and non-probability sampling. Probability sampling gives every part of population an equal probability of selection. Non-probability (Purposive sampling technique) is used for the study based on the age and accessibility of complete audited financial statements.

Table3.1: Establishment year of commercial banks of Ethiopia

No.	Name of Bank	Ownership	Year of Establishment
1	Commercial Bank of Ethiopia	Public	1963
2	Awash International Bank	Private	1994
3	Dashen Bank	Private	1995
4	Bank of Abyssinia	Private	1996
5	Wogagen Bank	Private	1997
6	United Bank	Private	1998
7	Nib International Bank	Private	1999
8	Corporate Bank of Oromia	Private	2004
9	Lion International Bank	Private	2006
10	Oromia International Bank	Private	2008
11	Zemen Bank	Private	2009
12	Buna International Bank	Private	2009
13	Berhan International Bank	Private	2009

Source: *NBE, 2019/20*

3.3. Data Source and Collection Methods

The study utilizes secondary data. The secondary data were collected from published and audited financial statements of selected Ethiopian commercial banks that cover a period of ten years starting from 2009/10 until 2018/19 fiscal year. Besides, data regarding macroeconomic variables such as GDP and inflation rate is gathered from the annual reports of the NBE. Additional information is also collected from other relevant sources like each selected bank and NBE website were visited

3.4. Data Analysis

The term analysis refers to the computation of certain measures along with searching for patterns of relationship that exist among data groups (Jones and Bentley, 2014). Time series analysis is a statistical technique that deals with time series data or trend analysis. Time series data means that data is in a series of particular time periods or intervals, cross sectional; data of one or more variables collected at the same point in time. For this particular study time series analysis or trend analysis is used.

First, the researcher collected the needed data from financial statements, notes to the financial statements, and head office cost ledger of bank. After that, collected data rearranged, edited and calculated in order to become complete data that is needed for this study. Next, the collected Time series data analyzed using descriptive statistics, and multiple linear regression analysis. The descriptive statistics (Mean, maximum and minimum values and standard deviations) were used to analyze the general trends of the data from 2010 to 2019.

The collected data is analyzed by adopting the descriptive statistics based on ratios, frequency, percentage & average, charts, graphs, tables and figures. A multiple linear regression model is used to determine the relative importance of each independent variable in explaining the effect on ROA of IT Investment on as the profitability of selected commercial banks in Ethiopia. The multiple linear regressions model was conducted by GLS and PLS using STATA/MP 16 software package.

3.5. Model Specification and Variable Identification

The aim of this research is to consider the relationship between IT investment and profitability of commercial banks in Ethiopia. The variables are taken from different papers discussed in the

empirical literatures that defines IT investment. IT (technology investment (TI)) which includes the investment in all information and communications technology and all expenses covering hardware and software and any other related expenses. The regression model of this study was estimated in the following form:

$$\boldsymbol{ROA = \beta 0 + \beta 1 TI} + \mu \ldots\ldots\ldots\ldots\ldots 1$$

To control the effect of bank specific, industry specific and macroeconomic factors the researcher add Bank Size(BZ), Labor productivity (LP), Market Concentration (CONS), inflation (INF) and GDP as a control variable. Thus the model is,

$$\boldsymbol{ROA = \beta 0 + \beta 1 TI + \beta 2 BZ + \beta 3 LP + \beta 4 MS + \beta 5 INF + \beta 6 GDP} + \mu \ldots\ldots\ldots\ldots 2$$

3.6 Variables for the Study

3.6.1 Dependent Variable

3.6.1.1 Return on Assets (ROA): is used to measures how effectively a bank has utilized its existing physical capital to earn income. It is measured by the ratio of Net Income to Total Asset. ROA is a useful measure of how well a bank manager is doing on the job because it indicates how well a bank's assets are being used to generate profits.

$$ROA = \frac{Net\ Income}{Total\ Asset}$$

3.6.2. Independent Variables

3.6.2.1. IT (technology investment): Includes the investment in all information and communications technology and all expenses covering hardware (data storage devices, terminals, memory, peripherals, workstations, personal computers, local area network hardware, wide area network hardware, analog Modems and digital access). Software (packaged software, application solutions software like core banking solution, application tools, systems infrastructure software).And any other related expenses like (spending on consulting services, implementation services, operational services, training and education, support and maintenance services).

3.6.2.2. Bank Size (BZ): The other important determinant of bank performance that was considered by the study is bank size. Since it is difficult to exactly measure the size of a bank, the logarithm of the total assets of a bank is usually used as a proxy for bank size. Bank size is

included as an explanatory variable to give an explanation for size related economies of scale or diseconomies of scale in Ethiopia's banking sector. However, there is no consensus as far as the relationship between bank size and bank profitability is concerned. Thus, the sign of bank size on profitability is subject to empirical study.

3.6.2.3. Labor productivity (LP): The people in a bank are the most valuable resources and the major driving force for successes and failures. The quality of human resources employed by a bank greatly affects its profitability. The recruitment process and training standard of the financial institution, which reflects the quality of the people in the organization, their ability to guidance and support to operations staff, compensation package as per the industry norms and attrition rate in the financial institution, which reflect the satisfaction among the employees and staff towards their work and organization. It is bank specific determinant profitability of commercial banks measured as the ratio of annual labor cost to net income.

3.6.2.4. Market Share: is captured by total assets of a bank to total industry assets at given period of time. Direct relationship between market share and bank profitability is observed in studies of (Berger, 1995; Eichengreen &Gibson, 2001 as cited in Francis, 2006). Therefore, it is proposed that market share and bank profitability are positively related.

3.6.2.5. Inflation Rate (INF): According to Perry (1992) the relationship between inflation and bank profitability depends on the nature of inflation (whether the inflation is anticipated or unanticipated). If the inflation is an anticipated type, the revenues of banks will increase faster than their costs since banks will be able to timely adjust interest rates. Thus, this type of inflation will have a positive impact on the profitability of banks. On the other hand, if the type of inflation is unanticipated one, bank costs will increase at faster rates than bank revenues because banks may not take a timely measure in adjusting their interest rates. In such a case, inflation will have a negative impact on bank profitability. The annual average percentage of inflation rate will be used to measure the effect of inflation on bank profitability.

3.6.2.6. Economic Growth (GDP): there are domestic and international studies that confirmed the significant impact of a country's economic growth on bank's profitability (Majed,2016; Shuleski,2017; Adugna,2020; Gebre,2020; Fesha,2018). This variable will be measured by the real GDP growth rate. It is hypothesized to affect banking profitability positively. This is because the default risk is lower in upturn than in downturn economy. In addition, higher economic growth may lead to a greater demand for both interest bearing and non-interest-bearing financial services, thereby improving the profitability of banks.

Table 3.2 Summary of Variables to be tested measurement, expected sign and significance

Sr.No	Variable	Explanation	Notation	Expected Sign
1	IT investment Unit= Numeral	It includes investment in all information and communications technology and all expenses covering hardware and software and any other related expenses.	ITI	+/Sig
2	Bank Size Unit=Numeral(birr)	Natural Logarithm of Total Asset	BZ	+/Sig
3	Labor productivity Unit=Numeral	Annual labor cost / Net Income	LP	-/In Sig
4	Market Concentration (Market share) Unit= percentage	Total Asset of a Bank/ Total Asset of all banks at given period of time.	CONS	+/Sig
5	Inflation Rate Unit= percentage	Annual inflation rate	INF	-/Sig
6	Economic Growth Unit= percentage	Annual Real GDP Growth Rate	GDP	+/Sig
7	Return on Assets Unit= percentage	Net Income/Total Asset	ROA	N/A
To**tal**			7	2

Source: Self Constructed based on research methodology.

