THE IMPACT OF FINANCIAL TECHNOLOGIES ON FINANCIAL INCLUSION IN KENYA

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D61/11259/2018

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION, (FINANCE OPTION) SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

SEPTEMBER 2021

DECLARATION

This research project is my original work and has not been submitted to any college, institution or university for any academic award other than the University of Nairobi.

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

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ACKNOWLEDGEMENT

I would like to express my gratitude to all those who gave me the encouragement to complete this project. Grateful to the Department of Finance and Accounting fraternity for the support and opportunity. I recognize and thank my phenomenal supervisor Professor Josiah Aduda, who was very thorough, supportive and available for consultations throughout the whole process, my moderator Dr. Herick Ondigo and Prof Cyrus Iraya(Chairman of the Department)

I also extend gratitude to my family for their encouragement, patience and love and most importantly, I thank the Almighty God for the successful completion of this project.

ABSTRACT

The study sought to evaluate the contribution of Fin-Tech to financial inclusion in Kenya. Descriptive research design was used collect and analyse data. The population of the study was all 25,000,000 adult population in Kenya interacting with Fin-Tech in various degrees. The study collected quarterly secondary data regarding financial inclusion and Fin-Tec from CBK database, Communication Authority database and KNBS. The data extracted was entered on data collection sheets in the form of excel sheets. Data on excel sheet were exported to STATA version 15. Measures of dispersal and central tendency were used including minimum, maximum, mean and standard deviation. OLS regression model helped evaluate the effect of Fin-Tech on financial inclusion in Kenya. The study adopted the models. The study examined whether or not the explanatory have significant effect on the dependent variable by comparing the p-value associated with the parameters with 0.05 level of significance. P-values less than 0.05 levels of significance implies significant effect of the explanatory variable on dependent variable. The study established that financial technology and other covariates have a significant effect on financial inclusion as measured by number of banks accounts, deposits and credit to private sector. Further, mobile money had a direct and significant effect on financial inclusion measured by number of bank accounts, deposits and credit to private sector. Agency banking had a significant effect on financial inclusion through number of bank accounts, deposits and credit to private sector. Point of Sale had a direct and significant effect on financial inclusion through number of banks accounts opened and credit to private sector, however, Point of Sale had negative and insignificant effect on financial inclusion through deposits. Diaspora remittances had a direct but not statistical significant effect on financial inclusion through number of bank accounts, deposits and credit to private sector. However, diaspora remittances had significant effect on financial inclusion measured by credit to private sector. The effect of lending rate on financial inclusion through number of bank accounts, deposits and credit to private sector was inverse and statistically significant. Finally, the effect of mobile phone penetration on financial inclusion through credit to private sector, deposits and number of bank accounts was direct and statistically significant. The study thus concluded that financial technology and other covariates have major effect on financial inclusion via number of banks accounts, deposits and credit to private sector. The study recommends to the Central Bank, Communication Authority of Kenya, communication firms and banking institutions to strengthen and deepen mobile money and agency banking. The CBK should put policies in place for securing transactions carried over the point of sale as well as improved POS technology. The study also recommends to the government to put in place policies and strategies for ease of the remittance money by Kenyans working and doing business abroad. The study also suggests to the Central Bank of Kenya, Sacco Regulatory Authority, commercial banks, deposit-taking MFIs to continue lowering the cost of borrowing.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AB	:	Agency Banking
ANOVA	:	Analysis of Variances
ATM	:	Automatic Vendor Machine
CBK	:	Central Bank of Kenya
DR	:	Diaspora Remittances
FI	:	Financial Inclusion
FIN-TECH	:	Financial Innovations
FSD	:	Financial Sector Deepening
GDP	:	Gross Domestic Product
ICT	:	Information and communications technology
KNBS	:	Kenya National Bureau of Statistics
LR	:	Lending Rate
MM	:	Mobile Money
MPP	:	Mobile Phone Penetration
OLS	:	Ordinary Least Squares
POS	:	Point of Sale
ROA	:	Return on Assets
SaaS	:	Software-as-a-service
VIF	:	Variance Inflation Factor

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Financial technologies have caused disruptions over the financial industry enabling most financial institutions to pull in unbanked people into access to financial products, while still maintaining the existing conventional customer base in what is referred to as financial inclusion (Mader, 2018). Academic literature exist on the association between financial technologies (Fin-Tech) and financial inclusion (FI). Financial technologies reduces the cost of financial intermediation hence enhancing financial inclusion (Ozili, 2018). Fin-Tech has the capability to enhance the reach of financial services to as many customers as possible ranging from credit, insurance, payment and savings facilities (Gorham and Dorrance, 2017).

Porter's Model of Generic Strategies explains that Fin-Tech is shifting the paradigm of financial services delivery by offering low cost products and focusing on the lower-income groups who have limited access to financial services (Porter, 1985). Financial Innovations theory advanced by Silber (1983) holds that that expansion of financial services by financial institutions is critical for achieving financial inclusion. The theory postulates that the reasons for innovation in financial sectors are the barriers of present in old model of commercial banking. Financial innovations characterize financial advancements by bringing forth better approaches for financial service provision to customers and ensuring better rates of returns for financial institutions. The financial intermediation theory as advanced by Akerlof (1970) postulates that financial intermediation ensures that those with excess funds are connected with those who need finances to start business ventures. The purpose of financial intermediation is to reduce the intermediation cost hence financial inclusion.

