

**EFFECT OF FINANCIAL TECHNOLOGY ON PROFITABILITY
OF COMMERCIAL BANKS IN KENYA**


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DECLARATION

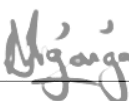
I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

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This research project has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

I dedicate this project to my family

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATM	Automated Teller Machine
CBK	Central Bank of Kenya
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
VIF	Variance Inflation Factors

ABSTRACT

Banks in Kenya have made significant investments in fintech to tackle issues about competition, income and cost. The critical issue is whether financial institutions that have adopted fintech have a cost advantage over those that have not. This research aimed at bringing out the effect that financial technology has on financial performance of commercial banks in Kenya. It was established from the research that mobile banking, agency banking, internet banking and ATMs has an effect on financial performance of banks in Kenya. The control variables used in the model were; Bank size, credit risk and capital adequacy. The research design adopted was Descriptive research design. The target population in this research was the banks in Kenya. As at 2020, there were 42 banks in Kenya but only 37 of them were able to provide a complete set of data. The data for the research variables were obtained from CBK and the audited annual financial statements for the banks as from 2016 to 2020. The research hypotheses were tested using correlation and regression by determining the relationship between ROA and financial technology. The results showed R^2 being 0.448 implying that the independent variables selected contributed to variations in ROA by 44.8%. It was further established from the study that the agency banking ($\beta=0.106$, $p=0.008$), internet banking ($\beta=0.133$, $p=0.000$), mobile banking ($\beta=0.113$, $p=0.000$) and bank size ($\beta=0.411$, $p=0.000$) were positively and significantly related to ROA among banks in Kenya. A negative significant relationship was established between Credit risk and ROA ($\beta=-0.506$, $p=0.000$) while capital adequacy and were not statistically significant. This study recommends that policy makers should provide an environment that allows banks to utilize financial technology since it enhances their performance. Directors and managers of commercial banks need to work towards improving the coverage of financial technology with the aim of enhancing their financial performance and ensuring that they remain competitive in an environment that is ever changing.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Banks' competitive advantage in a highly competitive market has been bolstered by financial technology (Fintech), which has helped shape the way financial institutions operate (Cihak & Singh, 2013). According to Kohali and Sheleg (2011), a revolution is occurring in the global banking sector, with banks using new technologies and stricter rules. Banks have started to apply technology in their daily operations because of this. Some chores have become much easier and cheaper because of new technology, but it also introduces new problems (Aladwani, 2001). It has seen financial services organizations deploy technology to build alternate channels and lower costs while improving efficiency, although these efforts have been unsuccessful (Kombe & Wafula, 2015). Concrete evidence does show that financial advisors are absolutely convinced that all of the innovation that is happening in the financial sector is important as it directs money to the efficient purposes as well as allocating the risk to the people who are in a position to utilize them. This does not change the fact that those advisors have the desire to get involved with fintech but are lacking adequate training and resources (Neaime & Gaysset, 2018).

There is a plethora of thought that has been put out in an effort to expound on the connection that exists between financial technology and profitability. This research found support for its hypotheses in the theory of the spread of innovation, the model of technological adoption, and the theory of financial intermediation. Mises (1912) was the first person to propose the theory of financial intermediation. He hypothesized that in order for financial institutions to maximize their performance, they needed to

both invest in financial intermediation and make it as easy as possible for their customers to trade on their behalf. The manner in which a particular preference channel is exploited will decide the mode of transmission that will be used to introduce a novel concept to a certain social structure (Rogers, 1995). The Technology Acceptance Model (TAM) sheds some insight on the many methods in which consumers take advantage of and absorb a novel idea (Davis, 1989). TAM was used in this research in order to get a better understanding of how financial institutions in Kenya adopt new technology.

The focus of the study is on Kenyan commercial banks. This is because the last decade has seen banks in Kenya embrace technological innovations. Technological innovation is available in Kenya in a number of forms, inclusive of mobile phone apps, mobile money wallets, as well as payroll borrowing. Loans with high interest rates are sometimes part of the deal. Customers' cell phone data, including social media, mobile transaction history and short message records and phone conversations, is used by banks to calculate credit ratings and determine loan amounts, [Mohamed, 2018]. The most common financial innovation services being offered by banks include M-Shwari, KCB MPESA and Fuliza (CBK, 2019). The current study sought to investigate how this influences the profitability among commercial banks.

1.1.1 Financial Technology

Financial technology, according to Sheleg and Kohali (2011), is any technological advancement that has an effect on the financial sector and its operations. Besises defines the word "financial technology" as firms that combine conventional financial services with current technology in order to develop internet-based and application-oriented services that are user-friendly, automated, transparent, and very efficient

(Triki & Faye, 2013). Financial technology, according to Freytag and Fricke (2017), is a new technology that facilitates financial services. Customers will be able to take advantage of investment possibilities made possible by financial technology using their mobile devices, which is something that customers can look forward to seeing offered by banks in the future in the form of social networking platforms (World Bank, 2017).

Within the realm of financial technology, a variety of technological solutions that prioritize convenience, accelerated processing times, and increased operational efficacy are already on the market (Klapper, 2016). The financial industry is comprised of a wide range of diverse stakeholders, all of which may be influenced by FinTech companies. The improvement of asset management services has come about as a result of the provision of asset management services to retail customers. This has been accomplished via the use of streamlined systems, algorithms, and robots. The monitoring of people's savings, credit ratings, how much they spend, and how much they owe in taxes is another way cryptocurrencies like Bitcoin have an effect on the financial industry. Banking services expand to the Internet of Things (IoT), smart contracts, and fintech in addition to more traditional services such as faster transactions made possible by distributed ledger technology, contactless transfers, and the use of cryptocurrency exchanges (Yang & Liu, 2016).

According to Demirguc-Kunt, Klapper, Singer, Ansar, and Hess (2018), the majority of financial transactions that take place in today's world are carried out with the assistance of financial technology. This generally entails gaining access to a personal or business bank account through the utilization of a mobile device. As a result of the fast development of the Internet and technology, financial institutions are now able to provide their services on the internet, which they own. Peer-to-peer lending, in which

individuals are able to get loans from other individuals or vice versa without involving bureaucracy bank as the intermediary, block chain and a digital ledger where the recordings of all the digital currency transactions are done chronologically and openly, as well as other services, technology related, such as credit cards, banking, and ATMs, has recently gained popularity. Peer-to-peer lending is gaining popularity because it eliminates the need for a bank to act as This study made an effort to quantify the amount of utilization of financial technology by determining the total number of transactions that were completed using mobile banking, online banking, agency banking, and ATMs.

1.1.2 Profitability

The ability of a corporation to earn revenue over a set length of time is referred to as profitability (Abernathy & Utterback, 2015). Industry profitability refers to the aggregate profitability of all firms in the industry (Niresh & Velnampy, 2014). Profitability measures a company's ability to generate revenue from the utilization of its resources over a specified timelines (Farah & Nina, 2016). Profitable means being able to reap the rewards from all of a company's operations, firms, or companies (Muya & Gathogo, 2016). In many cases, profit serves as a reward for the entrepreneur's investment. To be perfectly honest, profits are the key incentive for starting a firm.

Ogbadu (2009) asserted that profits are often employed as a measuring stick for the business's performance. The profit of a business is equivalent to the change between the money it makes from sales and everything else it has to spend to generate those sales. A business's principal purpose is to obtain profits; however, these might be expressed as accounting profits or economic profits (Anene, 2014). The profitability of

the management is shown by how well it converts the resources of the company to profits (Muya & Gathogo, 2016).

For this reason, corporations stand to gain a great deal of enhanced profitability (Niresh & Velnampy, 2014). To achieve long-term success and survival, a business must be profitable. Investors flock to a company because it offers profits. The firm has a good chance of being in business for a long term (Farah & Nina, 2016). Many organizations focus on increasing their profitability, and they often have numerous meetings in order to think of new ways to cut operational costs while also increasing sales (Schreibfeder, 2006).

A company's profitability is one of the most significant metrics to use in evaluating its overall success. Profitability is among the most important considerations in financial reporting for many businesses (Farah & Nina, 2016). Since profitability represents the entire success of a company's operations, it is essential to both its management and its shareholders, and also to other stakeholders associated with the organization. In Murigu and Mwangi (2015) opinion's, the two metrics, net profit margin (NPM) and Return on equity (ROE), may be utilized to determine the financial health of a company. The ratio of operational profit to total equity and operating profit to total capital are factors in computing ROE, which helps determine a company's capacity to utilize shareholder investment. On the other hand, NPM measures the income-generating capabilities of a bank's sales. The net income to total sales ratio (Majed, Said & Firas, 2012).

1.1.3 Financial Technology and Profitability

Entrepreneurial endeavors, innovative endeavors, and market dominance are the focal points of variation that has an economic impact (Davis, 1989). Theories on the revolution in financial technology have emerged as a result of this discussion. Rogers

(1995) goes on to add that invention creates a monopoly for a brief period of time until imitators appear on the scene and compete, so breaking the monopoly. Therefore, if financial institutions take use of financial technology and implement new products and services in order to obtain a competitive edge over other banks, then it is without a doubt that they will have an influence on the growth of the financial sector.

With the increase in the number of financial technology households, products on savings and borrowing have become easy to everyone (Mehotra & Yetman, 2015). Among the projected benefits of fintech is the long-term profitability of banks (Rasheed, Law, Chin & Habibullah, 2016). It is important to ensure that people have an easy access to and are in a position to utilize these services as it helps foster social growth and economic sustainability, decreasing destitution, and financial system stability (Zins & Weill, 2016).

According to Lenka and Sharma (2017), having access to financial technology can result in the creation of jobs in rural areas. This is because residents of these areas will have a higher disposable income, which in turn leads to increased savings, which in turn results in an overall expansion of the economy due to the effect of the multiplier. The performance of the bank is negatively impacted as a result of their inability to get funding as a direct result of their inadequate adoption of fintech. This stems from the misconception that low-income people do not have the financial resources necessary to save money or engage in endeavors that would result in increased revenue. Fintech makes access to funding quite easy, thus encouraging more investments by businesses and more risk taking, hence boosting the performance of the banks (Neaime & Gaysset, 2018)

1.1.4 Commercial Banks in Kenya

According to the CBK, a corporation is considered to be a bank if it either currently engages in banking operations in Kenya or has future ambitions to do so. Some of the operations that fall under the category of commercial banking include receiving deposits, giving credit, processing money transactions, and providing other financial services. The industry is very important to the functioning of the financial sector, notably in terms of the economy's ability to put its savings to use and its access to credit. The Central Bank of Kenya (CBK) is made abundantly plain to be the governing authority of the banking industry in Kenya's Annual Report on Bank Supervision (2018). In Kenya's banking sector, there are a total of 43 institutions, including 42 commercial banks, 1 mortgage financing bank, and 13 microfinance banks. A sizeable fraction of each of the 42 commercial banks is held by local inhabitants, while the remaining shares are controlled by foreign firms. Only 11 out of the 42 commercial banks have their stock listed at the NSE.