Model Specification: The relationship between the dependent variable, ROA of commercial banks and the Bank Size, Labor productivity, Market Concentration, inflation and GDP as a control variable is expressed as a linear combination of the independent variables plus an error term.

Following Greene (2009), the multiple linear regression models is specified a

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 5X6 + \varepsilon$$

$$Y = \partial + \text{ß}x$$

$$ROA = ITI(x1) + BZ(x2) + LP(x3) + MS(x4) + INF(x5) + GDP(X6) + \varepsilon.$$

Where: Y= ROA of commercial banks.

β0= Constant term.

X1= IT Investment (ITI).

X2= Bank Size (BZ)

X3= Labor Productivity (LP)

X4= Market Share (MS).

X5=Inflation Rate (INF).

X6= Economic Growth (GDP)

ε=error of terms.

Where the βS are coefficients of independent variables, Xs are column vectors for the independent variables in this case; IT Investment, Bank size, labor productivity, market share, inflation rate and economic growth while **ε** is a vector of errors of prediction. The error is assumed to be normally distributed with an expected value of zero and a common variance.

Doing multiple regressions helped the researcher to further understand the relationship among variables. Regression analysis was used to measure the relative strength of independent variables on dependent variable.

3.7. CLRM ASSUMPTIONS AND MODEL SELECTION

Classical linear regression model works only if assumptions of CLRM are maintained and hold true. Heteroscedasticity, Multicollinearity and Normality are the major assumptions of CLRM for panel data set. The validity of each assumption is checked based on appropriate and respective diagnostic tests that prove either the assumption is valid or not, i.e., different diagnostic tests are carried out to ensure that the data suits the basic assumptions of classical linear regression model. If there is violation of assumption, there are remedies to be made on the data so that the CLRM assumptions hold true.

3.7.1. Multicollinearity

In statistics, multicollinearity (also collinearity) is a phenomenon in which one predictor variable in a multiple regression model can be linearly predicted from the others with a substantial degree of accuracy. In this situation, the coefficient estimates of the multiple regressions may change erratically in response to small changes in the model or the data. (Wooldridge, 2020, Greene,2003, Gujarati & Porter,2009)

The diagnostic tests that are applied for checking multicollinearity problems are variance inflation factor (VIF) and correlation matrix among independent variables. Even though the value of perfect correlation is +or – 1, different values as cut off point are used by different scholars to test whether there is multicollinearity problem between independent variables or not. Wooldridge,2020, on the other hand states that correlation coefficient below 0.9 may not cause serious multicollinearity problem. In this study, a correlation value of more than 0.8 between independent variables is considered as multicollinearity problem. Using the other diagnostic test, if there is no VIF value more than 10 for each explanatory variable, it is concluded that there is no multicollinearity problem.

3.7.2. Heteroskedasticity

Homoscedasticity of data set is the other assumption of CLRM. Homoscedasticity or constant variance assumes that error term (e) has the same variance given any value of independent variables. Having different measure of dispersion of error means violation of homoscedasticity and the data is supposed to be suffered with heteroscedasticity problem. If heteroskedasticity exists, the estimators of the ordinary least square method are inefficient and hypothesis testing is no longer reliable or valid as it will underestimate the variances and standard errors. Heteroskedasticity problem means error terms do not have a constant variance (Brooks, 2008). Homoskedasticity assumption helps to get important efficiency properties of OLS. The assumption requires that variance of unobserved error does not depend on the level of independent variables (Wooldridge, 2009).

Breusch-Pagan test is the diagnostic tests that are used in this study. The test is applied to detect if there is Heteroscedasticity problem on the dataset. The test is applied using the following hypothesis and such hypothesis is evaluated based on the value that is generated from STATA 16software: -

H0: There is no Heteroskedasticity problem in the model.

H1: There is Heteroskedasticity problem in the model.

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

3.7.3. Autocorrelation

Autocorrelation, also known as serial correlation, is the correlation of a signal with a delayed copy of itself as a function of delay. Informally, it is the similarity between observations as a function of the time lag between them. Similarly in panel data, another important assumption is that the idiosyncratic errors are uncorrelated. However, in the case of panel data, the OLS standard errors would be biased due to cross-sectional dependence, in which each period is not independent of previous periods (Drukker, 2003).

Autocorrelation in panel data could cause serious problem as it creates certain biases within the disturbances term, thereby making the model less significant (Drukker, 2003). To test for autocorrelation, Wooldridge (2010) suggests a test to examine the presence of serial correlation within panel data model. The assumption of the panel data regression is that the there is no cross-sectional dependence. The hypothesis of Wooldridge Test for autocorrelation is written as follows.

H0: There is no autocorrelation between the disturbances within the panel data model

H1: There is autocorrelation between the disturbances within the panel data model

Under the null of no serial the residuals from the regression of the first-differenced variables should have an autocorrelation of -.5. This implies that the coefficient on the lagged residuals in a regression of the lagged residuals on the current residuals should be -.5.

3.7.4. Normality

Under normality assumption, error terms of the population that is represented by error term of the sample called ε which is the unobserved error is assumed to be normally distributed in the population. This means the population error is not dependent up on explanatory variables. Given that the error terms are not normally distributed implies that t and f statistics will not have t and f distribution respectively (Wooldridge, 2009). This is to mean the identification and

determination of significant explanatory variables will be difficult. The unobserved term can be expressed as the difference between the actual value of the dependent variable and the predicted value of the same dependent variable. Normality assumption has no role in showing that the OLS estimators are the best unbiased estimators (Wooldridge, 2009).To check normality, Jarque-Bera Normality test is applied. The result is generated from STATA 16 software.

3.7.5. Linearity

This assumption states that the relationships between the predictors and the outcome variable should be linear. In conduction linear regression, it is assumed that the relationship between the response variable and the predictors is linear. This is the assumption of linearity. If this assumption is violated, the linear regression will try to fit a straight line to data that does not follow a straight line (Wooldridge ,2020; Greene,2003; Gujarati & Porter,2009). There are various mechanisms and tests to check for linearity in linear assumption in the case of linear regression. To test for linearity, the researcher will use Ramsey's regression specification error test (RESET). The test examines whether non-linear combinations of the independent variable(s) can explain the dependent variable (Wooldridge, 2010). The hypothesis of the RESET can be written as follows.

H0: The model is linear

H1: The model is non-linear

3.7.6. Test for Model Specification between Random and Fixed Effect

Given panel data set, there are two most prominent models that are applied for regression analysis. These models are fixed effect, random effect GLS model (Gujarati 2003) and Common Effect Model (Pooled Least Square (PLS)). In fixed effect model intercepts of each cross section vary but they do not change over time which means it is time invariant (Gujarati 2003). Whereas in random effect model, each cross section is assumed to have common mean value for slope estimators (Hossain 2012).

The diagnostic tests that are applied to get the appropriate model for this data set are the Hausman test and Breusch and Pagan Lagrangian multiplier test for random effects. Hausman test is a statistical test to select whether the most appropriate model is Fixed Effect or Random Effect. If the test result

H0: Select Random Effect Model ($p > 0.05$)

H1: Select Fixed Effect Model (p <0.05)

Breusch and Pagan Lagrangian multiplier test for random effects test (LM) is a test to determine whether Random Effect model is better than Common Effect (PLS) method used. If the test result

H0: Select Common Effect (p> 0.05)

H1: Select Random Effect (p <0.05)

CHAPTER FOUR

DATA PRESENTATION, ANALYSES AND DISCUSSIONS OF RESULTS

4.1 Introduction

This chapter discusses about data analysis and presentation of the results generated from the data analysis. STATA version 16 is applied for data analysis and model building based on data collected from sampled commercial banks and selected macroeconomic variables. The necessary assumptions that have to be held for classical linear regression model are discussed and presented before building the model. Discussion and analysis are made on descriptive statistics results and regression results of the model. Interpretation of the results based on the relationships that exist between dependent and explanatory variables are made in this chapter.