According to a FSD report, an estimated 61.6% of the people within developing countries such as Kenya is still unbanked (Totoloet al. 2017). However, many developing countries are excluded from any form of financial service and the level has been dropping from over 40% of adults to 17% between 2006 and 2016. Inclusion was driven largely by mobile money services used by over 71% of adults (Financial Services Development [FSD], 2017). Individuals and enterprises in

Africa now have access to more financial services including credit from financial institutions (Govind and Marcus, 2012). In addition, the development in ICT has brought forth new technologies such as mobile money and point of sale (POS) that has broadened access to financial services such as payment and savings products alike. However, the financial systems of most African states are still underdeveloped as compared to other developing economies even after most of these countries have undergone extensive financial sector reforms in recent time (Mbutor & Uba, 2013).

1.1.1 Financial Technologies

Financial technologies (Fin-Tech) is the use of new technology and technology channels to complement the older financial service delivery systems (Bateman, Duvendack & Loubere, 2019). Fin-Tech stands for Financial Technologies, and in its broadest definition, it means technologies that are used in the financial services sector or used to help firms manage their financial aspects of their business (Mearian, 2017). Fin-Tech business models often focus on mobile customers and services are usually accessed with a software-as-a-service (SaaS) delivery model. By digitizing traditional finance-related workflows, small Fin-Tech start-ups can compete with traditional banks for customers. According to Gomber, Koch, and Siering (2017) Fin-Tec covers an extent number of new financial and banking services, financial businesses, finance-related software, and novel forms of customer communication and interaction, delivered by Fintech companies and innovative financial service providers (Ozili, 2018).

Fin-Tech is critical in the financial sectors given their ability to enhance access and use of financial products at the lowest cost possible (Han, Park & Kim, 2016). Fin-Tech aims to develop safer, more cost-efficient business models to support the exchange of money and other measures of value. Fin-Techs work in various zones going from loaning to individuals, advanced portable instalments, and virtual monetary standards (Osmani, et al., 2020).These zones are able to particularly affect the unbanked by bypassing conventional financial controls in formal banking sector and advancing financial services to those who needs them at the least possible cost (Kimiri, 2018). Fin-Tech oriented firms straightforwardly compete with banks in many areas of the financial markets. Fin-Techs have proved that financial products and services of all sorts need to be seamlessly integrated with needs of today's customers (Schmied & Marr, 2017).

Various proxies have been adopted to measure Fin-Tech. A major proxy for Fin-Tech especially in developing countries like Kenya is the mobile money or mobile banking. The volume and value of mobile money transactions is a key Fin-tech that has revolutionized Kenya (Johnson, 2016). Another proxy of Fin-Tech is the Point of sale (POS) measured as number of POS machines or volume of transactions (Winn, 2016). Point of sale with associated cards (debit cards and credit cards) is a critical Fin-Tech especially in urban areas. Finally, agency banking is another Fin-tech that has revolution financial sector especially in places far away from physical banking halls.

1.1.2 Financial Inclusion

Financial inclusion is that the pursuit of creating financial services accessible at affordable costs to all or any individuals and businesses, no matter net worth and size, respectively (Mader, 2018). Financial inclusion is also called inclusive financing. Financial inclusion or access is a component of financial development, alongside depth, efficiency, and stability (Fungáčová & Weill, 2015). Financial inclusion is the accessibility, ease of availability and usage of the formal financial series provided by financial institutions in an economy. Mbutor and Uba (2013) defined financial inclusion as the improvement in the number of households and individuals in an economy who holdings a formal bank account with banking intuitions.

The goal of Financial inclusion is to bring as many people as possible to access financial services provided by financial institutions (Adaramola & Kolapo, 2019). Financial development is vital for economic process, and financial inclusion especially, features a pertaining to equity also (Maina & Mungai, 2019). Other potential benefits of financial inclusion include improving efficiency and targeting of state welfare programmes; reducing corruption and terrorism more broadly, through better monitoring and regulation of monetary transactions using digital technology (Adewoye, 2013). Financial inclusion aims at improving the use of formal mode of payments, such as internet payments, mobile payments and others by populace.

Empirical literature has elaborated on measures of financial inclusion and has presented various proxies that can be adopted to quantify financial inclusion. Financial inclusion has three components including access, usage and barriers (Wang & Guan, 2017). Access to financial services is measured using various proxies such as number of bank accounts, number of bank branches (per 1000 population) and/or the number of ATM per (1000 people). Weligama (2018)

used volume of credit and deposit to GDP as measure of usage of banking services. In this research, the financial inclusion proxies will be number of bank accounts, volume of deposits and credits to GDP.

1.1.3 Financial Technologies and Financial Inclusion

The impact of Fin-Tech on financial services just products aimed at customers but also includes products that enhance the operations of financial institutions themselves. Fin-Tech companies are focused on delivering financial services to those whom the traditional financial service providers tend to shun (Martin, 2016). Fin-Tech such as internet (online) removes the necessity of visiting a bank branch. Financial technologies like mobile money have made is possible for customers to access banks and their products at the comfort of the homes or work without having to visit the physical bank. Ouma, Odongo and Were (2017) noted that accessibility and use of mobile phones in delivering financial products enhances the chances of saving at household level.