There have been a lot of developments made in the banking industry with the purpose of boosting the overall operations and the efficiency of those activities. Some of these trends include technical innovation, an increase in the competition between providers of financial services, and the consolidation of banking institutions. As a result, financial institutions are being forced to place a greater emphasis on certain aspects that contribute to performance enhancement, such as the supply of superior goods and services and the reduction of the costs associated with banking operations. With the banks' usage of financial technology, it has seen expenses in operational efficiency, administration and competition cut down (The National Treasury, 2016). According to Ngaruiya (2014), the use of financial technology is seen as a device that contributes to

the improvement of the financial transactions that are carried out. This is unequivocal proof that the greater use of financial technology has led to an improvement in the operational efficiency of the financial system in this industry.

There has been a wide range of performance among commercial banks in terms of profitability, with some commercial banks experiencing an increase in ROA while others experiencing a decline. As of late, a number of financial institutions, including Chase Bank, have suffered a decline as a direct result of unimpressive performance. There have also been mergers among the competing banks, all this with an aim of maintaining their financial stability in the market. The Kenya Deposit Insurance Corporation (KDIC) has ordered Dubai Banks and Imperial Bank to be liquidated (CBK, 2017). This is a clear indication of the necessity to explore the influence that financial technology has on profitability as well as propose legislative ideas that protect banks and the funds held by stakeholders from being exposed to financial risk.

1.2 Research Problem

The use of financial technology in the world's various financial institutions has seen a significant uptick in recent years. Some of the bank processes that have benefited from this enhancement are stocks trading, offering of new products, conducting internet and electronic payments, as well as incurring costs. As a consequence of this, the standard of the services provided by banks all over the globe has significantly increased in quality (Babajide et al., 2015). Finances are an essential creativity throughout the the growth process (Kim, Yu & Hassan, 2018). It is clear that specialists in innovation are of the opinion that the promotion of fintech will, in the long run, result in an increase in income for banks. If, on the other hand, access to financial technology is limited, there

is a good chance that financial institutions will not perform as well (Neaime & Gaysset, 2018).

Banks in Kenya have made significant investments in fintech to tackle issues about competition, income and cost. The critical issue is whether financial institutions that have adopted fintech have a cost advantage over those that have not. The KCB Bank Group has been using the T24 IT system since 2008, replacing the preceding TC3 system (CBK, 2018). The new system served as the basis for the development of further kinds of online banking, such as internet banking, mobile banking, agency banking, and online services offered at ATMs (thanks to the advent of ATMs which are powered by VISA). Other banks followed suit, including Standard Chartered Bank, Barclays Bank, Equity Bank, Cooperative Bank and others. This is all in an effort to ensure that online banking and other functions ran smoothly. The primary goal was to boost productivity (CBK, 2019). It is vital to do research on the topic if one want to arrive at an informed evaluation of the influence that fintech has had on the productivity of banks in Kenya.

Although international studies have been conducted studies in this field, the primary focus has been on certain components of financial technology relating to profitability. Internet banking contributed to cost-effective and efficient services, which boosted banks' profitability, according to a research that was conducted by Stoica, Mehdian, and Sargu (2015). The study was conducted in order to explore the influence that internet banking had on the performance of Romanian banks. De Young et al. (2015) conducted research in Oslo, Norway with the purpose of determining the effect that online banking has had on the performance of local banks. The research indicates that the use of online banking has led to an increase in bank profitability. Wadhe and Saluja

(2015) conducted research on the influence that electronic banking has on the profitability of Indian banks from the years 2006 to 2014. The results indicated that electronic banking had a favorable link with profitability in both private and public sector banks. This was shown by the fact that the correlation existed. Since each of these research was carried out in a unique environment, the findings from each of them cannot be used in the context of the present circumstance.

Electronic banking was shown to have a favorable impact on the profitability of Kenyan commercial banks, according to the findings of an analysis that was carried out locally by Mugodo (2016) on the ways in which the performance of commercial banks is influenced by electronic banking. Chirah (2018) carried a study in Kenya to investigate the ways in which alternative banking channels have an effect on the operational efficiency of banks. They arrived at the verdict that the use of online banking did not have a substantial impact on the effectiveness of the banks. Technology in the financial business has a favorable impact on performance, as found by Abdulkadir (2019), who performed study on the effect of fintech on the profitability of commercial banks in Kenya. It was the same with Kemboi (2018). These two studies, on the other hand, adopted limited definitions of fintech, focusing on only one or two features. It is clear from what has been said above that, despite the fact that there is comparable local research in this field, the results drawn from it are inconsistent. In addition, the bulk of earlier research has operationalized fintech in a variety of ways, with the majority opting for a limited definition. This knowledge vacuum is exactly what the present study attempted to solve by providing a more expansive definition. The results of this study provided an answer to the research question: What impact does financial technology have on the profitability of commercial banks in Kenya?

1.3 Research Objective

The study's objective was to determine the effect of financial technology on profitability of the commercial banks in Kenya.

1.4 Value of the Study

In the future, academics, students, and researchers who desire to undertake investigations that are comparable to or connected with this one will be able to use the results of the study as a reference to guide their work. The study will also assist academics and scholars in identifying other subjects of study by noting related issues that need further study and scientific analysis to fill study gaps.

Development and implementation of legislation and regulations to regulate financial system activity would benefit government and its agencies, such as CBK and the CMA. Smart financial technology policies and other technological advances that are shown to have a favorable influence on financial returns will help enhance the financial health of the whole nation.

Researchers believe that their findings will be of great use to the investing community since it will allow them to better understand the role of financial technology in a company's profitability and to take the right actions to maximize profits. As a result of these findings, theoretical breakthroughs will be made in financial technology and profitability.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a summary of previous research on financial technology and profitability, as well as an introduction to the theoretical underpinnings of the subject. A theoretical overview, empirical review, literature review summary, research gaps, and a conceptual framework that displays the hypothesized correlations between the study variables are all included.

2.2 Theoretical Framework

This research investigates a number of hypotheses that make an effort to explain the connection between financial technology and profitability. Among the several theoretical models that are discussed in this presentation are the technological acceptance model, profit maximization theory, diffusion of innovation theory, and financial intermediation theory.

2.2.1 Financial Intermediation Theory

Mises (1912) proposed the theory of financial intermediation, which states that major actors in financial intermediation are banks. Mises's idea was published in 1912. The money that their customers deposit is pooled and then lent out at an interest rate to those who are struggling financially. The banks are able to maintain a state of liquidity in the financial system because to this arrangement, which involves taking money from consumers with short-term deposits and using it to create longer-term deposits for other customers (Dewatripont, Tirole & Rochet, 2010). Ludwig von Mises, a prominent Austrian economist, proposed in 1912 that banks play a pivotal role as debt negotiators due to the fact that they lend money that has been borrowed from the general population.

When it comes to the process of financial intermediation, the two most important functions that banks do are money lending and money borrowing. Austrian economist Ludwig von Mises said in 1912 that banks' involvement in financial intermediation lowers their ability to make money while simultaneously providing them with the chance to do so. According to critics such as Allen and Santomero (2001), the concept of participation costs has been at the forefront of risk management in the financial industry and shows risk management as a developing term. In order to improve the profitability of banks, new financial technology may be used to make banking processes more comfortable for consumers.

2.2.2 Diffusion of Innovation Theory

W. R. Rogers (1995) was the first person to present this hypothesis to the public. The term "innovation" was coined by two writers named Mahajan and Peterson (1985). According to these two authors, an innovation is any novel thought, deed, or thing that is immediately incorporated into an existing social order after its introduction. It seeks to illustrate how internet and mobile banking are welcomed and implemented within the confines of society structure (Clarke, 1995). According to what Sevcik has to say about the subject, the adoption of innovations does not happen all at once but rather over a period of time (2004). In addition to this, he asserts that resistance to new ideas and innovations is a factor that contributes to a reduction in the rate of their adoption. The speed with which a corporation adopts new technology is largely determined by these five characteristics: complexity, compatibility, relative benefit, observability, and triability (Rogers, 1995). To begin, Rogers thinks that the degree to which a corporation accepts new innovation will be directly correlated to the degree to which it knows its relative advantages, relative triability, relative compatibility, and relative complexity. Internet banking has been shown to be beneficial in Kenya; hence, once

all of the essential infrastructure components are in place, it will be used. Enterprises are able to accelerate their pace of innovation adoption thanks to their information technology departments and their access to the internet. When an executive gives the go-ahead, businesses will use innovations like as mobile banking, internet banking, and agency banking. These banking methods are examples of innovations that have been implemented in businesses.

2.2.3 Technology Acceptance Model

Davis (1989) is credited with initially conceptualizing the technology acceptance paradigm, which is also often referred to as the Davis model (TAM). This model covers the adoption behavior of consumers, which is used to help customers choose a system that provides them with both benefits and conveniences. Moon and Kim (2015) investigated the fundamental nature of the validity of TAMs and came to the conclusion that the fundamental structure of TAMs is not the deciding element of user acceptance. Instead, usage of technology and other aspects of usability impact this. The anticipated usefulness of a technology or computer system can be defined by the theory that once it is implemented, the technology or computer system will significantly improve workers' overall performance (Davis, 1989). When an information system's ease of use is maintained throughout time, it indicates that the user has acquired the knowledge necessary to operate the system and make advantage of the new technology. The model places an emphasis on straightforward application as a method for estimating system usefulness (Gefen, Karahanna & Straub, 2013).

When individuals have faith that electronic banking is reliable, they are more inclined to make use of it (Potaloglu & Ekin, 2015). It is believed that factors such as the perceived ease of use and the perceived utility are significant in the process of

increasing the adoption of electronic banking. The use of Theory of Technology Acceptance has resulted in a shift in the practices of researchers. The present inquiry focuses on evaluating the advantages and disadvantages of incorporating technology into Kenya's commercial banks and establishing how simple or complex it is for Kenya's commercial banks to adopt electronic banking.