4.2 Descriptive Statistics

4.2.1 IT Investment of Commercial Banks

Investment in information technology by commercial banks is the total amount of capital spent on the combination of banking software and hardware infrastructures such as personal computers, ATM IT related security systems and infrastructures. Out of the total investment made in software, core banking system is the biggest investment banks have made so far in relation to IT. Core banking is a system that enables banks to deliver better quality customer service by allowing customers to access their account from all branches of a specific bank. In addition to core banking, most banks nowadays are investing on mobile and internet banking services which allow their customers to access their account and get different banking services without coming physically to banks using their phones and computers via internet. Moreover, banks are deployed various software, either internally developed or purchased from suppliers to facilitate day to day activities. Taking into consideration of the growth of the total amount of total investment capital, Banks seems to be determined to invest more in IT.

According to the data collected for the research as indicated in table 4.1 below, the total amount of IT investment made by the sampled 13 banks is Birr 27,226,381,708. While the annual average amount of investment in IT by the sampled banks is Birr 2,722,638,170.80, its average annual growth rate is 23 %. In terms of the ten years cumulative amount of investment made on

IT by the banks, CBE made the largest amount of investment of Birr 9,947,538,988.00 followed by Dashen Bank (Birr 3,756,174,624) and Awash International Bank (2,827,466,567.00).

Table 4.1 IT Investments of the sampled commercial banks from 2010-2019 (Millions of Birr)

Name of Bank	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Commercial Bank of Ethiopia	142.8	181.9	231.6	419.0	572.7	754.5	1,229.3	1,803.3	2,132.0	2,480.5
Awash International Bank	46.4	53.4	61.5	121.3	173.3	323.7	429.9	497.6	537.4	583.0
Dashen Bank	105.7	127.8	201.2	230.0	271.6	305.8	450.5	511.5	706.0	846.2
Bank of Abyssinia	12.9	15.8	20.5	128.2	141.2	158.6	244.0	293.2	462.1	517.8
Wegagen Bank	33.9	60.0	72.6	85.1	111.6	122.0	216.3	279.0	329.4	366.2
United Bank	34.5	44.8	57.7	64.9	126.6	165.5	189.9	221.2	289.7	343.6
Nib International Bank	30.1	33.3	38.1	50.7	126.0	141.3	205.2	230.1	278.0	296.1
Cooperative Bank of Oromia	10.4	12.7	36.3	42.9	51.2	66.4	108.7	143.4	208.3	278.7
Lion International Bank	8.2	9.2	11.3	14.0	18.1	24.6	51.3	90.3	104.4	125.3
Zemen Bank	19.9	38.3	52.1	62.6	73.9	102.1	124.3	148.7	175.4	223.3
Oromia International Bank	4.7	6.5	12.1	21.9	31.3	65.4	72.8	87.5	97.2	172.6
Bunna International Bank	5.0	7.8	17.3	26.3	34.1	49.8	103.3	134.7	179.2	242.0
Berhan International Bank	2.3	6.5	7.6	9.5	12.1	16.1	30.3	39.6	49.3	76.3
Total Per Year	456.8	598.0	819.9	1,276.4	1,743.8	2,295.8	3,455.9	4,480.1	5,548.1	6,551.6
Average Per Year	45.7	59.8	82.0	127.6	174.4	229.6	345.6	448.0	554.8	655.2
Annual Growth Rate		0.24	0.27	0.36	0.27	0.24	0.34	0.23	0.19	0.15

Source: Computation from banks financial Statements

4.2.2 Trend of IT Investment and ROA of Commercial Banks

Meanwhile, the average annual ROA of the sampled commercial banks is 3.96. The trend of growth of ROA shows that there is an average annual -0.04 growth rate. In general, the ROA of the sampled banks shows fluctuations within the study ten years. On the other hand, there is an increase growth rate in investment of sampled banks in IT. Table 4.2 shows the trend in the growth of investment in IT and ROA by the sampled banks.

Table 4.2 Trend of ROA AND ITI OF Sampled Banks 2010-2019

Year	ROA	Annual Growth Rate
2010	4.44	45.68
2011	5.10	59.80
2012	4.76	81.99
2013	4.38	127.64
2014	4.34	174.38
2015	3.77	229.58
2016	3.36	345.59
2017	3.11	448.01
2018	3.16	554.81
2019	3.20	655.16
Average Annual ROA	**3.96**	272.2638

Source: Computation from banks financial Statements

4.3 Result of Quantitative Analysis

4.3.1 Descriptive Statistics

Out of the competing measurements, return on asset is used to measure profitability of commercial banks in this study. Four bank specific and two macroeconomic explanatory variables are used for analysis. 13 sample commercial banks have been selected to make data analysis out of the total population of commercial banks in Ethiopia. As the population of private commercial banks is 17 (NBE, 2020), the sample considers 76% of the population. The data range that is used in the study covers 10 years data for the period ranging from 2010 (2009/10) to 2019(2018/19). The total observations considered in the study amounts to 130. Table 4.3 shows the mean, standard deviation, minimum and maximum values of variables that are used for data analysis. The following discussion is made based on the data extracted from STATA 16.

Table 4.3 Descripitive Statistics of Variables

```
. summarize ROA ITI BZ LP CONS GDP INF
```

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	130	2.622839	.7086022	.3717752	5.248692
ITI	130	209.4337	356.6514	2.303733	2480.479
BZ	130	9.370738	1.379253	5.938907	13.47707
LP	130	.7301928	.4965825	.1450877	4.838749
CONS	130	7.56402	16.56519	.3020187	66.6655
GDP	130	9.607	1.144164	7.7	11.4
INF	130	12.86	8.231624	2.8	34.1

Source: STATA 16 Results

4.3.1.1 Explained Variable

Return on Asset (ROA) is measured with net income after tax divided by total asset of the bank. It indicates the return level of the total asset employed by the bank. As shown in table 4.3 above, the mean value of ROA is 2.62 %. This means commercial banks on the average are earning 2.62 % of return from the total asset employed. The maximum and minimum ROA are 5.2 % and 0.37 % respectively. The difference on ROA is an indicator on the level of efficiency on the utilization of assets employed by banks. This indicates that banks are different in utilizing their total asset in generating profit. Particularly those banks that show the minimum ROA are inefficient in utilizing total asset for generating profit and hence there is a room to improve efficiency of utilization of asset in generating profit.

4.3.1.2 Explanatory Variables

The data shows that the mean value of IT investment by commercial banks is 209.4.It shows that on average each bank spent Birr 209.4 for investment in IT. The maximum and minimum value of investment in IT by banks is 2.3 and 2480.4 respectively. From this figure, it can be inferred that while the maximum investment made in IT is birr 2480.4 million, the minimum value is birr 2.3 million.

The other measure used is standard deviation, which is a measure of how much the data in a set varies from the mean commonly called one of the measures of variability or dispersion. The larger the value of standard deviation, the more the data in the set varies from the mean showing high level of variability. The smaller the value of standard deviation, the less the data in the set varies from the mean showing lower level of variability (S.C. Gupta and Indra Gupta, 2013).

In terms of standard deviation, the amount of standard deviation of IT investment is 356.65 which show a large difference from that of ROA and all the other variables from the respective mean value. Thus, it can also be inferred from this that there is more variability in the amount of IT investment made by the sampled banks.

Bank size, labor productivity and market share have a mean value of 9.3, 0.73 and 7.5 respectively. The market share standard deviation is greater than that of bank size and labor productivity indicating more variation in market share among the commercial banks. On the other hand, the lowest amount of standard deviation is that of labor productivity which is 0.497 showing a lowest level of variability or dispersion amongst banks in labor productivity. While there is an average growth rate 9.6 % in the country's economy as shown in the mean of GDP, the average growth rate of growth in inflation is 12.86 %.