Byegon, Cheboi and Bonuke (2019) explains that financial innovations like agency banking; mobile money enhanced the relationship between behavioural factors and financial inclusion. Ozili (2018) noted that digital finance via Fin-Tech suppliers has vital positive outcomes for financial inclusion in developing and developed nations. Durai and Stella (2019) argued that Digital Finance enhances financial inclusion through their convenience, accuracy, usability, convenience, and easy interbank. Hence, digital finance in the form of mobile banking, credit cards, Internet banking, mobile wallets (apps) have a major influence on financial inclusion. Demir, Pesqué-Cela, Altunbas and Murinde (2020) showed that that FinTech lowers income inequality indirectly through its impacts on financial inclusion. Gibson (2015) discovered that Fin-Tech had discontinued the normal money services model that has reduced the barriers to entry thus increasing money inclusion.

1.1.4 Financial Technology and Financial Inclusion in Kenya

Measurement of financial inclusion in Kenya commenced in 2006 through the creation of Fin Access surveys implemented over the years by the Central Bank Kenya (CBK), Kenya National Bureau of Statistics (KNBS) and Financial Sector Deepening (FSD) Kenya. The 2019 survey findings clearly show that Kenya's financial inclusion landscape has undergone a transformation since 2006. Formal financial inclusion has risen to 82.9 percent, up from 26.7 percent in 2006,

while complete exclusion has narrowed to 11.0 percent from 41.3 percent in 2006. Furthermore, the disparities in financial access between rich and poor, men and women, and rural and urban areas have also declined remarkably (finacess, 2019).

Key drivers of these changes include the growth of mobile money, government initiatives and support, and developments in information and communications technology (ICT). The significant reduction in the proportion of the adult population totally excluded from financial services and products vindicates the policies, strategies and reforms undertaken by the government as well as the widespread adoption of digital technology and innovations by financial sector players. These have helped in deepening financial inclusion by enabling the population to overcome infrastructural constraints to access especially in rural areas. Despite the progress made so far, affordability and consumer protection issues such as unexpected charges remain barriers to formal service access. Even more notable is the considerable modesty of the developmental impact of formal financial access. Many Kenyans have formal accounts in various forms, but these accounts are rarely used because they are not solving real day-to-day problems for many households, smaller and micro scale businesses and farmers (Finacess, 2019).

1.2 Research Problem

Digital finance solutions also referred to as Fin-Tech offers great possibility to enhance the reach of financial products for the benefit of unbanked population. The rapid development of Fin-Tech is dramatically transforming the financial services landscape (Gomber, Koch & Siering, 2017). They are providing easy and affordable access to financial services which is a critical aspect of sustainable economic development as it can help smoothen consumption, and improve livelihoods by having better saving techniques, to have access to credit and be able to make cheaper payments (Gorham & Dorrance, 2017). Fin-Tech solutions have the potential to promote sustainable economic development by improving wider right to use financial services to the unbanked population in emerging markets Han, Park & Kim, 2016).

In Kenya, there has been remarkable growth of Fin-Tech with increased adoption of digital technologies by financial institutions and users that have enhanced access to financial products including account opening, savings facilities, credit facilities and payments platform. The growth

of Fin-Tech in Kenya has seen improved financial inclusion. Major fin-tech driving financial inclusion in Kenya includes mobile money, agency banking, point of sale, internet banking among others. However, Kimiri (2018) noted that Kenya is still grappling with high number of unbanked population. Majority of Kenyans are still not enjoying all possible financial services even with the explosion of financial technologies. Access to credit facilities is still a challenge with few adults being banked. Furthermore, Credit reference bureaus have listed most Kenyans for failure to pay mobile-based loans hence limiting their access to more credit facilities (Byegon, Cheboi & Bonuke, 2019).

Globally, Ozili (2018) revealed that digital finance via Fin-Tech suppliers has vital positive outcomes for financial inclusion in developing and developed nations. Therefore, Fin-tech facilitates low-income borrowers in accessing conventional bank services via modern technologies. Durai and Stella (2019) revealed that financial inclusion is being enhanced by Digital Finance through their convenience, accuracy, usability, convenience, and easy interbank. Demir et al., (2020) revealed that FinTech lowers income inequality indirectly through its impacts on financial inclusion. Gibson (2015) discovered that Fin-Tech had discontinued the normal money services model that has reduced the barriers to entry thus increasing money inclusion. Kim, Zoo, Lee, Kang (2018) evaluated the nexus of mobile financial services, financial inclusion, and development. The findings revealed that mobile banking had a major impact on financial inclusion. Gorham and Dorrance (2017) established that Fin-Tech has the potential to expand access to safe and reasonable money services.

Locally, Sindani, Muturi and Ngumi (2019) revealed that internet banking improved financial inclusion by banking institutions in Kenya. ATM banking had a major direct impact on financial inclusion. Sindani, Muturi and Ngumi (2019) was firm level study at the bank level hence there is a gap for macro level study using macro data. Ouma, Odongo and Were (2017) revealed that accessibility and use of mobile phones in delivering financial products enhances the chances of saving at household level. Ouma, Odongo and Were (2017) was however limited to one financial technology hence there is a gap in other financial technologies that may also have role on financial inclusion. Byegon, Cheboi and Bonuke (2019) showed that financial innovations has an intervening effect on the link between behavioral factors and financial inclusion. Hence financial

innovations like agency banking, mobile money enhanced the relationship between behavioral factors and financial inclusion. Byegon, Cheboi and Bonuke (2019) examined the indirect effect of financial innovation on financial inclusions hence a gap remains on the direct effect of financial innovations on financial inclusion in the micro enterprise setting in Nairobi. The study therefore sought answers to the research question: what is the effect of Fin-Tech on financial inclusion in Kenya.