2.3 Determinants of Profitability

Taking into account a variety of factors, both internal and external to the company, makes it feasible to evaluate the state of the company's finances. Internal components of a bank's range of manipulation are subject to variation from institution to institution. Deposit liabilities, management efficiency and quality, management quality, capital size, and labor productivity are the five qualities that define financial organizations. The key factors that have an effect on the overall success of a bank are the state of the nation's political climate, the effectiveness of the country's monetary policy, the level of inflation, and the gross domestic product.

2.3.1 Financial Technology

Full commodities solutions traditionally handled by banks may now be provided by FinTech, a term that refers to the utilization of technological improvements in financial services. FinTech is a broad term that refers to the utilization of technological advancements in the financial services industry (Arner 2015). It is possible to describe FinTech as a new kind of money service business that combines information technology with money services such as asset management, transfer, and paymentsent. Fintech, then, is a blend of financial services and information technology (Lee & Kim, 2015). Businesses that use cutting-edge technology to better their financial operations are gathered together in this office (McAuley, 2015).

The expansion in the capacity of available technologies has, to some degree, made possible the development of more effective methods for running businesses in the present day and age (Stiroh, 2001). Banks are now providing services to clients in a more efficient manner because to the advent of ICT, according to the results of a study team headed by Ongori and Migiro (2010). Researchers doing the investigation made this discovery. When embarking on a worldwide expansion strategy, it is important to focus on improving customer service, reducing transaction costs, and using new technologies more widely. Fintech plays a part in the company's overall productivity and financial success, and this function is important (Brynjolfsson & Hitt, 1996). Technology has allowed for a reduction in the costs associated with trading, making commodities both more accessible and more affordable for institutions (Bames, 2014).

2.3.2 Capital Adequacy

According to the findings of Athanasoglou and colleagues (2005), investment is recognized as a crucial factor in determining financial performance. The contributions that the bank's owner makes to the bank's operations in order to sustain those activities and to serve as a backup in the event that anything unfavorable occurs are what make up the bank's capital. In imperfect capital markets, well-capitalized banks are required to reduce their borrowing in order to maintain the integrity of a certain asset index. As a consequence, these banks often have lower financing costs than other types of financial institutions.

It is reasonable to suppose that the signaling effect of a bank that has sufficient capital will be one of surpassing expectations. Athanasoglou et al. (2005) concluded that capital contributions had a beneficial potential unfavorable influence on the

profitability of banks in Greece, which validates the country's excellent financial situation. This was discovered after the researchers factored in capital contributions. In addition, Baba and Nasieku (2016) found that there is a correlation between the amount of money a firm invests into the economy and its profitability.

2.3.3 Credit Risk

Due to the crucial role credit risk plays in a financial institution, it is an expensive risk for a financial organization. Because it constitutes a threat to the company's very survival, it provides a significant challenge to the firm's ability to remain financially stable (Sufi & Qaisar, 2015). Lenders provide loans with the knowledge that the borrowers would return them in full and without default, preventing the loans from falling into the category of "non-performing" (Bhattarai, 2016). If non-performing loans continue to be recorded on the bank's books, it will have a devastating effect on the institution's profitability. It is probable that financial institutions have not put in place an efficient method to control the risk of credit (Afriyie & Akotey, 2012).

Credit risk is characterized by moral hazards and unequal distributions of information within the banking system. Credit risk has a significant bearing on a bank's earnings due to the fact that a significant portion of a bank's income comes from the interest that is charged on loans. On the other hand, it is impossible to deny the danger that credit risk poses to the financial industry. Effective measures need to be taken to address credit risk (Bhattarai, 2016). Previous studies have shown that the quality of a bank's assets is a good determinant of how well it is doing financially. Non-performing loans are one kind of credit risk indicator; they have the ability to disrupt the overall credit system of the bank, which in turn would lower the value of the bank's credit (Afriyie & Akotey, 2012).

2.3.4 Bank Size

The size of a bank may be directly impacted by both legal and financial considerations. The size of the bank is another factor that might affect whether or not it has sufficient capital. Larger banks often have better access to lower-cost capital, which enables them to generate even greater profits. To get some understanding of the relationship between bank size and return on assets, consider the fact that bank size is correlated with return on assets. As a consequence, large banks benefit from economies of scale, which enable them to reduce expenses and enhance their financial performance (Amato & Burson, 2007). Because a larger bank is often linked with improved capital ratios, the idea that a larger bank's size is connected with an increase in profitability has been decisively supported by this finding (Magweva & Marime, 2016).

In order for an organization to be effective, it is necessary for it to have the resources necessary to keep its operations going (Amato & Burson, 2007). In contrast to companies that have a greater number of assets, businesses that have enormous financial resources are able to finish many major projects that provide higher returns. Other organizations have collateral that is enough for obtaining loan facilities and credit that is more comprehensive than those of smaller firms since these other organizations have greater assets (Njoroge, 2014). According to Lee (2009), the total assets of a company have an effect on the amount of profitability that is documented for that company each year.

2.4 Empirical Review

Different research has been conducted both worldwide and locally to demonstrate the financial value of fintech, with diverse conclusions, despite the fact that some of the findings contradict one another.

2.4.1 Global Studies

In 2014, Kajewski published an essay that investigated banking sector innovations, analyzing their advantages, challenges, and recommendations for their implementation in Australia. The research design that was used for this study was a descriptive one. In order to provide a more accurate picture of the risks faced by the sector as a whole, secondary data, risk manuals, and financial reports were taken from 38 commercial banks in Australia. Results were examined using autocorrelation methods and regression analysis. The results demonstrated that throughout time, banks have invested in new technology platforms in an effort to make their services more accessible. The amount of transactions increased as the quality of each transaction improved. Financial institutions were able to lower their costs and better serve their customers in the aftermath of innovation, he discovered.

Research was carried out by De Young et al. (2015) in the city of Oslo, Norway, to investigate the impact that the internet has had on the production and productivity of local banks. This study focused on a population of interest consisting of 29 different financial institutions and was conducted between the years 2006 and 2019. The researchers discovered their findings by using a descriptive study technique. In order to collect information for the online questionnaire, both primary data, which is defined as data that has been acquired directly from the sources, and secondary data, which is defined as information that has been assembled from yearly financial reports, were employed. The result showed that traditional land-based banks that do not implement internet banking do not do as well as those that have. This is due to the fact that their earnings are much lower owing to their overall income and deposits, and their operating expenses are also significantly higher. In addition, the findings of the research showed that economic inequalities are difficult to swiftly close, even if, as a result of economies

of scale, differences in financial performance may be made up for in a very short length of time.

The impacts of electronic banking were the primary subject of the research that Wadhe and Saluja (2015) conducted in order to analyze the profitability of Indian banks from 2006 to 2014. The study made use of data relevant to commercial banks in India in order to conduct its research. In order to discover the nature of the relationship between banking services and profitability, a multiple regression analysis was carried out. It was found that using online banking led to an improvement in profitability for financial institutions in both the public and private sectors. According to the findings of this study, increasing the number of ATMs has a positive impact on profitability. Despite the fact that there were very few linkages between the two, it is possible that some may be formed between the profit of the financial institutions and the number of branches.

Financial inclusion on a big scale and India's economic development throughout the period from 2004 to 2013 are examined by Sharma (2016). Financial inclusion may be seen through the lens of three primary tenets. As the number of individuals who can use and access banking services rises, so does the number of people who have access to such services (deposits). Research shows that as the economy expands, more individuals will get access to financial services. Due to the Granger causality investigation, a link between the volume of savings accounts and GDP was shown to exist in both a one-way and a two-way fashion.

2.4.2 Local Studies

Wanalo (2018) wanted to determine whether the application of technical financial technology (TFT) had a significant impact on financial performance. In order to do so,

he looked at the performance of commercial banks in Kenya. Wanalo's research interests were focused on investigating whether TFT had a significant impact on financial performance. The financial intermediation theory, the innovation diffusion theory, and Silber's financial technology constraints were the three hypotheses that were considered over the course of this investigation. The approach that is included in descriptive research was used in order to carry out this study. In this particular analysis, all commercial banks were taken into consideration. This study included a total sample size of 15 participants, all of whom worked in banking, and the participants came from commercial as well as non-commercial institutions. In addition to the data obtained from the CBK and the bank's website, other information was obtained from the annual reports that were supplied by commercial banks between the years of 2012 and 2016. This study made use of a panel data analysis approach. The Prais-Winstein regression model was used in order to arrive at these conclusions. The usage of automated teller machines and banking agencies, albeit on the rise, does not significantly affect the overall financial health of a bank.

Chirah (2018) made an effort to investigate the ways in which alternative banking channels have an effect on the operational efficiency of commercial banks in Kenya. We used data from all 42 of Kenya's commercial banks, which amounts to a total of 42 banks. The independent variable in this research was alternative banking channels, which includes activities such as making a transaction via the internet, a smartphone, or an automated teller machine (ATM), in addition to agency banking. The efficiency of operations was measured by the ratio of total operating expenditures to total revenue. Additional data has been gathered on an annual basis starting in January 2013 and continuing all the way through December 2017 for a total of five years. According to the findings of this inquiry, the value of liquidity is both positive and significant.

After conducting research into the relationships between ATMs, agency banking, mobile banking, internet banking, and firm size and capital structure, it was found that none of these factors play a significant role in determining the level of operational efficiency achieved by commercial banks. This was one of the findings of the research.

Over the course of six years, starting in 2012 and continuing through 2017, Sindani, Muturi, and Ngumi (2019) investigated the effect that the development of financial channels of distribution had on the rate of financial inclusion in Kenya. The particular goals that will direct this research are as follows: investigate the impact that internet banking has had on the financial inclusion of Kenyans; investigate the impact that ATM banking has had on the financial inclusion of Kenyans. Data from secondary sources were gathered in preparation for further study. Frequency tables, percentages, and means were utilized to analyze the data collected in order to present the findings of this study. As a consequence of this investigation, descriptive statistics were used to generate the set of category sets that were produced. The mean, standard deviation, and variance of the dependent and independent variables functions were determined in order to define the variables utilized in the study. Because of its positive effects on both productivity and efficiency, this study shows that the advent of internet banking in Kenya has been beneficial to the country's financial system. The advent of automated teller machines (ATMs) has also contributed to greater financial inclusion in Kenya.

Ogweno (2019) carried out a survey in order to have a better understanding of the ways in which financial technology affects the financial performance of regulated MFI in Kenya. The residents of the neighborhood that was the focus of the research are now being served by a total of thirteen microfinance institutions (MFIs) that are licensed.