4.3.2 Diagnostic Test for CLRM Assumptions

Data analysis of any data set provides appropriate results if the data set used for analysis holds true the assumptions applicable for the method adopted. This study uses CLRM method for data analysis. Thus, before performing data analysis and making conclusions based on the result derived from the data analysis, it is the responsibility of the data analyst to ensure that the assumptions that are applicable for CLRM hold true. This section of the chapter is about major diagnostic tests of CLRM that includes tests for Multicollinearity, Heteroskedasticity, Autocorrelation, Linearity and Normality. More than one different diagnostic test may be applied for a particular assumption to indicate consistent results of the test.

4.3.2.1 Multicollinearity Test

Multicollinearity Testing Through VIF

The diagnostic test for multicollinearity problem is to check whether there exists close to perfect correlation or not between independent variables using variance inflation factor (VIF) or correlation matrix among independent variables. These two tests are applied in this data set to ensure that there is no multicollinearity problem between predictor variables. The result of VIF and correlation matrix between independent variables is presented below.

Table 4.4 Variance Inflation Factor of Explanatory Variables

```
. vif
```

Variable	VIF	1/VIF
BZ	3.36	0.297876
CONS	2.85	0.350960
ITI	2.46	0.405853
GDP	1.67	0.600237
LP	1.33	0.751529
INF	1.28	0.778877
Mean VIF	2.16	

Source: STATA 16 Results

According to the table…above, there are no issues of multicollinearity as the VIF for each of the explanatory variables is less than 10 and the tolerance value (1/VIF) for the variables is above 0.1 (Wooldridge, 2015). The highest VIF value is 3.36 and the mean VIF is 2.06. Furthermore, the lowest tolerance value is 0.29.

Multicollinearity Testing Through Correlation Matrix

The multicollinearity between independent variables can also be tested using correlation matrix between independent variables as shown in table 4.5.

Table 4.5 Correlation Matrix of Explanatory Variables

e(V)	ITI	BZ	LP	CONS	GDP	INF	_cons
ITI	1.0000						
BZ	-0.3873	1.0000					
LP	-0.0101	-0.1831	1.0000				
CONS	-0.3125	-0.5511	0.2894	1.0000			
GDP	0.1626	0.3439	0.2502	-0.3248	1.0000		
INF	0.1148	0.1752	0.2225	-0.1714	0.4412	1.0000	
_cons	0.1125	-0.7911	-0.1367	0.4997	-0.8321	-0.4656	1.0000

Source: STATA 16 Results

The result shows that there is no close to perfect correlation between independent variables. Hence both diagnostic tests show consistent result. To conclude, as can be seen from both table 4.4 and 4.5 above, there is no multicollinearity problem in the data set in both diagnostic tests.

4.3.2.2 Heteroskedasticity Test

The diagnostic tests is applied in order to identify whether homoscedasticity assumption holds

true or not is Breusch- Pagan/ Cook-Weisbergtest for heteroscedasticity. The result of the test is evaluated based on preset hypothesis.

Null= Data set is homoskedastictic (Homoskedasticity assumption holds true)

Alt= Data set has heteroscedasticity problem

The p value of the diagnostic test is the basis to evaluate the preset hypotheses stated above. If the p value is more than the critical value, it indicates that there is no sufficient evidence to reject the null hypotheses.

Table 4.6 Breusch- Pagan/ Cook-Weisberg test for Heteroskedasticity Test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROA

         chi2(1)      =     0.62
         Prob > chi2  =   0.4300
```

Source: STATA 16 Results

The Breusch-pagan / Cook-weisberg test for heteroskedasticity test in table 4.6 above shows p value of 43 %. Since this value is above 5%, there is no sufficient evidence to reject the null hypothesis and hence the data is homoscedastic.

4.3.2.3. Autocorrelation

After heteroscedasticity was tested, the next step was to test for autocorrelation or cross-sectional dependence of the error term in each of the regressions (Wooldridge, 2015). The assumption of the fixed effect regression is that the there is no cross-sectional dependence. This section will present the autocorrelation test result.

Table 4.7. Test for Autocorrection in Panel Data

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      12) =      4.115
           Prob > F =      0.0653
```

Source: STATA 16 Results

It is shown that the null hypothesis was accepted as the value of p is greater than 0.05 in the table above.

4.3.2.4 Normality Test

Normality test is used to determine whether the error term is normally distributed. Brooks (2008) noted that the Jarque-Bera statistic would not be significant for disturbance to be normally distributed around the mean. The purpose of the Jarque-Bera test is to make sure that the data set is well-modeled by a normal distribution. The hypothesis for the normality test was formulated as follows:

H0: Error term is normally distributed

H1: Error term is not normally distributed

$\alpha = 0.05$

Decision Rule: Reject H0 if P value of JB less than significant level 0.05. Otherwise, do not Reject H0.

Table 4.8: Result of Normality Test: Bera-Jarque test

```
. jb resid
Jarque-Bera normality test:  .3991 Chi(2)  .8191
Jarque-Bera test for Ho: normality:
```

Source: Stata 16 Results

Table 4.8 indicated that distribution of the panel observation is symmetric about its mean. The Jarque-Bera statistic has a P-value of 0.8191 implies that the p-value for the Jarque-Bera test is greater than 0.05 which indicates that there was no evidence for the presence of non-normality in the data. Thus, the null hypothesis that the data is normally distributed should not be rejected since the p-value was considerably in excess of 0.05. The histogram below also shows the normal distribution of the residuals.

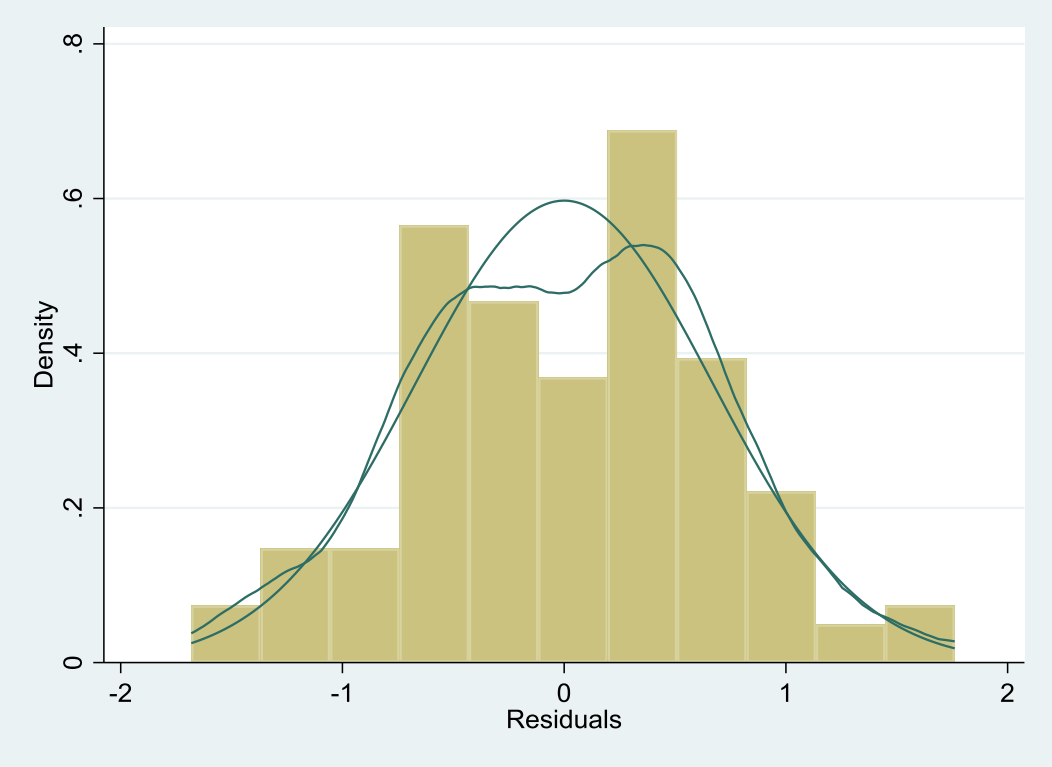

Fig.4.1 Normality Graph (Histogram of Residuals)

4.3.2.5 Linearity Test

The following section represents the linearity testing of the independent variables ROA as the dependent variables. The regression containing the independent variables was run and the linearity test results were obtained.