Even though studies exist globally and locally on the relationship between Fin-Tech and financial inclusion, there are still a number of gaps. First, most studies have concentrated one or a few aspects of Fin-tech with most aspects ignored in studies. Secondly, majority of studies in Kenya have not introduced diaspora remittances and lending rate as control variables given that the two variables play critical role in financial inclusion in empirical literature. Thirdly, majority of studies have been based on bank level studies with few macro-level analyses in Kenya. The study thus sought answers to the research question; what is the impact of Fin-Tech on financial inclusion in Kenya?

1.3 Research Objective

To establish the impact of Fin-Tech on financial inclusion in Kenya.

1.4 Value of the Study

The study results would be important for practice, theory and policy. Regarding practice, the study findings and recommendations are expected to be of great significant to the Fin-Tech companies operating in developing countries such as Kenya. The findings would enlighten the management of Fin-Tech companies on how the Fin-Tech strategy is influencing financial services delivery to the unbanked population in the country. The management would also get insight on key areas in which to focus on in order to successfully implement this strategy to enhance financial inclusion in the country.

This study will be of value to policy makers, specifically within developing countries such as the central bank of Kenya as the regulator of financial institutions and services in the country. The current boom of Fin-Tech has already caught the attention of central bank of the Kenya, which is seeking to regulate this market. Thus, the study may provide valuable insight into the nature of

operations of Fin-Tech which may help in formulation of appropriate policies to regulate Fin-Techs.

Finally, this study will be beneficial to the scholars and researchers. First, the study will add value to the existing body of knowledge on Fin-Tech strategy and financial inclusion in developing countries. Secondly, the study will be a source of reference as it would provide literature to current and future scholars and researchers on subject matter. They may also find useful research gaps that may stimulate interest in further research in future.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section covers literature reviewed related to the research. It discusses the theories that were guide the study under the theoretical foundation. The chapter also presents the empirical literature. In this section, the study reviews and discusses empirical literature related to Fin-Tech strategy and financial inclusion. The chapter also highlighting the gaps identified in the empirical literature. The chapter also presents the conceptual framework of the study that shows the relationship between study variables.

2.2 Theoretical Framework

The theoretical foundation is important to the study since helps understand the problem under study. The study was anchored on Porter's Model of Generic Strategies for Competitive Advantage, theory of financial innovation Model and Financial intermediation theory.

2.2.1 Porter's Model of Generic Strategies

Porter (1980) in the early 1980s developed Porter's Generic Strategies. Competitive strategies are concepts that are inter-connectedly used by many institutions to enhance procedure of operations and win over their rivals. Porter's generic strategies model depicts strategy as the actions taken that create positions that are defendable in an industry (Porter, 1985). The theory holds that there two competitive advantage types that can be possessed by organizations: low cost and differentiation. The two essential kinds of competitive advantage together with the activities scope that an organization tries to attain them, result in three generic strategies for ensuring performance that is above average in an industry: focus, differentiation and cost leadership. Strategy focus has two variants, differentiation focus and cost focus (Tanwar, 2013).

Regarding cost leadership strategy, an organization works to be the lowest producer of cost in its business industry. The cost advantage sources are different and are reliant on industry structure. The sources of cost advantage may involve economies of scale, proprietary innovation, and different variables. In a strategy of differentiation, an institution tries to stand out in its business industry across a few dimensions that are generally valued by the purchaser. The market focusers chooses a segment or segment groups and tailors its procedure to operating for them to the

avoidance of others (Pretorious, 2008). The strategy of focus has two variations (Differentiation and cost focus). In cost focus, an institution identifies cost advantage in its segment that is targeted, while in focus on differentiation an organization looks for separation in its segment that is targeted. Notwithstanding the benefits of the theory, various scholars have criticized Porters generic strategies. Aktouf, Chenoufi, and Holford (2005) noted that even though Porter's framework does provide a basic systematic approach to strategic management, it fails to provide any scientific rigor." Nandakumar, Ghobadian and O'Regan (2011) argues that Porter's generic strategies are limited in explaining heterogeneity in performance in business firm. Mintzburg (1988) held that Porter's cost leadership strategy should be called renamed price differentiation describing it as a strategy premised on lower pricing than that of the competitors. He suggests that competitive strategy has only one component that is differentiation in pricing and products.

Porter's Generic Strategies model relevant for the current study. The theory informs the Fin-Tech as a strategy for achieving financial inclusion. Fin-Tech enhances access, usage and affordability of financial services through cost advantage. Fin-Tech lowers the cost of offering financial products and services to customers thereby enhancing financial intermediation and inclusion in the process. This theory clarifies the strategies being utilized by Fin-Tech organizations, with the end goal for them to be competitive against conventional financial institutions.

2.2.2 Theory of Financial Innovations

Silber (1983) proposed the financial innovations theory that holds that that expansion of financial services by financial institutions is main rationale for seeking financial inclusion (Li and Zeng, 2010). The theory postulates that the reason for the innovations in finance are the barriers of present in old model of commercial banking. The old model of banking is associated with information asymmetry, cost of running physical bank and other operational costs (Blach, 2011). Innovations of financial technologies is a basic drive of the financial system, which promotes transformation of the economy and associated economic advantage from the new technology that is revitalizing financial sector (Sekhar, 2013). Financial innovations characterize financial advancements by bringing forth better approaches for financial service provision to customers and ensuring better rates of returns for financial institutions. Further, financial innovations leads to boosting the economy of a country (Raines & Leathers, 1992).