During the first five years of the project's existence, data was collected on an annual basis across the whole of that time period. According to the results, the correlation between variables was analyzed using a multiple linear regression model, and the research style that was used was a descriptive cross-sectional design. The results of the study showed that the size of the bank, the amount of deposits, and the amount of mortgages each had a significant influence on the development of savings account balances. The quantity of automated teller machines, agency banking, and the financial success of the bank were not shown to have a significant association with one another.

An in-depth research on the impact that digital payment methods have on the day-to-day operations of commercial banks was carried out by Abdulkadir (2019) in Kenya. The amount of transactions that were carried out through mobile and internet banking was credited as being the driving force for the deployment of digital internet banking. In this particular instance, all of the data was obtained from commercial banks. The study made use of factors such as financial institutions and capital adequacy ratios in order to take into consideration the magnitude of the financial institution. A technique of study known as descriptive research was used in order to compile information on all of Kenya's commercial banks. The Pearson correlation was used to establish the straightforward linear link. A regression analysis was used so that the dynamics of the association could be exposed. According to the findings of the study, financial technology are a factor in successful financial performance.

2.5 Conceptual Framework

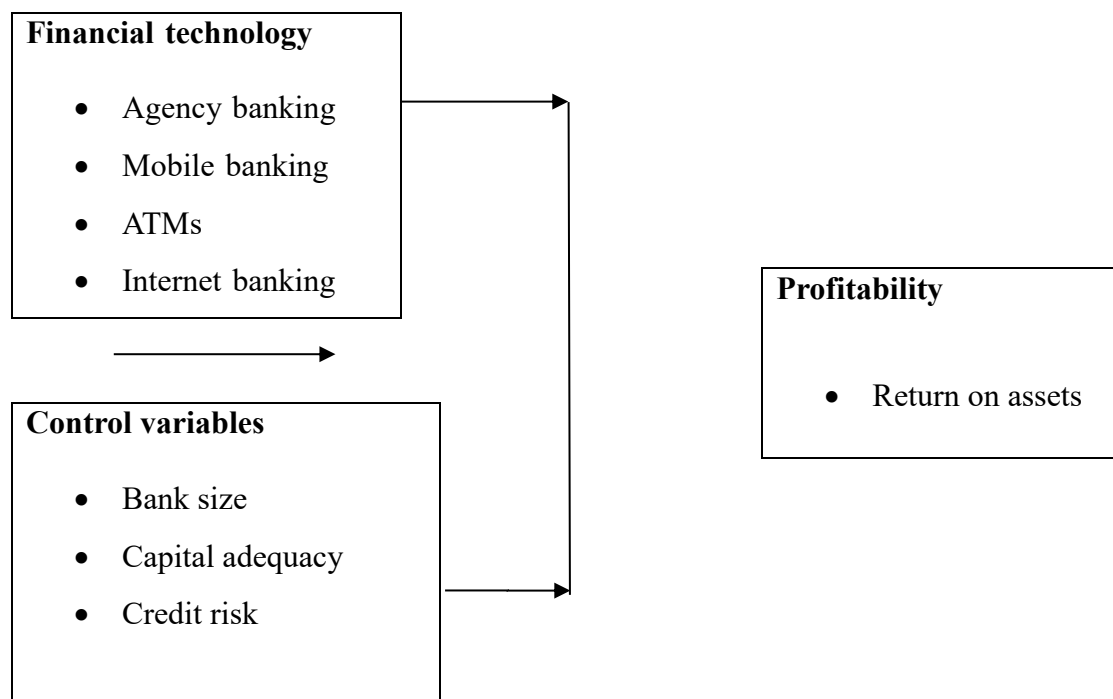
The following model will illustrate the predicted connection that exists between the variables. The financial technology, which was characterized as agency banking, ATMs, mobile banking, and internet banking, was the variable that was used to predict

the outcome. The control factors for this study were the size of the bank, whether or not it had sufficient capital, and the credit risk. The level of profitability, as determined by ROA, served as the dependent variable in this analysis.

Figure 2.1: The Conceptual Model

Independent variables

Dependent variable



Source: Researcher (2022)

2.6 Summary of the Literature Review

There have been a number of different theoretical frameworks presented in an effort to explain the anticipated link between financial technology and bank profitability. Among the several models and theories that are examined in this study are the financial intermediation theory, the technological adoption model, and the diffusion of innovation hypothesis. In addition to it, a number of the factors that have the largest impact on profitability were looked at. Several domestic and international research on financial technology and profitability have been examined. This section also delves into the findings of these investigations.

The disparity in findings between global and regional studies on the effect of financial innovation on the profitability of commercial banks is another compelling argument in favor of doing further research in this area. In order for the findings of the research to be taken seriously, the investigators would need to perform an exhaustive investigation on how the influence of financial technology on the profitability of commercial banks operates in the Kenyan setting. In the end, it should be made abundantly obvious how the use of reliable methodology may show the effect of financial technology on the profitability of commercial banks. The results of this investigation helped close this information gap.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The research study should contain a research methodology that specifies the technique that was followed in order to conduct the research in order to achieve the objective of identifying the influence that financial technology has on profitability. This chapter presents a discussion of the study design, the process for collecting data, the diagnostic tests that were carried out to verify the data, and, ultimately, the method for interpreting the findings.

3.2 Research Design

In this examination, a descriptive research approach was utilized to analyze the influence that technological advancements in the financial industry have had on the profitability of the financial sector in Kenya. Because it enabled the collecting of information on the existing circumstances, the descriptive research design was chosen for the conduct of this particular investigation (Khan, 2008). The researcher was well-versed in the subject matter that was being considered, but they wanted to understand more about the nature of the relationship between the study variables; as a consequence, the research design that was selected was the one that was the most suitable. To be more exact, the purpose of descriptive research is to produce an accurate and correct portrayal of the study variables, which assisted in the answer to the research questions that were provided in the beginning (Cooper & Schindler, 2008).

3.3 Population and Sample

A population is a collection of interesting events, such as those detailed in an inquiry, from which observations are taken, and the term "population" is used to refer to the results of those observations (Burns & Burns, 2008). The participant population of this research was comprised of the 42 commercial banks operating in Kenya as of the 31st of December in the year 2020. Due to the relatively small size of the total population, each of the 42 banks was considered for inclusion in the research (see appendix D).

3.4 Data Collection

The data came exclusively from secondary sources of information, which were researched and analyzed. Because it is a requirement for commercial banks to submit their reports to the regulator, the secondary data was collected from the financial reports of commercial banks as well as the Central Bank of Kenya. The information was gathered on a yearly basis during the course of the previous five years (January 2016 to December 2020).

3.5 Diagnostic Tests

A variety of diagnostic tests, including normality, stationarity, the Hausman test, multicollinearity, homogeneity, and autocorrelation, were carried out in order to determine whether or not the model was viable. The assumption of normalcy stated that the residual of the dependent variable would be regularly distributed and located relatively near to the mean. The Shapiro-Wilk test or the Kolmogorov-Smirnov test was used in order to successfully complete this task. In situations in which one of the variables did not have a normal distribution, the logarithmic adjustment technique was used to make adjustments to that variable. The test for stationarity was performed in order to determine whether or not the statistical properties such as variance, mean, and

autocorrelation changed throughout the course of the study's duration. The Levin-Lin Chu unit root test was used to confirm the existence of this attribute. The natural logarithm was used to convert the data in the case that it was determined that the data did not satisfy this criteria. Robust regression was also used due to the fact that it results in superior regression coefficients when compared to conventional least square (Khan, 2008).

The term "autocorrelation" refers to a statistical technique that evaluates how close one time series was to its lagging value over a range of different timings. The Wooldridge test was used in the process of determining the results of this test, and in the case that the assumption was disproved, robust standard errors were included into the model. A multicollinear relationship is said to occur when there is a perfect or nearly perfect linear link between a number of different independent variables. Variance Inflation Factors (VIF) and tolerance levels were also applied in this process. The presence or absence of heteroskedasticity in a regression helps to establish whether or not the error variance may be attributed to the variables being analyzed independently. This was checked using the Breuch Pagan test, and if the data did not match the homogeneity of variances assumption, robust regression analysis was used since it delivers superior regression coefficients when there are outliers in the data (Burns & Burns, 2008).

3.6 Data Analysis

Following the examination of the many different data sources, the collected information was then arranged in a manner that would best suit the objectives of the research. The study was performed on a PC using SPSS version 23, the most recent available version. Using descriptive statistics, we were able to determine not only the

central tendency measurements (such as mean and median), but also the dispersion measures (such as standard deviation). In the framework of inferential statistics, correlation and regression analysis are necessities. The purpose of correlation analysis is to identify the degree of connection among the researched variables, while regression analysis seeks to comprehend the cause and effect relationships existing between the variables being studied. A multivariate regression analysis was used in order to determine the nature of the connection between the dependent variable (profitability) and the following independent factors: agency banking, ATMs, mobile banking, internet banking, bank size, capital sufficiency, and credit risk.

3.6.1 Analytical Model

In order to determine the relative relevance of each of the elements that explain profitability in Kenya, a multivariate regression model was applied.

The following multivariate regression model was used in the investigation;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon$$

Where:

Y was profitability calculated as net income divided by total assets.

β_0 in the regression equation will be the constant (value) of the regression (function parameter)

β_1 to β_7 are the the independent variables' coefficients

X_1 the entire amount of money transacted via agency banking outlets will be referred to as agency banking to express it as a linear function of natural logarithm of the amount of funds transacted.

X_2 was mobile banking as measured by logarithmic expression of total quantity of money exchanged via accounts held in mobile banking

X₃ was Automatic Teller Machine as measured by logarithmic expression of total quantity of money exchanged via Automatic Teller Machine

X₄ was internet banking as calculated by logarithmic expression of total quantity of money exchanged via internet banking

X₅ was bank size as calculated by logarithmic expression of sum of all assets

X₆ was capital adequacy as given by the proportion of total core capital to risk weighted assets

X₇ was credit risk calculated by dividing non-performing loans and total loans

é was the parameter representing error

3.6.2 Operationalization of the Study Variables

Variables	Measurement	Reference
Profitability	Total income to its total assets	Abernathy and Utterback (2015)
Agency banking	Log total value of agency banking transactions	Sheleg and Kohali (2011)
Mobile banking	Log total value of mobile banking transaction	Yang and Liu (2016)
ATMs	Log total value of ATM transactions	Demirguc-Kunt et al. (2018)
Internet banking	Log total value of internet banking transactions	Triki and Faye (2013)
Bank size	Natural log of total assets	Amato and Burson (2007)
Capital adequacy	Core capital to risk weighted assets	Baba and Nasieku (2016)
Credit risk	Non-performing loans to total loans	Sufi and Qaisar (2015)

3.6.3 Tests of Significance

Parametric tests are required to be carried out in order to evaluate not only the relevance of the model as a whole but also the statistical significance of each item that is estimated. The F-test, which was developed from the ANOVA, was used to determine whether or not the overall model was significant. The t-test, on the other hand, was used to determine whether or not any of the individual variables were significant. Both of these tests were derived from the ANOVA.