Table 4.9 Test for Linearity

```
Ramsey RESET test
Test uses square of fitted value of y (X*beta-hat)
Ho: E(y|X) is linear in X
Wald test statistic:              Chi-sq(1) =  3.44   P-value = 0.0635
```

Source: STATA 16 Results

The above table 4.9 shows the linearity test of the independent variables with ROA as the dependent variable. As can be shown in table, the linearity test of the independent variables were insignificant, whichindicates that they have a linear relationship with ROA since they did not rejectthe null hypothesis of linearity.

4.3.3 Test for Model Specification

In order to select the appropriate model for the study, two tests are applied. These are the Hausman test and Breusch and Pagan Lagrangian multiplier test for random effects.

Hausman test is a statistical test to select whether the most appropriate model is Fixed Effect or Random Effect. If the test result

H0: Select Random Effect Model (p> 0.05)

H1: Select Fixed Effect Model (p <0.05)

Table 4.10 Test of Appropriateness of Model

```
. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |    fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
         ITI |  -.0008611    -.0009774        .0001162        .0000875
          BZ |   .3375608     .3377625       -.0002016        .0512999
          LP |  -.5170553    -.6092975        .0922423        .0451386
        CONS |   .0892837    -.0121079        .1013915         .061155
         GDP |   .1407654     .1179917        .0227738        .0165688
         INF |   .0230995      .021064        .0020356        .0005923
------------------------------------------------------------------------------
                           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)
                          =        7.88
                Prob>chi2 =      0.2471
                (V_b-V_B is not positive definite)
```

Source: STATA 16 Results

The p value of the test is 24.71 % which is above the significance level of 5%. From this figure, it is possible to conclude that there is no sufficient evidence to reject the null hypotheses which means random effect GLS model is appropriate for the data set that regress ROA on above explanatory variables.

The second test is the Breusch and Pagan Lagrangian multiplier test for random effects test (LM) is a test to determine whether Random Effect model is better than Common Effect (PLS) method used. If the test result

H0: Select Common Effect (p> 0.05)

H1: Select Random Effect (p <0.05)

Table 4.11 Breusch and Pagan Lagrangian multiplier test for random effects test (LM)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        ROA[ID,t] = Xb + u[ID] + e[ID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     ROA |    .6293804        .793335
                       e |    .3741464        .611675
                       u |    .0575993       .2399985

        Test:   Var(u) = 0
                                 chibar2(01) =     6.21
                              Prob > chibar2 =   0.0064
```

Source: STATA 16 Results

As shown in the table above, the p value is less than less than 0.05. Thus, random effect model is selected as appropriate for the study.

4.4 Result of Regression Analysis

4.4.1 Result of Regression Analysis

In this section of the paper, the results of the regression analysis are presented and discussed. The regression analysis will give due emphasis on the effect of investment in IT on the ROA of selected banks. Besides, more emphasis is given for those significant independent variables and their relationship with explained variable. The following table is the result of the relationship between profitability measured in ROA with above explanatory variables.

Table 4.12 Random Effect GLS regression model for ROA

```
Random-effects GLS regression                   Number of obs     =       130
Group variable: ID                              Number of groups  =        13

R-sq:                                           Obs per group:
     within  = 0.3358                                         min =        10
     between = 0.3317                                         avg =      10.0
     overall = 0.3336                                         max =        10

                                                Wald chi2(6)      =     61.90
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ITI	-.0009774	.0002429	-4.02	0.000	-.0014534	-.0005014
BZ	.3377625	.0842685	4.01	0.000	.1725993	.5029256
LP	-.6092975	.1327279	-4.59	0.000	-.8694394	-.3491557
CONS	-.0121079	.0073573	-1.65	0.100	-.0265278	.0023121
GDP	.1179917	.0642345	1.84	0.066	-.0079056	.2438889
INF	.021064	.0076268	2.76	0.006	.0061156	.0360123
_cons	-1.235997	1.201218	-1.03	0.304	-3.590341	1.118347
sigma_u	.23999852					
sigma_e	.61167504					
rho	.13341024	(fraction of variance due to u_i)				

Source: STATA 16 Results

Based on the results of random effect regression as shown in table 4.11, the model equation for ROA is:

$$\text{ROA} = -1.235997 - 0.0009774\text{ITI} - 0.3377625\text{BZ} - 0.609297\text{LP} - 0.121097\text{CONS} + 0.1179917\text{GDP} + 0.021064\text{INF}$$

As shown from upper right section of table4.11, the overall p value of 0.0000 indicates that all coefficients of explanatory variables are nonzero. Moreover, in general it is also to mean that the explanatory variables are significant to determine ROA. The overall R-sq value is 33.36 % and the within and between values are 33.58 % and 33.17 % respectively. R-sq overall indicates that 33.36 % of change in ROA is explained by those explanatory variables used in the model. This means the remaining66.64% (100%-33.36 %) of changes in ROA is explained by other independent variables that are apart from those variables considered in the model. The intercept or coefficient of the constant of the model indicates that given all independent variables are set to zero, the value of ROA is -1.236.

From table 4.11, we understood that ITI, BZ, LP and INF are significant at 5% significance level. The rest of the explanatory variables are not significant at 5% significance level and hence

in the following section, discussion is made on the relationship between those significant explanatory variables with ROA. The basis of discussion is the data in table 4.11 which is extracted from STATA 16.

The following section presented with the summary of major findings and test of hypothesis constructed.

4.4.1.1 IT Investment

The result of the regression model shows that there is significant relationship between IT investment and profitability of commercial banks represented by ROA. ITI has coefficient value of -0.0009 with significant level of 0.000. The negative coefficient indicates that there is a negative relationship between ITI and ROA. The corresponding p value indicates the level of significance of ITI on ROA. ITI is significantly related with ROA even at a significance level less than 1%. The coefficient of the variable indicates that a 1% increase in ITI will bring down ROA of the bank by 0.09 %, what it means is increasing investment in IT does not guarantee an increase in ROA. Thus, the result of study also shows that there is a negative significant relationship between investment in IT and profitability of commercial banks of Ethiopia which is measured by ROA.

The results of the study coincided with Dawit (2017) finding on his study of the impact of IT investment on performance of Ethiopian commercial banks for the period from 2006 to 2015.The study employed a multivariate regression model using Return on Asset (ROA) as dependent variable for measuring the financial performance of the selected Banks and six independent explanatory variables of which three IT investment variables (hardware, software, and IT service).The overall result of the study revealed that IT investment have negative significant impact on the financial performance of commercial Banks in Ethiopia.

Meanwhile, Eyob (2010) study on capital investment decisions on IT and its impact on corporate value maximization of Ethiopian Financial Institutions revealed that there was no statistically significant difference in financial performance between banks with high IT capital and banks with relatively low IT capital. Similarly, Rahel (2015) study of capital investment decisions on information technology and its impact on the performance of six private commercial banks in Ethiopia for period of ten years starting from 2005- 2014 showed that IT investment impact on ROA of banks is not significant.