Financial innovations improves liquidity of financial markets; guarantee the distribution of financial assets to those who needs them and in addition enhancing the availability to rising demand for financial products hence financial inclusion (Blach, 2011). The rising inventive models of financial inclusion through mobile and other computerized financial services are helping with addressing the gap of financial instruments and products (Waema & Omwansa, 2014). Financial innovation theory has been criticized for assuming that financial innovations are always associated with reduced cost of financial intermediation that may not hold especially when innovation is accompanied by growth of social evils like cybercrime that takes advantage innovations to make users of financial information worse off through loss of money, information among other breaches (Miller, 1992; Palmer, 2015).

The theory of financial innovations underpins the current study by informing the independent variable Fin-Tech. The theory explains that innovations in financial sectors leads to emergence of financial technologies that assists in financial intermediation that ensures those who have no access to financial products can access them easily. Financial technologies that are a product of financial innovations are critical lowering information asymmetry; cost of running physical banks and other operational costs hence reduced cost of financial intermediation that further leads to financial inclusion.

2.2.3 Financial Intermediation Theory

The financial intermediation theory as advanced by Akerlof (1970) postulates that the financial intermediation process includes economic units with surplus funds deposited with financial institutions who in turn lend the same funds to economic units with deficit funds. Generally, financial intermediaries exist in the financial markets because of the very nature of market imperfections concerning surplus units and deficit units. In a 'perfect' financial market condition where there are no information and transaction costs, financial intermediaries would not exist since they would be serving no purpose (Nyamweya & Obuya, 2020. In reality, most financial markets are characterized by information asymmetry hence there exist differences in access to market information between buyers and sellers of financial products.

Financial markets have pronounced and elevated levels of information asymmetries that make it crucial that intermediaries should exist to bridge the gap in information and make flow of finances

within an economic system practicable (Obuya and Olweny, 2017). However, the theory has some limitations in regards to underpinning the current study. The traditional criticism against the financial intermediation theory is that a massive number of financial assets are required for it to hold with the exception of special cases only (Allen & Santomero, 1997). However, with the current development of advanced methods of option pricing and pricing models and the extension of these ideas on option valuation and other derivatives have served to negate this criticism and weakness of standard market theory of financial intermediation.

The theory underpins the current study by examining the contributions of financial intermediation to financial inclusion. Financial intermediation ensures that those with excess funds are connected with those who need finances to start business ventures. The purpose of financial intermediation is to reduce the intermediation cost hence financial inclusion.

2.3 Determinants of Financial Inclusion

A number of factors affects the financial inclusion including. The current study focused on four factors affecting financial inclusion including Fin-Tech, diaspora remittances, lending rate and mobile phone penetration.

2.3.1 Financial Technologies

The connection between financial technologies and inclusive financing is that the premise that and majority of the excluded population who owns mobile phone such that economic services can be offered via mobile phones and other interconnected devices such as laptops and tablets that ensures improved access to finance for the excluded population (World Bank, 2014). The positive effects of financial Technology for financial inclusion are varied. Better access financial technologies can improve access to basic financial services, thereby resulting in improved financial inclusion in rural areas among low-income earners (Demir, Pesqué-Cela, Altunbas & Murinde, 2020). Further, better access to Fin-Tech leads to channelling of financial products to rural and poor communities hence improved access to finance for bank customers in rural and poor communities. Easy-to-use financial technologies gives an additional convenient platform for people to hold out basic financial transactions together with payments for electricity, facility, cash transfer to family and friends etc. (Erman, 2017).

2.3.2 Diaspora Remittance

Arthur, Musau and Wanjohi (2020) revealed that remittances from diaspora had direct and major effect on financial inclusion. Ocharo (2014) noted that that remittance was positive and statistically significant and it enhanced financial inclusion. Buencamino and Gorbunov (2012) observed that over the years governments were introducing a number of incentive based and mandatory measures to encourage migrants to remit more through formal channels. Mandatory minimum remittance requirements were only successful where the government played an active role in the process by directly assisting local companies win contracts abroad. El Qorchi, Maimbo and Wilson (2003), in their study, informal remittance systems, argued that developing international regulatory and supervisory standards for informal funds transfer systems is a complex process, and hence, called on regulators to note the differences in the stages of national economic development in general and the financial sector in particular

2.3.3 Lending Rate

The lending rates charged by commercial banks have an effect on financial inclusion by acting as a barrier or enabler to financial inclusion. Uddin and Islam (2017) noted that Financial Inclusion high interest rate have verse impact on financial inclusion. Further, the study it was noted that lower loan interest rate can encourage population to access financial services like loans. Oyelami, Saibu and Adekunle (2017) on determinants of financial exclusion revealed that that financial inclusion is affected by interest rate. Caballero-Montes (2020) also revealed that interest rate caps have a significant effect on financial inclusion. Interest rate caps act as enabler to financial inclusion.

2.3.4 Mobile Phone Penetration

Mobile phone penetration is the number of the population using mobile phones. Senou, Ouattara, and Houensou (2019) on determinants of financial inclusion noted that mobile phone penetration and internet usage are critical financial inclusion. Boro (2017) on impact of mobile banking on financial inclusion established that mobile phone penetration rate had a major impact on financial inclusion. Access to mobile phone devices enabled the population to easily access financial services of banks through their phones. Penetration to mobile phones also enhanced uptake of mobile money services. Chinoda and Kwenda (2019) noted that financial inclusion responded positively and significantly to mobile phones.