CHAPTER FOUR

DATA ANALYSIS RESULTS AND FINDINGS

4.1 Introduction

The examination of data is the primary emphasis of this chapter. The purpose of this study was to determine whether or not there is a correlation between the use of financial technology and the profitability of banks in Kenya. In line with the particular aims, descriptive and inferential analyses were used to study patterns, which were then examined, and conclusions were reached on the basis of those analyses.

4.2 Descriptive Statistics

The purpose of the study was to attempt to characterize the data by calculating their means and standard deviations. Before moving on to inferential analysis, it was required to first do a descriptive analysis since this aids in understanding the features of the data that was obtained. Table 4.1 presents the findings of the investigation.

Table 4.1: Descriptive Results

	N	Minimum	Maximum	Mean	Std. Deviation
Profitability	185	-.244	.070	.00644	.038379
Agency banking	185	8.473	17.293	14.31379	1.647710
Mobile banking	185	4.323	5.588	5.09096	.319403
ATMs	185	5.087	9.407	7.97377	.555799
Internet banking	185	8.473	17.293	14.32992	1.605652
Bank size	185	14.7750	20.6163	17.725991	1.3648773
Capital adequacy	185	.0280	2.1258	.237358	.2113328
Credit risk	185	.0008	38.5539	.355127	2.8284459
Valid N (listwise)	185				

Source: Research Findings (2022)

The descriptive analysis is shown in Table 4.1 below. Profitability served as the dependent variable, while advancements in financial technology served as the

independent variable (agency banking, mobile banking ATMs and internet banking). In the end, the control variables were determined to be enough capitalization, credit risk, and the size of the bank.

4.3 Diagnostic Tests

A series of diagnostic tests, including normality, stationarity, the Multicollinearity test, homogeneity of variance, and autocorrelation, were carried out in order to determine whether or not the model was viable.

4.3.1 Normality Test

The Kolmogorov-Smirnov test and the Shapiro-Wilk test were used to conduct the normality test. The purpose of these tests was to determine whether or not the data obtained assumed a normal distribution. If the p value is larger than 0.05, then the data is considered to have a normally distributed distribution.

Table 4.2: Test for Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Profitability	0.326	185	0.112	0.869	185	0.078
Agency banking	0.408	185	0.207	0.918	185	0.102
Mobile banking	0.272	185	0.063	0.881	185	0.094
ATMs	0.124	185	0.057	0.874	185	0.091
Internet banking	0.176	185	0.061	0.892	185	0.101
Bank size	0.567	185	0.365	0.923	185	0.120
Capital adequacy	0.644	185	0.412	0.874	185	0.094
Credit risk	0.598	185	0.394	0.892	185	0.116

a. Lilliefors Significance Correction

Source: Research Findings (2022)

The results of the normality test showed a p value that was greater than 0.05, which meant that the null hypothesis was rejected and the alternative hypothesis was accepted. This also meant that the normality test showed that the data followed a normal distribution.

4.3.2 Multicollinearity Test

The phenomenon known as multicollinearity occurs when there is a perfect or nearly perfect linear link between a number of independent variables. Variance Inflation Factors (VIF), in addition to tolerance limits, were used.

Table 4.3: Multicollinearity

Variable	Collinearity Statistics	
	Tolerance	VIF
Agency banking	0.724	1.382
Mobile banking	0.684	1.463
ATMs	0.697	1.434
Internet banking	0.621	1.610
Bank size	0.703	1.422
Capital adequacy	0.661	1.513
Credit risk	0.634	1.577

Source: Research Findings (2022)

According to the findings shown in Table 4.3, none of the variables exhibited multicollinearity since their VIF values were lower than 10 and their tolerance values were higher than 0.2.

4.3.3 Heteroskedasticity test

The Breusch-Pagan test was used in order to examine the possibility of heteroskedasticity. The assumption that the variance of the error terms stays the same served as the null hypothesis. The results of the test for heteroskedasticity are shown in Table 4.4.

Table 4.4: Heteroskedasticity Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
Ho: Constant variance
Variable: fitted values

chi2(1)	=	0.7003
Prob > chi2	=	0.6429

Source: Research Findings (2022)

Based on the findings shown in Table 4.4, which are supported by a p-value of 0.6429, it can be concluded that the null hypothesis of homoskedastic error terms is not rejected.

4.3.4 Autocorrelation Test

The term "autocorrelation" refers to a measurement that determines how comparable one time series was to its lagging value over a number of different timings. The Wooldridge test was used in order to conduct the analysis of this test.

Table 4.5: Test of Autocorrelation

Wooldridge test for autocorrelation in panel data		
H0: no first-order autocorrelation		
F(1, 184) =		0.324
Prob> F =		0.5360

Source: Research Findings (2022)

The findings shown in Table 4.5 do not provide sufficient evidence to reject the null hypothesis that there is no serial connection since the p-value is significant (p-value = 0.5360).

4.3.5 Stationarity Test

The test for stationarity was carried out in order to ascertain whether or not the statistical properties, such as variance, mean, and autocorrelation, shift throughout the course of the study's duration. The results of the Levin-Lin Chu unit root test are shown in Table 4.6.

Table 4.6: Unit Root Test

Levin-Lin Chu unit-root test			
Variable	Hypothesis	p value	Verdict
Profitability	Ho: Panels contain unit roots	0.0001	Reject Ho
Agency banking	Ho: Panels contain unit roots	0.0000	Reject Ho
Mobile banking	Ho: Panels contain unit roots	0.0000	Reject Ho
ATMs	Ho: Panels contain unit roots	0.0000	Reject Ho
Internet banking	Ho: Panels contain unit roots	0.0000	Reject Ho
Bank size	Ho: Panels contain unit roots	0.0000	Reject Ho
Capital adequacy	Ho: Panels contain unit roots	0.0000	Reject Ho
Credit risk	Ho: Panels contain unit roots	0.0000	Reject Ho

In light of the findings shown in Table 4.6, the researchers decided to reject the null hypothesis stating that panels do not contain unit roots. This decision was based on the fact that the p values for each variable were lower than 0.05. This indicated that the panel data for all of the variables were in a stationary state.

4.4 Correlation Results

An study of correlation was carried out in order to determine the degree of relationship, as well as the direction of that link, that exists between each predictor variable and the responder variable. Table 4.7 presents the findings of the analysis, which illustrate the nature of the interactions between the research variables in terms of size and direction.

Table 4.7: Correlation Results

		ROA	Agency banking	Mobile banking	ATMs	Internet banking	Bank size	Capital adequacy	Credit risk
ROA	Pearson Correlation	1							
	Sig. (2-tailed)								
Agency banking	Pearson Correlation	.183*	1						
	Sig. (2-tailed)	.013							
Mobile banking	Pearson Correlation	.189**	.060	1					
	Sig. (2-tailed)	.010	.419						
ATMs	Pearson Correlation	.005	.041	.070	1				
	Sig. (2-tailed)	.949	.580	.345					
Internet banking	Pearson Correlation	.037	.061	.066	.040	1			
	Sig. (2-tailed)	.619	.412	.373	.592				
Bank size	Pearson Correlation	.495**	.163*	.137	.069	.043	1		
	Sig. (2-tailed)	.000	.026	.062	.353	.560			
Capital adequacy	Pearson Correlation	.057	.000	.081	.099	.003	.034	1	
	Sig. (2-tailed)	.438	.995	.272	.181	.972	.643		
Credit risk	Pearson Correlation	.479**	-.022	-.063	-.025	-.096	-.174*	.155*	1
	Sig. (2-tailed)	.000	.764	.393	.737	.191	.018	.036	

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).
 c. Listwise N=185

Source: Field data (2022)

The findings shown in Table 4.8 indicate that ROA and agency banking have a correlation that is positive and statistically significant ($r=0.183^{**}$), assuming a significance threshold of 5%. This indicates that ROA and agency banking will go in the same manner going forward. In addition, the findings indicate that ROA and mobile banking have a positive correlation that is statistically significant ($r=0.189^{**}$), which was calculated using a significance threshold of 5%. This indicates that both ROA and mobile banking will go in the same way in the future. In addition, the findings indicate that ROA and ATMs have a positive correlation that is statistically significant ($r = 0.005$ at the 5 percent significance level), and the same can be said for online banking ($r = 0.037$ at the 5 percent significance level). Regarding the confounding factors, the size of the bank showed a correlation that was both positive and significant with ROA. However, credit risk exhibited a large inverse association with ROA, which was far more significant than the link between capital sufficiency and ROA.

4.5 Regression Results

An investigation using regression analysis was carried out in order to determine the degree to which ROA can be explained by the factors that were chosen. The outcomes of the regression were detailed in Tables 4.8 – 4.10.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669 ^a	.448	.426	.029082

a. Predictors: (Constant), Credit risk, Agency banking, ATMs, Mobile banking, Internet banking, Capital adequacy, Bank size

Source: Field data (2022)

According to the results, which were represented by an adjusted R2 value, the independent factors that were analyzed explained 44.8% of the differences in ROA that were found across commercial banks in Kenya. This indicates that the seven variables are responsible for 44.8 percent of the variances in ROA across commercial banks in Kenya, whilst other factors that were not investigated in this study are responsible for 55.2 percent of the variability.

Table 4.9: ANOVA Analysis

Model	Sum of Squares	Df	Mean Square	F	Sig.
1	.271	184	.001	20.491	.000 ^b
	Regression	7	.017		
	Residual	177	.001		
	Total	184			

a. Dependent Variable: ROA
b. Predictors: (Constant), Credit risk, Agency banking, ATMs, Mobile banking, Internet banking, Capital adequacy, Bank size

Source: Field data (2022)

The results of the ANOVA, which are shown in Table 4.9, reveal that the data had a level of significance of 0.000; thus, this demonstrates that the data are perfect for drawing conclusions about the variables.