A number of reasons can be proposed as to the negative relationship of IT investment and ROA of the selected commercial banks of Ethiopia. First, similar to any other large investment in any business field, it might take a long period of time to reap the fruits of the initial investment. Second, the commercial banks lack the necessary human resource, IT infrastructure, marketing system and the like elements that enable to fully utilize the benefits of IT investment. Third, the country's socio-cultural context, level of economic development, the enabling environment, the level of awareness of the population and similar factors might have hindered the banks from effectively and efficiently exploit the IT technology.

The result of the study implies that Ethiopian commercial banks IT investment policies, strategies and measures should be revisited to enable an economically viable and financially profitable result. In line with this a research based well planned system and structure should be put in place before making investment in IT. It should also be stressed that a concerted effort should also be made to engage the relevant stakeholders, collaborators and customers in pursuing further actions as the investment in IT and the accompanying service delivery directly or indirectly involve these actors.

Thus, in general, as indicated below the null hypothesis has been rejected and concludes that IT investment has a negative and significant relationship with profitability of selected commercial banks in Ethiopia.

Ho: There is positive relationship between IT investment (IT) and banks profitability of commercial banks in Ethiopia.

4.4.4.2.Bank Size (BZ)

The results of the regression model also shows that there is a direct relationship between bank size as measured in natural logarithm of total assets and profitability of commercial banks represented by ROA. BZ has coefficient value of 33.78 % with significant level of 0.000. The positive coefficient indicates that there is a positive relationship between BZ and ROA. The corresponding p value indicates the level of significance of BZ on ROA. BZ is significantly related with ROA even at a significance level less than 1%. The coefficient of the variable indicates that a 1% increase in BZ will increase ROA of the bank by 33.78 %, what it means is increasing investment in BZ one of the determining factors in the increase of ROA.

The result of the study implies that bank size is one of the most important elements that affect the profitability of commercial banks of Ethiopia. Policies, strategies and measures that positively influence bank size should be followed in co-ordination with other important factors that affect the profitability of commercial banks of Ethiopia.

Thus, the hypothesis of the research that there is a positive relationship between bank size and bank profitability as indicated below is accepted.

Ho: Bank Size has positive effect on commercial bank's bank profitability.

4.4.4.3.Labor Productivity (LP)

A productive, effective and efficient labor force in a bank is the most valuable resources and the major driving force for successes and failures of the bank. The quality of human resources employed by a bank as well as the continuous human development activities of the bank greatly affects the bank's profitability.

LP is measured as the ratio of annual labor cost and net profit. The results of the study revealed that labor productivity has a negative and a statistically significance effect on bank profitability. LP has coefficient value of negative 60.9 % with significant level of 0.000. The negative coefficient indicates that there is a negative relationship between LP and ROA. The corresponding p value indicates the level of significance of LP on ROA. LP is significantly related with ROA even at a significance level less than 1%. The coefficient of the variable indicates that a 1% increase in LP will decrease ROA of the bank 60.92.

The result of the study is consistent with Athanasoglouet al. (2005) finding which shows that labor productivity growth has significant effect on bank profitability. According to Athanasoglouet al. (2005), in recent years banks have been targeting high levels of efficiency and productivity growth both by keeping the labor force steady and by increasing overall output since they are being faced with severe competition due to the lowering of barriers to entry and the globalization of the industry.

The result of the study showed that labor productivity is one of the critical elements that affect the profitability of commercial banks of Ethiopia. This implies that human resource planning, management and development should continue to be the focus area of commercial banks of Ethiopia.

Thus, the null hypotheses indicated below that LP has negative effect on bank profitability is

accepted.

Ho: Labor productivity has negative effect on commercial bank's bank profitability.

4.4.4.4.Inflation (INF)

The result of the research showed that INF has a significant effect on bank's ROA. LP has coefficient value of positive 2.1 % with significant level of 0.006. The positive coefficient indicates that there is a positive relationship between INF and ROA. The corresponding p value indicates the level of significance of INF on ROA. INF is significantly related with ROA even at a significance level less than 1%. The coefficient of the variable indicates that a 1% increase in INF will decrease ROA of the bank 2.1 %.

The result of the study is supported by other studies. For instance, Kutsienyo (2011) pointed out that inflation is used as a signal by bank managers to forecast accurately inflation and are proactive in managing anticipated inflation. By making accurate forecast of inflation, the manager can increase the rates on loan faster than the rate at which operating cost is increasing so that inflation favorably impacts on profitability. In line with this Bourke (1989), Molyneux et al. (1992), Athanasoglou et al. (2005) & Tesfaye (2014) indicated that inflation is anticipated by banks which give opportunity for the bank to adjust the interest rate according to the expected inflation rate enabling the increase in revenue faster than costs.

Finally, the null hypotheses as indicated below that INF has negative effect on bank profitability is rejected.

Ho: Inflation has negative effect on commercial bank's bank profitability.

4.4.2 Summary of Research Findings

Table 4.13 Summary of actual and expected signs of explanatory variables on the dependent variables

Variable	**Expected impact on ROA**	**Actual impact on ROA**	**Decision Rule**
IT Investment (ITI)	**+ve**/Significant	**-ve**/significant	**Reject null**
Bank Size**(BZ)**	**+ve**/ Significant	**+ve**/ Significant	**Accept null**
Labor Productivity **(LP)**	**-ve**/ Significant	**-ve**/ significant	**Accept null**
Market Share **(CONS)**	**-ve**/ Significant	**+ve**/insignificant	----------
Inflation (**INF)**	**-ve**/ Significant	**+ve**/ Significant	**Reject null**
Economic Growth(**GDP)**	**+ve**/ Significant	**+ve**/ insignificant	----------

The above table summary of the research findings shows that:

IT Investment and labor productivity have a negative and significant effect on the profitability of Ethiopian commercial banks. Bank size and inflation has a positive and significant effect on the profitability of Ethiopian commercial banks. Market share and economic growth has insignificant effect on the profitability of Ethiopian commercial banks.

4.5. Impact of IT Investment of Profitability on ROA

In order to establish the level of impact that each variable has on the dependent variable, the study checked the Standardized Coefficients of the variables. The impacts of, "LP", "BZ", "INF" and "ITI" on ROA in commercial bank are .1327279, .0842686, .0076268and .0002429 respectively, in their descending order indicating that labor productivity has the highest impact on ROA. Therefore, Ethiopian commercial banks have to work hard to improve their efforts in improving labor productivity, devise measures for the proper management of inflation, continue their bank size and take an innovative and efficient IT Investment solution to enhance bank's ROA. The negative significant impact of ITI on the profitability of commercial banks may emanate from several factors.

As it is discussed on literature above Similar to Dawit (2017) one of which is that the positive results from investment in IT might take a long time. It can also be proposed that other factors not included in the study might have a significant and negative impact on ROA curtailing or shadowing the positive impact of investment on IT on the profitability of commercial banks of Ethiopia. Contrast to Kyompaire (2011) found that positive relationship between the levels of implemented IT and profitability of the bank. Taddesse (2015) and Rahel (2015) found positive significance impact on performance of Private commercial Banks in Ethiopia.

CHAPTER FIVE

SUMMERY, CONCLUSION AND RECOMMENDATION

5.1. Summary of Findings and Conclusion

In the context of the study the researcher examines the relationship between IT investments and performance of selected Ethiopia commercial banks. Panel data of thirteen (13) selected commercial banks for 10 years period covering from 2009/10 to 2018/19 fiscal year was used. Applying quantitative research approaches the researcher addresses both general and specific objectives of the study. The following section provides summary of results obtained from the analysis made on both qualitative and quantitative research method used.

It is observed that investment on Information technology have been increasing from time to time with more technological advancements in Ethiopia commercial banks. Banks are investing on IT related products and services such as: core banking software, Electron banking like POSs, ATMS, mobile banking, internet banking and also any software and hardware used on daily activists of the bank.