2.4 Empirical Studies

Okiro and Ndungu (2013) examined the impact of mobile and internet banking in Kenya. The study established that financial institutions have been in the process of significant transformation due to innovation in information technology. The study found out that rapid development of information technology had made banking tasks more efficient and cheaper. It had changed how customers interact with their financial institutions. Okiro and Ndungu (2013) was limited to mobile banking. Gibson (2015) conducted a study on the impact that financial technology has on the financial services in developing countries. The study discovered that Fin-Tech had discontinued the normal money services model that has reduced the barriers to entry thus increasing money inclusion. It had modified the approach money services are delivered to the shoppers.

Ouma, Odongo and Were (2017) examined the connection between use of mobile phones in providing financial services on mobilization of savings in selected countries in sub Saharan Africa. The study adopted logistic regression where results revealed that accessibility and use of mobile phones in delivering financial products enhances the chances of saving at household level. Additionally, the study revealed that mobile financial services have major effect on amount saved. Ouma, Odongo and Were (2017) was however limited to one financial technology hence there is a gap in other financial technologies that may also have role on financial inclusion.

Kithinji (2017) evaluated the causal effect link between digital banking strategy and financial Inclusion among commercial banks in Kenya. The study adopted multivariate regression analysis based on panel data for commercial banks running from 2012-2016. The findings based on ANOVA revealed that digital banking strategies had significant direct causal effect relationship with financial inclusion among commercial banks in Kenya. Financial inclusion was measured by the number of accounts, number of branches, deposits value and customer base. Mobile banking, ATM banking, agency banking and online had a major effect on financial inclusion. Kithinji (2017) was based on bank level data and another study based on macro level data is necessary.

Mulwa (2017) conducted an investigation on the effect of internet banking on financial performance of commercial banks in Kenya. The study acknowledged that internet banking has the potential to transform financial services and banking industry. The study adopted a descriptive

research design and descriptive statistics for analysis. The findings revealed that ROA in commercial banks in Kenya was on an upward trajectory due to increase in online customer deposits through internet banking. In addition, internet expenses fees and commissions increased to total asset ratio increased. Mulwa (2017) was limited to internet banking and another study examining other aspects of Fin-tech besides internet banking would be more informative.

Gorham and Dorrance (2017) explored the potential for technology innovation within the money services sector, with a spotlight on Fin-Tech. The study established that Fin-Tech has the potential to expand access to safe and reasonable money services to additional customers. The benefits of those innovations embody lower prices for services driven by larger efficiencies and targeted promoting, improved transparency regarding product and repair terms and prices, larger money management, quicker and/or time period deposits and expenses mirrored in account balances, new merchandise and services specifically geared toward the underserved and improved safety and security of funds.

Ozili (2018) evaluated the influence of digital finance on stability and financial inclusion. The analysis revealed that digital finance via Fin-Tech suppliers has vital positive outcomes for financial inclusion in developing and developed nations, and therefore the digital finances convenience facilitates borrowers with incomes that are low and ranging is often additional vital to them compared to the larger expense they will pay to amass the precise services from banks that are standard. Nevertheless, the analysis explains that in spite of the benefits of digital finances, it faces some difficulties for money inclusion and stability. Kim, Zoo, Lee, Kang (2018) evaluated the nexus of mobile financial services, financial inclusion, and development. This research was a critical analysis of 54 academic research papers. The findings revealed that mobile banking had a major impact on financial inclusion.

Byegon, Cheboi and Bonuke (2019) examined the intervening role of financial innovations on the link between behavioural factors and utilization of formal financial services among Micro enterprises in Kenya. The study adopted descriptive survey where a sample of four hundred and eighty six managers of micro-enterprises in Nairobi was studied. The study was based on regression analysis where results showed that financial innovations has an intervening effect on the link between behavioural factors and financial inclusion. Hence financial innovations like

agency banking, mobile money enhanced the relationship between behavioural factors and financial inclusion. Byegon, Cheboi and Bonuke (2019) examined the indirect effect of financial innovation on financial inclusions hence a gap remains on the direct effect of financial innovations on financial inclusion in the micro enterprise setting in Nairobi.

Durai and Stella (2019) evaluated the contribution of Digital finance to financial inclusion. The study used primary data where multivariate regression was adopted. Research showed that financial inclusion was affected by Digital Finance through their convenience, accuracy, usability, convenience, and easy interbank. Hence, digital finance in the form of mobile banking, credit cards, Internet banking, mobile wallets (apps) have a major influence on financial inclusion. Durai and Stella (2019) was not carried out in Kenya hence may not be wholesomely be adopted in Kenya.

Sindani, Muturi and Ngumi (2019) examined the causal effect link between financial inclusion and financial distribution channels in Kenya. Financial distribution channels included, internet banking and ATM banking. Annual Secondary data was collected for a period of six years from 2012 to 2017. The study population was all the forty-four silenced commercial banks in Kenya. The study adopted regression analysis where internet banking improved enhanced financial inclusion by banking institutions in Kenya. ATM banking had a major direct impact on financial inclusion. Sindani, Muturi and Ngumi (2019) was firm level study at the bank level hence there is a gap for macro level study using macro data.

Demir, Pesqué-Cela, Altunbas and Murinde (2020) evaluated the link between FinTech, financial inclusion, and income inequality in a panel of one hundred and forty countries. The study examined the effect of FinTech on inequality directly and indirectly via financial inclusion. The study adopted OLS, 2SLS and IV models. The study revealed that FinTech lowers income inequality indirectly through its impacts on financial inclusion. Demir, Pesqué-Cela, Altunbas and Murinde (2020) examined the mediating effect of financial inclusion on the relationship between fin-tech and income inequality. Another study needs to be carried out that adopts Fin-Tech as the independent variable affecting financial inclusion.