Table 4.10: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	-.543	.033	-7.423	.000
	Agency banking	.106	.004	.126	.008
	Mobile banking	.113	.011	.108	.000
	ATMs	.001	.004	.021	.712
	Internet banking	.133	.078	.121	.4704
	Bank size	.411	.002	.395	.000

Capital adequacy	.002	.001	.104	1.830	.069
Credit risk	-.506	.001	-.421	-7.304	.000
a. Dependent Variable: ROA					

Source: Field data (2022)

The coefficient of regression model was as below;

$$Y = -0.543 + 0.106X_1 + 0.113X_2 + 0.133X_3 + 0.411X_4 - 0.506X_5$$

Where:

Y = ROA; X₁ = Agency banking; X₂ = Mobile banking; X₃ = Internet banking; X₄ = Bank size; X₅ = Credit risk

4.6 Discussion of Research Findings

The purpose of this research was to investigate the impact that advancements in financial technology have had on ROA. The research was conducted using a descriptive design, and the population consisted of all 42 banks in Kenya. The information was collected from 37 different banks. The data used in the research came from secondary sources, such as yearly reports submitted by individual banks and the CBK. The following aspects of banking and financial technology were taken into consideration: mobile banking, online banking, automated teller machines, and agency banking. The factors that served as controls were enough bank capital, bank size, and credit risk. The analysis of the data included both descriptive and inferential statistical methods. The discussion of the findings may be found in this section.

According to the findings of the regression analysis, agency banking has a positive and statistically significant relationship with the ROA of banks ($\beta=0.106$, $p=0.008$). These results are consistent with those obtained by Abdulkadir (2019), who discovered a favorable correlation between ROA and agency banking. Additionally, King'ang'ai et al. (2016) found that agency banking has a good and substantial influence on the

performance of Kenyan banks, which is in line with our results. A benefit of agency banking was discovered by the researchers.

In addition, the findings of the regression showed that mobile banking had a positive and statistically significant relationship with the ROA of banks in Kenya ($\beta= 0.113$, $p = 0.000$). These results are in agreement with those reported by Muli (2018), who discovered that mobile banking had a favorable and substantial influence on efficiency. These results, on the other hand, contradict those of Kamande (2018), who found that mobile banking did not substantially impact ROA.

In addition, the findings suggest that the use of online banking is associated in a way that is both positive and significant with the ROA of banks in Kenya ($\beta=0.133$, $p=0.000$). These results are in agreement with those that were found by Kim et al. (2019), who found that the performance of banks is affected by online banking. Even while this study found a correlation between online banking and MFIs' ROA, Ogweno (2019) found no such correlation. Ogweno came to the conclusion that online banking and ROA for MFIs had no meaningful link.

In terms of the control factors, the capital adequacy variable showed a positive impact that was not statistically significant, the bank size variable showed a significant positive effect, and the credit risk variable showed a significant negative effect. The square root of R was equal to 0.448. In light of this, we may deduce that the chosen predictor factors were responsible for 44.8 percent of the variance in ROA. According to the findings of this research, financial technology has a major impact on ROA, and this is due to the fact that the overall model is important.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter examines the findings presented in the preceding chapter, draws inferences based on those findings, and then discusses the challenges that were faced while conducting the research. In addition to this, it makes recommendations for those who determine policy and offers ideas for areas in which more research may be conducted.

5.2 Summary of Findings

The purpose of this study was to investigate the impact that technological advancements in the financial sector have on the profitability of banks in Kenya. The following categories of banking were chosen as candidates for investigation: mobile

banking, online banking, agency banking, credit risk, enough capital, and bank size. In order to finish the investigation, a descriptive research design was chosen as the method. The use of SPSS was used in the analysis of the secondary data that was obtained from CBK. The annual reports of 37 banks were combed through to acquire data on an annual basis for the next five years, from 2016 to 2020.

The first purpose of this study was to investigate the impact that agency banking has on the profitability of Kenyan financial institutions. According to the findings of the correlation analysis performed at a significance level of 5%, agency banking exhibited a positive link with profitability. This suggests that an increase in profitability might be achieved with the use of agency banking improvements. The findings of the regression analysis ($\beta=0.106$, $p=0.008$) indicate that agency banking had a positive and statistically significant influence on ROA across Kenya's financial institutions.

The second goal was to determine the impact that mobile banking has had on the profitability of commercial banks in Kenya. The significance threshold used for the correlation analysis was 5%, and the findings indicate that mobile banking has a positive link with profitability. It may be deduced from this that an increase in profitability would result from the development of mobile banking. The findings of the regression analysis ($\beta=0.113$, $p=0.000$) indicate that the use of mobile banking had a positive and statistically significant influence on ROA among banks in Kenya.

The third goal was to investigate how automated teller machines (ATMs) affect the profitability of banks in Kenya. The correlation findings at a significance threshold of 5 percent demonstrate that automated teller machines had a positive association with profitability; nevertheless, this correlation was not significant. The regression findings ($\beta=0.001$, $p=0.712$) demonstrate that automated teller machines had a beneficial

influence on the profitability of banks in Kenya; nevertheless, this effect was not statistically significant.

The analysis of the impact that online banking has had on the profitability of the banking industry in Kenya was the fourth goal. Internet banking has a positive link with profitability, according to the correlation analysis findings using a significance threshold of 5%. It may be deduced from this that an increase in profitability would result from the development of online banking. The findings of the regression analysis ($\beta=0.133$, $p=0.000$) reveal that the use of online banking had a positive and statistically significant influence on the profitability of banks in Kenya.

The fifth goal was to investigate the impact that bank size has on profitability across all of Kenya's financial institutions. The significance threshold for these correlation data was set at 5%, and they reveal that a positive connection exists between the size of a bank and its profitability. This suggests that an increase in bank size would lead to an increase in profitability. The findings of the regression analysis ($\beta=0.411$, $p=0.000$) indicate that the size of a bank had a positive and statistically significant influence on the profitability of banks in Kenya.

The sixth goal was to investigate the relationship between adequate capital levels and profitable operations in Kenya's banking sector. The correlation findings at a significance threshold of 5 percent reveal that capital sufficiency had a positive association with profitability; however, this link was not statistically significant. This suggests that a rise in the level of adequate capital would not result in a material shift in the amount of money the business makes. The regression findings ($\beta=0.069$, $p=0.002$) demonstrate that there was a favorable impact of capital adequacy on profitability across banks in Kenya; however, this effect was not statistically significant.

The seventh goal was to investigate the influence that credit risk has on profitability in the banking industry in Kenya. According to the findings of the correlation analysis, credit risk exhibited a negative connection with profitability when evaluated at a significance level of 5%. Furthermore, the association was shown to have a statistically significant impact. The findings of the regression analysis ($\beta=-0.506$, $p=0.000$) indicate that credit risk had a negative and statistically significant influence on the profitability of banks in Kenya.

5.3 Conclusions

The objective of the research was to investigate the relationship between technological advancements in the banking sector and increased profits. The findings of the research demonstrated that using an agency banking model had a constructive and material impact on a company's profitability. This would suggest that financial institutions that have implemented agency banking on a broad scale are more likely to report high levels of profitability when compared to financial institutions that have implemented agency banking on a smaller scale. According to the findings of the research, agency banking contributes significantly to the profitability of banks in Kenya.

The data also suggested that mobile banking had a favorable and substantial influence on profitability. This was further demonstrated by the findings. This would suggest that financial institutions that have implemented mobile banking on a wide scale are more likely to report high levels of profitability when compared to financial institutions that have implemented mobile banking on a smaller scale.

In addition, the findings of the research suggested that using online banking had a constructive and material impact on a company's profitability. This would suggest that financial institutions that have made widespread use of internet banking are more likely

to report high levels of profitability as compared to financial institutions that have made less extensive use of agency banking. The findings of the research indicate that Kenyan banks may increase their profitability via the use of online banking.

In addition, the findings demonstrated that the level of credit risk has a large and detrimental impact on a company's profitability. This indicates that banks with large levels of non-performing loans (NPLs) on their books will ultimately have lower levels of profitability. In addition, the research demonstrated that the size of a bank has a materially favorable influence on the amount of money it makes. This might be explained by the availability of greater governance systems in major banks as opposed to small banks.

5.4 Recommendations for Policy and Practice

According to the results of the research, agency banking has a substantial impact on profitability. As a result, the research suggests that the CBK, which is the regulator, should provide policy guidelines that explain how banks should use agency banking. They should also cultivate an atmosphere that is hospitable and makes it simple for banks to implement agency banking. In addition, the management and directors of banks in Kenya should strive toward ensuring that the banks have agency banking locations located in the various regions of the nation.

The outcomes of the research indicate that using mobile banking has a beneficial and noticeable impact on a company's profitability. According to the findings of the research, the management of banks in Kenya should prioritize expanding their use of mobile banking since doing so would contribute to an increase in profitability. This recommendation comes from the study. It is the responsibility of policymakers such as

the CBK to foster an environment that is favorable for banks to engage in mobile banking operations.

In addition, it was discovered that using the internet for banking had a large and beneficial effect on profitability. According to the findings of the study, management and directors of commercial banks in Kenya should take measures to ensure that customers can use internet banking without having to worry about their financial data being compromised. This will result in increased levels of profitability for the banks. In order to make this a reality, the government need to put effort into expanding internet access.

5.5 Limitations of the Study

The emphasis was placed on a few of the factors that are believed to have an effect on the profitability of banks in Kenya. In specifically, the research focused on seven different explanation factors. On the other hand, the profitability of a company may also be affected by a variety of other variables. Some, such as managerial effectiveness and corporate governance, are within the bank's sphere of influence, while others are not.

For this study, secondary quantitative data were used. The research also disregarded qualitative data that would have shed light on other aspects of the connection between financial technology and the profitability of banks. Focus groups, open-ended surveys, and interviews are all examples of qualitative research methodologies that may assist in the production of more definitive results.

The duration of this investigation was a whole five years (2016 to 2020). It is not yet known whether or not the effects will be maintained over a longer length of time. In addition, it is not apparent whether or not the same benefits will be obtained after the

year 2020. The research should have been carried out over a longer time frame in order to take into consideration significant occurrences in the economic sphere.

In order to conduct the data analysis, the researchers used a regression model known as ordinary least square. It was not possible to generalize the findings of the research in a way that was accurate because using regression models has some limitations, such as erroneous and deceptive outcomes that cause the value of the variable to change. Because of these limitations, it was not possible to use the research. Additionally, the conclusion may turn out differently if additional data were included in the regression. Consequently, the model itself constitutes still another restriction.