Main motivational factors for banks to invest huge amount of money on IT include delivering quality customer services, increasing efficiency and effectiveness and to be competitive and leading in the fast-growing banking industry. Looking at overall IT Investment, it can be seen that technological products investment is holding large portion of overall capital investment profitability made, the average percentage of IT Investment share in relation to total fixed asset of banks is near to 50%, which shows banks are investing on IT related products aggressively.

From the regression output, ITI, BZ, LP and INF have significant relationship with performance measure ROA of commercial banks. While ITI and LP have a negative relationship with ROA of banks, BZ and INF have a positive relationship with bank investment. Economic Growth (GDP) and market share (CONS) have insignificant relationship with ROA of commercial banks.

The findings of the research reveal that Information technology has helped to reduce the rate of fraud in the banking system. Information technology has also provided better and well-grounded infrastructure to speed up transaction, increase consistency and enhance banks operation. Banks have been able to derive benefits from information technology, electronic banking and service

delivery in the area of improved efficiency and effectiveness of their operations so that more transactions can be processed faster and most conveniently, which will impact significantly on the overall performance of the banks.

Investment in IT has a significant negative relationship with ROA with a p value of 0.000 and coefficient of -0.0009774. LP does also have a negative significant relationship with ROA with a p value of 0.000 and coefficient of 0.6092975. BZ and INF have a positive significant relationship with ROA with a p value of 0.000 and 0.006 respectively. Market share (CONS) and GDP does not have significant relationship with ROA of commercial banks. As a result, the research hypothesis Investment in IT has a positive and INF has a negative relationship with ROA is rejected. On the other hand, the research hypotheses that bank size has a positive and labor productivity has a negative relationship with ROA are accepted.

5.2. Recommendations

- ✓ It is recommended that Ethiopian commercial banks should continent to exploit the merit of information technology investment as a tool to increase their earning power as well as to improve their day-to-day activities.
- ✓ Ethiopian banking industry should evaluate the impact of IT investment on the profitability, whose business behavior and attitude are changing rapidly now a days following stiff competition.
- ✓ Additionally the banking industry should not only be concerned about internal structures and policies, but they must consider both the internal environment and the macroeconomic environment together in fashioning out strategies to improve their profitability. For instance, the negative relationship of investment in IT and ROA should be studied and strategies should put in place to reverse the situation.
- ✓ Ethiopian government is recommended to balance its desire to control inflation with the need to maintain lasting viability of the banking industry.
- ✓ Finally, the study further recommended that comprehensive investigation future researcher could increase the number of observations like interest rate, Liquidity and other which are discussed on literature above by increasing the sample size and extending the period of time with unbalanced data. In addition, future research could cover cross

countries to capture countries differences and to uncover difference from financial system and regulation factors.

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APPENDIX

Appendix I-Regression Data

OBS	ID	Bank	Year	ROA	ITI	BZ	LP	CONS	GDP	INF
1	1	CBE	2010	2.652	142.814	11.215	0.219	59.072	10.570	2.800
2	1	CBE	2011	2.497	181.866	11.650	0.210	63.478	11.400	18.100
3	1	CBE	2012	3.419	231.640	11.976	0.161	66.535	8.700	34.100
4	1	CBE	2013	3.008	418.985	12.183	0.227	65.866	9.900	13.500
5	1	CBE	2014	2.822	572.687	12.405	0.345	66.459	10.300	8.100
6	1	CBE	2015	2.888	754.485	12.624	0.381	66.201	10.400	7.700
7	1	CBE	2016	2.173	1,229.293	12.857	0.554	66.665	8.000	9.700
8	1	CBE	2017	1.952	1,803.285	13.102	0.485	65.341	10.100	7.400
9	1	CBE	2018	0.935	2,132.004	13.260	0.145	62.211	7.700	14.600
10	1	CBE	2019	1.611	2,480.479	13.477	0.842	61.462	9.000	12.600
11	2	AIB	2010	2.750	46.439	9.108	0.378	7.180	10.570	2.800
12	2	AIB	2011	3.252	53.365	9.314	0.336	6.140	11.400	18.100
13	2	AIB	2012	3.005	61.510	9.482	0.381	5.496	8.700	34.100
14	2	AIB	2013	2.466	121.313	9.786	0.568	5.993	9.900	13.500
15	2	AIB	2014	2.797	173.326	10.004	0.552	6.018	10.300	8.100
16	2	AIB	2015	2.560	323.694	10.135	0.723	5.497	10.400	7.700
17	2	AIB	2016	2.430	429.871	10.329	0.827	5.318	8.000	9.700
18	2	AIB	2017	2.377	497.580	10.597	0.942	5.337	10.100	7.400
19	2	AIB	2018	2.700	537.359	10.920	0.827	5.991	7.700	14.600
20	2	AIB	2019	3.260	583.010	11.220	0.671	6.435	9.000	12.600
21	3	DB	2010	2.623	105.654	9.422	0.356	9.831	10.570	2.800
22	3	DB	2011	3.074	127.780	9.593	0.321	8.117	11.400	18.100
23	3	DB	2012	3.722	201.185	9.771	0.291	7.337	8.700	34.100
24	3	DB	2013	3.073	229.958	9.891	0.421	6.655	9.900	13.500
25	3	DB	2014	3.244	271.592	9.997	0.440	5.979	10.300	8.100
26	3	DB	2015	2.944	305.841	10.117	0.687	5.399	10.400	7.700
27	3	DB	2016	2.430	450.511	10.306	0.783	5.198	8.000	9.700
28	3	DB	2017	2.263	511.455	10.491	0.990	4.800	10.100	7.400
29	3	DB	2018	2.045	705.980	10.724	1.179	4.924	7.700	14.600
30	3	DB	2019	1.809	846.220	10.937	1.371	4.847	9.000	12.600
31	4	BOA	2010	2.239	12.880	8.745	0.564	4.997	10.570	2.800
32	4	BOA	2011	2.486	15.830	8.893	0.502	4.030	11.400	18.100
33	4	BOA	2012	2.625	20.520	9.017	0.491	3.450	8.700	34.100
34	4	BOA	2013	2.606	128.185	9.226	0.507	3.424	9.900	13.500
35	4	BOA	2014	2.401	141.217	9.330	0.640	3.070	10.300	8.100
36	4	BOA	2015	2.106	158.620	9.523	0.893	2.980	10.400	7.700