Arthur, Musau and Wanjohi (2020) evaluated how financial inclusion in Kenya was impacted by diaspora remittances. The study was based on quarterly data for the period 2008 to 2018. Descriptive research design where employed in the research. The study adopted multivariate time series regression model. The research revealed that remittances from diaspora had direct and major effect on financial inclusion. Arthur, Musau and Wanjohi (2020) was limited to role of diaspora remittances in financial inclusion leaving a gap that examines other factors affecting financial inclusion in addition to diaspora remittances.

In a study in Ghana, kumbo, Nyaaba, and Akologo (2018) evaluated the effect of diaspora remittances on financial inclusion. The study adopted survey design where a sample of 16772 households were adopted into the study out of the total population. The research adopted logistic regression analysis where results showed that remittances increased the chance of opening bank accounts, however, it had no predictive power over loan application and qualification. Akumbo, Nyaaba, and Akologo (2018) was limited to diaspora remittances and did not examine other factors affecting financial inclusion including financial technology.

Oyelami, Saibu and Adekunle (2017) revealed that low financial inclusion among the poor masses is a hindrance to inclusive development among developing countries. The study therefore examined the determinants of financial inclusion in countries in the Sub-Saharan Africa. The study used ARDL to capture the long run time series data that is non-stationery. The study revealed that financial inclusion is explained by interest rate, ATM usage, level of income and literacy. The breath of the study by Oyelami, Saibu and Adekunle (2017) can be expanded to include more variables of in line with financial technology.

Boro (2017) evaluated how financial inclusion was affected by mobile banking in Kenya. The study was based on analytical model with quarterly data collected from 2007 to 2016. The study adopted trend analysis and OLS regression analysis with the results revealing that financial inclusion was affected by mobile banking transactions and mobile money subscription through deposits. Boro (2017) was limited to mobile banking as one aspect of financial technology and another study with more financial technology variables would expand the breath of the current study.

Kithinji (2017) evaluated how financial inclusion in Kenya was affected by digital banking. The study was based on secondary data sourced between 2012 and 2016 from CBK and was a descriptive survey of all banks licensed by CBK. The digital finance tools examined included mobile banking, ATM banking, Agency banking and online. Proxies including number of bank accounts, number of outlets, deposits and customer base, measured financial inclusion. The study adopted OLS regression with the study establishing that digital banking had a major impact on financial inclusion. Kithinji (2017) did not introduce control variables to capture extraneous variables that also influence financial inclusion.

Senou, Ouattara and Houensou (2019) examine the effect of digital technology on financial inclusion in West Africa. Data was sourced from central bank of West African states. Digital technology was captured by mobile phone penetration and internet usage. Financial inclusion was measured by number of bank accounts per 1000 adults, credit to private sector as a ratio of gross domestic product and ratio of deposits to gross domestic product. The study adopted Random effect and GMM model with the findings showing that mobile phone penetration and internet usage had a major direct effect on financial inclusion in west Africa states both in isolation and jointly. Senou, Ouattara and Houensou (2019) was based in West Africa and its domestication in Kenyan context is welcomed.

2.5 Summary of Literature Review and Knowledge gaps

The literature has examined theoretical and empirical studies underpinning the current study. The theoretical literature was based on Porter's model of Generic strategies for competitive advantage, theory of financial innovation model and financial intermediation theory. The empirical literature has examined a number of studies on the effect of financial technology on financial inclusion with major financial technologies examined including mobile banking, agency banking, online banking and ATM banking. Additional other studies have examined role of control variables such as diaspora remittance, interest rates, literacy on financial inclusion. Generally, Studies in the empirical literature have established that there exist major relationship between Fin-Tech and financial inclusion. However, a number of Gaps have been identified in the empirical literature.

First, most studies have concentrated one or a few aspects of Fin-tech with most aspects ignored in studies. The studies have tended to concentrate on either mobile banking or ATM banking or agency banking. The current study therefore examined more financial technology variables including mobile money, agency banking and Point of sale. Secondly, majority of studies in Kenya have not introduced diaspora remittances and lending rate as control variables given that the two variables play critical role in financial inclusion in empirical literature. Empirical studies examining determinants of financial inclusion globally have tended to include diaspora remittance and interest rate in the estimation models given that the variables are critical to financial inclusion. The current study therefore included lending rate, mobile phone penetration and diaspora remittance as control variables. Thirdly, majority of studies have been based on bank level studies with few macro level analyses in Kenya. The current study was therefore based on macro level data. Overall, the study examined the impact of Fin-Tech on financial inclusion in Kenya so as to bridge various gaps identified.

2.6 Conceptual Framework

The conceptual framework in figure 2.1 presents the diagrammatical relationship between study variables. Fin-Tech (Mobile money, Point of Sale and Agency banking) is the independent variable while financial inclusion is the dependent variable. Diaspora remittance, lending rate and mobile phone penetrations are the control variables. The study expected positive relationship between Fin-Tech (Mobile money, POS and agency banking) and financial inclusion. The study also expected positive relationship between Diaspora remittances and financial inclusion. The study also expected inverse relationship between average lending rate and financial inclusion and finally, the study expected positive relationship between mobile phone penetration and financial inclusion.