5.6 Suggestions for Further Research

The results of the investigation showed that the R square value was 44.8 percent. This suggests that the study did not take into account all of the elements that impact profitability at the banks in Kenya, which means that there are other factors that affect profitability. Therefore, more studies need to center their attention on other areas of corporate governance such as managerial effectiveness, liquidity, board composition in terms of experience, audit committees, and the like, all of which are relevant to profitability in the banking industry.

The scope of the investigation was restricted to Kenyan commercial banks. According to the recommendations made by the report, further investigation should be carried out on more financial institutions located in Kenya. It is important for future study to investigate the ways in which financial technology affects things other than profitability, such as the value of banks, how efficiently they operate, and how quickly they expand.

The most recent five years were chosen as the focal point of our study since there is a wealth of data on those years readily accessible. Previous research may have been conducted over a longer period of time, such as ten or twenty years, and may have a substantial influence on current research by either complementing or refuting the findings that were found here. One of the benefits of conducting a study over a longer period of time is that it increases the likelihood that the researcher will see the impacts of economic cycles like booms and recessions.

This study depended on a regression model, which has its own set of limitations, such as mistakes and findings that are deceptive when a variable is altered. In conclusion, this research relied on a regression model. In the future, research should focus on models such as the Vector Error Correction Model (VECM) in order to analyze the myriad of connections that exist between financial technology and profitability.

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APPENDICES

Appendix I: List of Commercial Banks in Kenya

1. ABC Bank (Kenya)
2. Bank of Africa
3. Bank of Baroda
4. Bank of India
5. Barclays Bank of Kenya
6. Chase Bank Kenya (In Receivership)
7. Citibank
8. Commercial Bank of Africa
9. Consolidated Bank of Kenya
10. Cooperative Bank of Kenya
11. Credit Bank
12. Development Bank of Kenya
13. Diamond Trust Bank
14. Dubai Islamic Bank
15. Ecobank Kenya
16. Equity Bank
17. Family Bank
18. First Community Bank
19. Guaranty Trust Bank Kenya
20. Guardian Bank
21. Gulf African Bank
22. Habib Bank AG Zurich
23. Housing Finance Company of Kenya
24. I&M Bank
25. Imperial Bank Kenya (In receivership)
26. Jamii Bora Bank
27. Kenya Commercial Bank
28. Mayfair Bank
29. Middle East Bank Kenya
30. National Bank of Kenya
31. NIC Bank

32. Oriental Commercial Bank
33. Paramount Universal Bank
34. Prime Bank (Kenya)
35. SBM Bank Kenya Limited
36. Sidian Bank
37. Spire Bank
38. Stanbic Bank Kenya
39. Standard Chartered Kenya
40. Trans National Bank Kenya
41. United Bank for Africa
42. Victoria Commercial Bank

Source: CBK (2021)

Appendix II: Research Data

Bank	Year	ROA	Agency banking	Mobile banking	ATMs	Internet banking	Bank size	Capital adequacy	Credit risk
1	2016	0.008	9.653	5.350	8.040	13.449	16.9342	0.1645	0.1426
	2017	0.003	11.265	5.338	8.025	14.595	16.9451	0.1528	0.1566
	2018	0.006	10.369	5.446	8.329	14.645	17.0576	0.1560	0.1829
	2019	0.000	9.626	5.365	8.338	14.883	17.1451	0.1844	0.1989
	2020	0.002	13.454	5.439	8.334	15.079	17.1964	0.1538	0.1490
2	2016	-0.015	13.449	5.429	5.087	14.605	18.0537	0.1639	0.2325
	2017	0.000	14.595	5.476	8.024	15.989	17.8408	0.1616	0.2606
	2018	0.001	14.645	5.514	8.112	15.922	17.8080	0.1578	0.2816
	2019	0.004	14.883	5.511	8.171	15.858	17.7090	0.1602	0.3383
	2020	-0.046	15.079	5.544	6.785	15.785	17.5996	0.1083	0.4139
3	2016	0.030	14.605	5.465	7.043	13.760	18.0376	1.9617	0.0754
	2017	0.036	15.989	5.588	7.594	14.577	18.2332	0.3053	0.0846
	2018	0.041	15.922	5.184	8.172	14.940	18.3812	0.3229	0.0586
	2019	0.032	15.858	5.152	8.090	14.722	18.6278	0.3466	0.0882
	2020	0.029	15.785	5.261	8.133	15.115	18.7805	0.3274	0.0828
4	2016	0.035	13.760	5.229	7.999	15.332	19.2998	0.1840	0.0420
	2017	0.028	14.577	5.289	8.182	13.573	19.3751	0.1786	0.0521
	2018	0.026	14.940	5.247	8.079	14.286	19.4197	0.1803	0.0556
	2019	0.023	14.722	5.303	8.917	14.465	19.6003	0.1638	0.0610
	2020	0.020	15.115	5.331	8.189	14.998	19.7397	0.1667	0.0560
5	2016	0.026	15.332	5.330	8.122	11.145	17.5571	0.4230	0.0202
	2017	0.034	13.573	5.348	8.143	12.798	17.6829	0.4574	0.0139

	2018	0.037	14.286	5.314	8.107	12.500	17.8521	0.5397	0.0207
	2019	0.031	14.465	5.419	8.199	12.966	17.9537	0.4392	0.0713
	2020	0.037	14.998	4.960	7.396	14.089	17.9514	0.4842	0.0936
6	2016	0.039	11.145	5.092	8.555	13.254	18.2945	0.2832	0.0580
	2017	0.033	12.798	5.125	7.141	14.251	18.4534	0.2637	0.0192
	2018	0.040	12.500	5.110	8.034	13.175	18.4028	0.2555	0.0368
	2019	0.037	12.966	5.166	8.154	14.129	18.2656	0.2764	0.0162
	2020	0.030	14.089	5.166	8.178	12.968	18.3858	0.2715	0.0257
7	2016	0.017	13.254	5.207	7.774	15.661	19.1891	0.1792	0.1059
	2017	0.029	14.251	4.737	7.575	16.210	19.2507	0.1845	0.0745
	2018	0.023	13.175	4.760	8.192	15.935	19.3199	0.1732	0.0831
	2019	0.023	14.129	4.837	8.026	16.061	19.3172	0.1573	0.0797
8	2020	0.003	12.968	4.765	8.032	16.087	16.4642	0.0939	0.0553
	2016	-0.015	15.661	4.855	7.780	13.912	16.4487	0.0790	0.1176
	2017	-0.025	16.210	4.820	6.449	13.143	16.4149	0.0509	0.1527
	2018	-0.042	15.935	4.862	8.182	13.890	16.3718	0.0280	0.1533
	2019	-0.045	16.061	4.878	7.674	14.067	16.2888	0.1352	0.2568
9	2020	-0.006	16.087	4.873	8.528	14.072	16.1464	0.1551	0.0638
	2016	0.009	13.912	4.925	8.123	13.029	16.3200	0.2285	0.0722
	2017	0.009	13.143	4.934	8.182	13.022	16.4904	0.1477	0.0754
	2018	0.014	13.890	5.012	7.911	13.254	16.7006	0.1451	0.0724
	2019	0.010	14.067	4.771	7.885	13.502	16.8910	0.1496	0.0870
10	2020	0.034	14.072	4.721	7.899	13.758	19.6518	2.1258	0.0342
	2016	0.036	13.029	4.692	7.848	15.034	19.6787	0.2277	0.0390
	2017	0.029	13.022	4.688	7.731	15.011	19.7736	0.2268	0.0620

	2018	0.031	13.254	4.677	8.248	15.578	19.8406	0.1618	0.1009
	2019	0.031	13.502	4.602	7.253	16.112	19.9402	0.1505	0.0979
11	2020	0.004	13.758	4.529	7.706	16.133	16.6135	0.2508	0.2601
	2016	0.002	15.034	4.547	7.709	14.321	16.6072	0.2355	0.2098
	2017	0.007	15.011	4.455	7.709	14.378	16.5449	0.2323	0.2981
	2018	0.070	15.578	4.489	8.182	14.636	16.5472	0.3147	0.3695
12	2019	0.024	16.112	4.335	8.130	14.473	19.4199	0.1463	0.0241
	2020	0.024	16.133	4.323	7.594	14.276	19.6087	0.1850	0.0325
	2016	0.019	14.321	5.350	7.942	14.288	19.7107	0.1901	0.0666
	2017	0.019	14.378	5.338	7.684	15.268	19.7497	0.2111	0.0629
	2018	0.019	14.636	5.446	8.025	15.616	19.7719	0.2091	0.0683
13	2019	-0.230	14.473	5.365	8.100	16.384	14.7750	0.7005	38.5539
	2020	-0.119	14.276	5.439	7.114	16.312	15.4739	0.2990	0.0037
	2016	-0.064	14.288	5.429	8.002	8.654	16.0114	0.1486	0.0095
14	2017	0.002	15.268	5.476	8.146	8.473	17.7749	0.2496	0.0622
	2018	-0.043	15.616	5.514	7.932	8.765	17.6683	0.1944	0.1628
	2019	-0.021	16.384	5.511	8.058	8.937	17.7944	0.1599	0.3770
	2020	0.004	16.312	5.544	8.159	8.982	17.8130	0.1659	0.1735
	2016	0.002	8.654	5.229	7.763	14.510	18.1380	0.1622	0.1448
15	2017	0.040	8.473	5.289	8.038	14.426	19.8748	0.2017	0.0272
	2018	0.035	8.765	5.247	8.646	15.198	19.9761	0.1966	0.0628
	2019	0.036	8.937	5.303	8.040	15.635	20.0779	0.2041	0.0553
	2020	0.035	8.982	5.331	8.112	14.631	20.1671	0.1593	0.0710
	2016	0.036	14.510	5.330	7.893	15.810	20.3283	0.1979	0.0873
16	2017	0.024	14.426	5.348	6.324	15.807	18.2134	0.1441	0.0367