37	4	BOA	2016	2.158	244.008	9.762	1.038	3.018	8.000	9.700
38	4	BOA	2017	1.973	293.186	10.161	1.261	3.451	10.100	7.400
39	4	BOA	2018	1.760	462.058	10.373	1.537	3.467	7.700	14.600
40	4	BOA	2019	1.977	517.759	10.579	1.267	3.388	9.000	12.600
41	5	CBO	2010	1.419	10.400	7.478	0.982	1.407	10.570	2.800
42	5	CBO	2011	1.890	12.700	7.824	0.696	1.385	11.400	18.100
43	5	CBO	2012	2.779	36.322	8.208	0.415	1.537	8.700	34.100
44	5	CBO	2013	2.895	42.938	8.785	0.459	2.203	9.900	13.500
45	5	CBO	2014	4.681	51.217	8.903	0.348	2.001	10.300	8.100
46	5	CBO	2015	2.726	66.421	9.347	0.517	2.499	10.400	7.700
47	5	CBO	2016	0.372	108.702	9.261	4.839	1.828	8.000	9.700
48	5	CBO	2017	1.904	143.384	9.785	1.425	2.369	10.100	7.400
49	5	CBO	2018	1.751	208.322	10.305	1.338	3.240	7.700	14.600
50	5	CBO	2019	1.574	278.739	10.640	1.458	3.603	9.000	12.600
51	6	NIB	2010	3.365	30.107	8.695	0.384	4.751	10.570	2.800
52	6	NIB	2011	3.465	33.342	8.870	0.392	3.938	11.400	18.100
53	6	NIB	2012	3.459	38.087	9.021	0.404	3.466	8.700	34.100
54	6	NIB	2013	3.130	50.706	9.121	0.489	3.082	9.900	13.500
55	6	NIB	2014	2.920	126.016	9.282	0.617	2.926	10.300	8.100
56	6	NIB	2015	2.543	141.349	9.492	0.700	2.890	10.400	7.700
57	6	NIB	2016	2.240	205.196	9.675	0.815	2.766	8.000	9.700
58	6	NIB	2017	2.339	230.126	9.958	0.812	2.815	10.100	7.400
59	6	NIB	2018	1.929	277.994	10.192	1.076	2.893	7.700	14.600
60	6	NIB	2019	2.138	296.081	10.426	0.975	2.907	9.000	12.600
61	7	UB	2010	2.959	34.450	8.682	0.388	4.692	10.570	2.800
62	7	UB	2011	3.001	44.832	8.952	0.359	4.277	11.400	18.100
63	7	UB	2012	3.390	57.716	9.081	0.396	3.680	8.700	34.100
64	7	UB	2013	2.874	64.912	9.209	0.528	3.365	9.900	13.500
65	7	UB	2014	2.342	126.586	9.382	0.715	3.233	10.300	8.100
66	7	UB	2015	1.959	165.452	9.572	1.125	3.131	10.400	7.700
67	7	UB	2016	1.955	189.876	9.761	1.176	3.013	8.000	9.700
68	7	UB	2017	1.763	221.229	9.999	1.399	2.934	10.100	7.400
69	7	UB	2018	2.046	289.670	10.241	1.183	3.039	7.700	14.600
70	7	UB	2019	2.105	343.627	10.484	1.128	3.081	9.000	12.600
71	8	WB	2010	3.890	33.904	8.656	0.407	4.569	10.570	2.800
72	8	WB	2011	4.010	59.996	8.995	0.373	4.463	11.400	18.100
73	8	WB	2012	4.021	72.614	9.030	0.430	3.495	8.700	34.100
74	8	WB	2013	3.272	85.143	9.249	0.541	3.503	9.900	13.500
75	8	WB	2014	2.762	111.597	9.353	0.764	3.138	10.300	8.100
76	8	WB	2015	2.570	121.996	9.526	0.918	2.989	10.400	7.700
77	8	WB	2016	2.324	216.318	9.690	1.010	2.808	8.000	9.700

78	8	WB	2017	2.483	279.035	9.947	0.988	2.786	10.100	7.400
79	8	WB	2018	2.897	329.373	10.218	0.853	2.969	7.700	14.600
80	8	WB	2019	2.086	366.206	10.301	1.279	2.567	9.000	12.600
81	9	LIB	2010	2.901	8.237	7.218	0.456	1.085	10.570	2.800
82	9	LIB	2011	2.421	9.188	7.500	0.525	1.001	11.400	18.100
83	9	LIB	2012	3.061	11.289	7.809	0.492	1.031	8.700	34.100
84	9	LIB	2013	3.782	13.956	7.987	0.421	0.992	9.900	13.500
85	9	LIB	2014	3.520	18.141	8.192	0.561	0.984	10.300	8.100
86	9	LIB	2015	3.426	24.584	8.676	0.612	1.277	10.400	7.700
87	9	LIB	2016	3.219	51.312	9.003	0.766	1.412	8.000	9.700
88	9	LIB	2017	2.113	90.256	9.302	1.110	1.462	10.100	7.400
89	9	LIB	2018	2.729	104.380	9.569	0.890	1.552	7.700	14.600
90	9	LIB	2019	2.643	125.284	9.923	0.901	1.758	9.000	12.600
91	10	ZM	2010	3.965	19.930	6.962	0.225	0.840	10.570	2.800
92	10	ZM	2011	5.249	38.256	7.386	0.184	0.894	11.400	18.100
93	10	ZM	2012	3.607	52.074	7.781	0.267	1.003	8.700	34.100
94	10	ZM	2013	2.898	62.627	8.086	0.377	1.095	9.900	13.500
95	10	ZM	2014	3.260	73.907	8.275	0.419	1.068	10.300	8.100
96	10	ZM	2015	3.145	102.134	8.492	0.481	1.063	10.400	7.700
97	10	ZM	2016	3.551	124.301	8.916	0.363	1.295	8.000	9.700
98	10	ZM	2017	2.727	148.731	9.186	0.314	1.301	10.100	7.400
99	10	ZM	2018	2.179	175.374	9.429	0.405	1.348	7.700	14.600
100	10	ZM	2019	3.293	223.336	9.595	0.425	1.266	9.000	12.600
101	11	BB	2010	0.833	4.722	7.020	1.143	0.890	10.570	2.800
102	11	BB	2011	2.493	6.543	7.582	0.572	1.086	11.400	18.100
103	11	BB	2012	2.053	12.112	7.933	0.509	1.167	8.700	34.100
104	11	BB	2013	2.172	21.881	8.272	0.524	1.318	9.900	13.500
105	11	BB	2014	2.655	31.258	8.724	0.634	1.675	10.300	8.100
106	11	BB	2015	2.989	65.425	9.163	0.643	2.079	10.400	7.700
107	11	BB	2016	2.742	72.814	9.324	0.695	1.947	8.000	9.700
108	11	BB	2017	2.412	87.533	9.695	0.801	2.165	10.100	7.400
109	11	BB	2018	2.421	97.164	10.077	0.623	2.580	7.700	14.600
110	11	BB	2019	3.183	172.623	10.367	0.621	2.740	9.000	12.600
111	12	OIB	2010	1.719	4.950	6.174	1.043	0.382	10.570	2.800
112	12	OIB	2011	2.261	7.750	6.661	0.678	0.432	11.400	18.100
113	12	OIB	2012	1.770	17.301	7.212	1.020	0.568	8.700	34.100
114	12	OIB	2013	1.996	26.263	7.663	1.043	0.717	9.900	13.500
115	12	OIB	2014	2.509	34.140	8.010	0.809	0.820	10.300	8.100
116	12	OIB	2015	2.326	49.752	8.412	0.964	0.981	10.400	7.700
117	12	OIB	2016	2.217	103.325	8.828	1.263	1.185	8.000	9.700
118	12	OIB	2017	1.833	134.654	9.192	1.430	1.309	10.100	7.400

119	12	OIB	2018	3.058	179.188	9.474	0.856	1.412	7.700	14.600
120	12	OIB	2019	2.347	241.950	9.582	1.071	1.250	9.000	12.600
121	13	BIB	2010	1.572	2.304	5.939	0.675	0.302	10.570	2.800
122	13	BIB	2011	2.324	6.515	6.818	0.398	0.506	11.400	18.100
123	13	BIB	2012	2.655	7.580	7.159	0.412	0.538	8.700	34.100
124	13	BIB	2013	2.380	9.539	7.695	0.432	0.741	9.900	13.500
125	13	BIB	2014	3.173	12.099	7.942	0.501	0.766	10.300	8.100
126	13	BIB	2015	2.506	16.053	8.336	0.715	0.910	10.400	7.700
127	13	BIB	2016	3.610	30.339	8.883	0.611	1.252	8.000	9.700
128	13	BIB	2017	3.011	39.648	9.262	0.932	1.405	10.100	7.400
129	13	BIB	2018	2.330	49.282	9.552	1.338	1.525	7.700	14.600
130	13	BIB	2019	2.388	76.259	9.861	1.360	1.653	9.000	12.600