	2018	0.005	15.198	5.314	8.503	16.632	18.0567	0.2078	0.1197
	2019	-0.014	15.635	5.419	7.823	16.553	18.0516	0.1986	0.1923
	2020	0.004	14.631	4.960	8.497	16.488	18.0204	0.1952	0.1618
	2016	0.012	15.810	4.950	8.338	13.903	18.1831	0.1869	0.1409
17	2017	-0.001	15.807	4.901	8.498	14.147	16.4941	0.1145	0.2346
	2018	-0.004	16.632	4.960	8.498	15.608	16.5210	0.1399	0.3195
	2019	0.009	16.553	5.067	8.107	15.939	16.6697	0.1534	0.4078
	2020	-0.012	16.488	5.027	8.575	15.781	16.6992	0.0911	0.4882
	2016	0.010	13.903	5.092	7.755	14.201	16.7474	0.0810	0.4145
18	2017	0.009	14.147	5.125	8.134	14.758	17.5282	0.2649	0.0916
	2018	0.013	15.608	5.110	7.837	15.067	17.2864	0.2547	0.1108
	2019	0.007	15.939	5.166	6.572	15.193	17.2774	0.2387	0.1088
	2020	0.002	15.781	5.166	7.977	15.299	17.4516	0.2597	0.1467
	2016	0.020	14.201	5.207	8.759	14.735	17.1856	0.2428	0.1090
19	2017	0.016	14.758	4.737	7.374	14.401	16.4972	0.1763	0.0304
	2018	0.016	15.067	4.760	7.533	14.583	16.5037	0.1904	0.0169
	2019	0.010	15.193	4.837	7.743	14.620	16.5757	0.2022	0.0453
	2020	0.014	15.299	4.765	8.371	14.876	16.5997	0.2275	0.0757
	2016	0.011	14.735	4.855	8.040	11.683	16.6120	0.2220	0.0689
20	2017	0.029	14.401	4.820	7.854	12.546	17.0226	0.1577	0.0842
	2018	0.018	14.583	4.862	7.594	11.930	17.1171	0.1872	0.0923
	2019	0.005	14.620	4.878	7.523	12.984	17.2596	0.1620	0.0929
	2020	0.004	14.876	4.873	8.552	13.008	17.3218	0.1866	0.1064
	2016	0.005	11.683	4.925	7.728	13.706	17.3744	0.1711	0.1534
21	2017	0.029	12.546	4.934	8.003	14.077	16.1408	0.3213	0.0792

	2018	0.024	11.930	5.012	8.174	14.217	16.3419	0.3911	0.1871
	2019	0.011	12.984	4.771	8.494	14.403	16.8845	0.2463	0.0745
	2020	0.010	13.008	4.721	8.499	13.678	17.0273	0.2729	0.0922
22	2016	0.017	13.706	4.692	7.803	12.438	18.0874	0.1813	0.0437
	2017	0.013	14.077	4.688	8.340	12.652	18.0912	0.1769	0.0692
	2018	0.002	14.217	4.677	8.347	13.478	18.0282	0.1700	0.1081
	2019	-0.010	14.403	4.602	7.794	12.387	17.9190	0.1534	0.2494
	2020	-0.002	13.678	4.529	7.826	13.474	17.8490	0.1456	0.2356
23	2016	0.037	12.438	4.547	7.654	14.836	19.0716	0.2020	0.0248
	2017	0.037	12.652	4.455	7.810	14.657	19.1652	0.1815	0.0289
	2018	0.030	13.478	4.489	7.784	15.143	19.2966	0.1858	0.0870
	2019	0.026	12.387	4.335	7.727	15.496	19.3315	0.1792	0.1079
	2020	0.033	13.474	4.323	7.794	16.198	19.4287	0.2156	0.0979
24	2016	0.001	14.836	5.350	8.241	13.923	16.6358	0.1625	0.0517
	2017	-0.011	14.657	5.338	8.574	14.970	16.5742	0.2008	0.1720
	2018	-0.037	15.143	5.446	8.238	15.174	16.3714	0.1933	0.1331
25	2016	0.035	15.496	5.365	7.692	16.404	20.1400	0.1536	0.0446
	2017	0.033	16.198	5.439	7.971	16.372	20.2045	0.1801	0.0705
	2018	0.030	13.923	5.429	7.667	13.149	20.2873	0.1663	0.0766
	2019	0.034	14.970	5.476	8.427	13.172	20.3868	0.1955	0.0627
	2020	0.028	15.174	5.514	8.496	14.291	20.6163	0.1903	0.1016
26	2016	-0.013	16.404	5.511	8.076	13.916	15.4706	0.3933	0.1590
	2017	-0.005	16.372	5.544	7.880	13.792	15.4489	0.5708	0.1807
	2018	0.000	13.149	5.465	6.393	15.999	15.4946	0.4494	0.3825
	2019	0.000	13.172	5.588	7.731	16.552	15.9516	0.3119	0.1374

27	2016	0.003	14.291	5.184	8.070	17.119	16.1101	0.3869	0.0821
	2017	0.009	13.916	5.152	7.806	17.293	16.1741	0.3316	0.0718
	2018	0.008	13.792	5.261	7.785	17.168	16.1683	0.3093	0.0940
	2019	-0.002	15.999	5.229	7.774	13.112	16.3327	0.3442	0.1931
28	2016	-0.009	16.552	5.289	7.867	13.473	18.6473	0.1399	0.1116
	2017	0.001	17.119	5.247	7.521	13.262	18.5348	0.0715	0.1749
	2018	0.007	17.293	5.303	7.597	13.123	18.5148	0.0542	0.3001
	2019	-0.001	17.168	5.331	8.036	13.795	18.5591	0.0370	0.3913
	2020	-0.008	13.112	5.330	8.490	13.178	18.5343	0.1150	0.3564
29	2017	0.027	13.473	5.348	7.767	13.273	18.9262	0.2059	0.0912
	2018	0.026	13.262	5.314	7.157	13.209	18.9481	0.2304	0.1126
	2019	0.020	13.123	5.419	7.908	13.166	19.1442	0.2227	0.1089
	2020	0.020	13.795	4.960	6.900	13.466	19.1550	0.1869	0.1224
30	2016	0.015	13.178	4.950	7.826	15.871	16.1693	0.2412	0.0519
	2017	0.011	13.273	4.901	7.594	15.840	16.0592	0.2741	0.0828
	2018	0.012	13.209	4.960	8.497	16.080	16.0711	0.2946	0.1056
	2019	0.024	13.166	5.067	7.600	16.570	16.1067	0.2853	0.1318
	2020	0.009	13.466	5.027	7.545	16.744	16.1615	0.2450	0.1211
31	2016	0.031	15.871	5.092	7.684	14.117	17.9899	0.1729	0.0170
	2017	0.029	15.840	5.125	7.358	16.162	17.9950	0.2216	0.0362
	2018	0.029	16.080	5.110	7.707	16.371	18.1721	0.2248	0.0486
	2019	0.023	16.570	5.166	8.483	16.383	18.4220	0.3729	0.0606
	2020	0.024	16.744	5.166	7.988	16.476	18.5049	0.4136	0.1018
32	2016	-0.005	14.117	5.207	7.950	12.591	18.7977	0.1509	0.1025
	2017	-0.192	16.162	4.737	8.002	12.628	16.0873	0.1281	0.8832

	2018	-0.029	16.371	4.760	8.009	13.081	16.2608	0.1644	0.7290
	2019	0.019	16.383	4.837	8.841	13.343	18.0733	0.2425	1.2528
	2020	0.012	16.476	4.765	9.347	13.520	18.0994	0.2312	0.8521
33	2016	0.019	12.591	4.855	9.038	13.042	16.7655	0.2468	0.1284
	2017	0.001	12.628	4.820	8.843	13.456	16.8541	0.2325	0.2383
	2018	-0.022	13.081	4.862	7.572	14.169	16.7757	0.1646	0.2780
	2019	-0.015	13.343	4.878	8.891	14.455	17.0467	0.1440	0.2035
	2020	0.004	13.520	4.873	9.185	14.617	17.0908	0.1793	0.1968
34	2016	0.024	13.042	4.925	9.407	13.562	19.1552	0.1870	0.0411
	2017	0.021	13.456	4.934	9.161	14.290	19.1847	0.1812	0.0505
	2018	0.017	14.169	5.012	9.117	14.979	19.3319	0.1684	0.0666
	2019	0.022	14.455	4.771	8.875	14.970	19.4537	0.1740	0.0945
	2020	0.021	14.617	4.721	9.372	14.799	19.4947	0.1834	0.0998
35	2016	0.027	13.562	4.692	7.562	14.378	19.2707	0.2116	0.1015
	2017	0.036	14.290	4.688	7.631	14.704	19.3389	0.2091	0.0829
	2018	0.024	14.979	4.677	7.695	14.957	19.4705	0.1852	0.0896
	2019	0.028	14.970	4.602	7.952	14.831	19.4694	0.1947	0.1169
	2020	0.027	14.799	4.529	7.916	14.540	19.5264	0.1773	0.0953
36	2016	-0.034	14.378	5.350	8.659	16.000	16.4876	0.1745	0.3332
	2017	-0.054	14.704	5.338	8.553	16.274	16.4404	0.1627	0.1677
	2018	-0.101	14.957	5.446	8.434	16.135	16.2268	0.1265	0.4271
	2019	-0.244	14.831	5.365	8.215	16.242	16.0372	0.2201	0.5598
	2020	-0.069	14.540	5.439	8.325	16.445	15.7413	0.2060	0.7111
37	2016	0.016	16.000	5.429	7.606	14.742	16.1624	0.2164	0.1103
	2017	0.011	16.274	5.476	7.743	14.835	16.1547	0.2230	0.1156

	2018	0.004	16.135	5.514	7.728	14.036	16.1419	0.2908	0.2416
	2019	-0.007	16.242	5.511	7.821	14.621	16.1414	0.2111	0.2211
	2020	-0.009	16.445	5.544	8.057	14.727	16.0475	0.2015	0.2857
38	2016	-0.034	14.742	5.465	8.146	13.179	15.8672	0.2379	0.0180
	2017	0.004	14.835	5.588	8.228	13.505	15.5385	0.3868	0.0186
	2018	0.003	14.036	5.184	6.365	13.509	15.6880	0.3878	0.0436
	2019	0.003	14.621	5.152	7.870	14.283	16.5455	0.3316	0.1276
	2020	0.004	14.727	5.261	7.513	14.396	16.5936	0.2537	0.2432
39	2016	0.036	13.179	5.229	7.917	10.741	16.8122	0.1930	0.0329
	2017	0.026	13.505	5.289	8.049	10.802	16.9247	0.2545	0.0255
	2018	0.024	13.509	5.247	7.456	10.946	17.0730	0.2274	0.0008
	2019	0.014	14.283	5.303	7.851	11.867	17.2917	0.2109	0.0308
	2020	0.015	14.396	5.331	7.694	12.995	17.4010	0.2015	0.0506