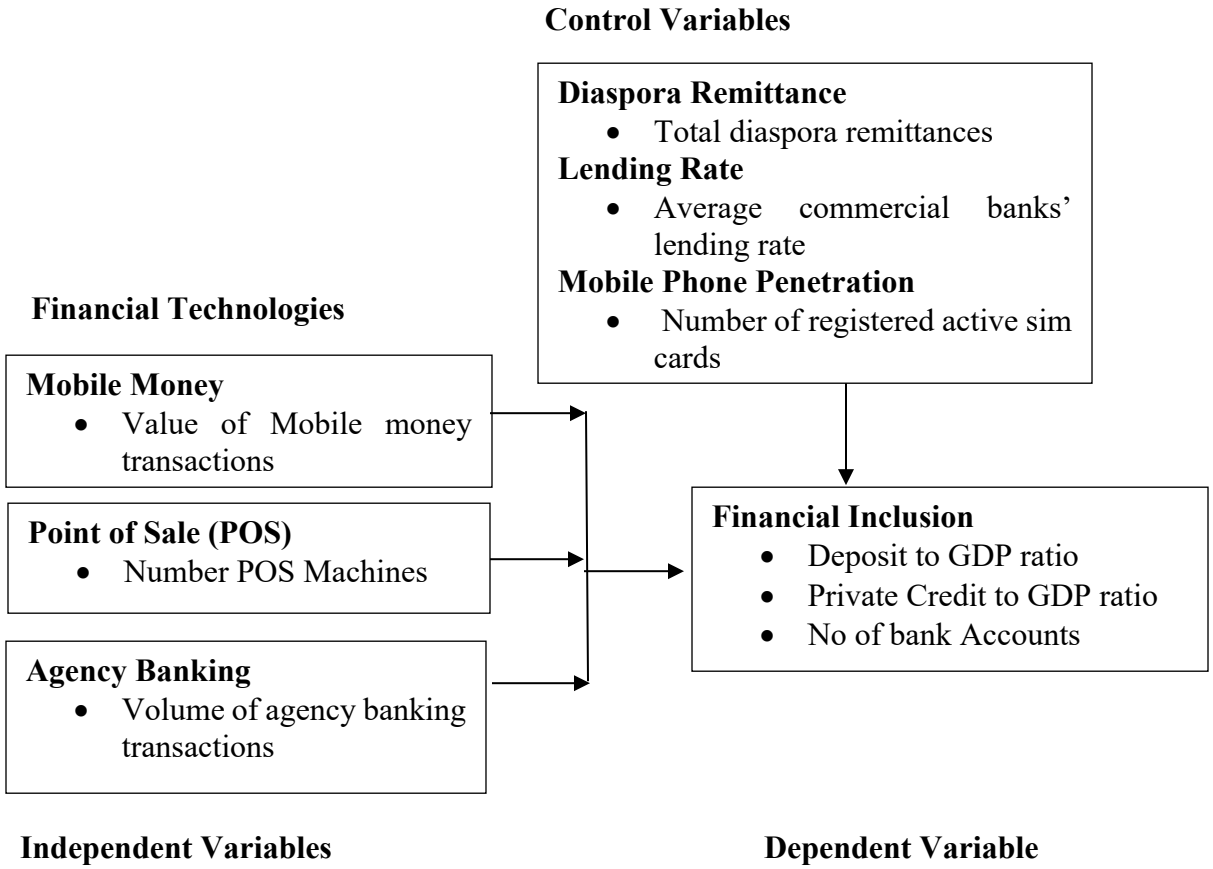

Figure 2. 1: Conceptual Model

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This section sets out the research methodology that was utilized in the research in gathering, measuring and analyzing of data. The chapter starts with discussing the research design adopted, population, data collection procedure, data analysis and diagnostic tests.

3.2 Research Design

Descriptive research design was adopted given that the researcher intended to establish causal effect relationship between variables especially where researcher has no control over the environment in which the variables are interacting (Saunders, Lewis and Thornhill, 2019). The design enabled the researcher to evaluate the contribution of Fin-Tech to financial inclusion in Kenya.

3.3 Target Population

The population of the study was all population in Kenya interacting with Fin-Tech the study will target data collected on Fin-Tec and Financial inclusion proxies. There were about 47.5 million Kenyans interacting with Fin-Tech in various degrees (KNBS, 2019). The study adopted secondary macro data regarding study variables in Kenya hence no sampling was carried out. The data targeted was country level macro data hence data was not be collected from individual Kenyans. The study targeted quarterly data from 1st Quarter 2011 to 4th Quarter 2020. (To assess reception of fin-tech in the last 10 years). The data will Yield 40 observations for each variable.

3.4 Sample

The study was a census regarding all Kenyans interacting with Fin-Tech and how that has affected financial inclusion among Kenyans. There was thus no need for sampling with the study collecting secondary data regarding all Kenyans.

3.5 Data Collection

The study was collected quarterly secondary data regarding financial inclusion and Fin-Tec. Data regarding Fin-Tech (Mobile money, POS, Agency banking) data was extracted from CBK

database. Regarding Control variables (Diaspora remittance and lending Rate) data was extracted from CBK database. Data regarding mobile phone penetration was extracted from Communication Authority of Kenya database. Regarding financial inclusion (No of savings accounts, deposits, credit and GDP) data was extracted from economic surveys by the Kenya national Bureau of statistics. The data extracted was entered on data collection sheets in the form of excel sheets.

3.6 Data Analysis

The collected was entered on excel sheet and evaluated for completeness and absence of errors. Data on excel sheet will be exported to STATA version 15. Descriptive statistics was utilized to determine outliers and elaborate on study variables. The measures of dispersal and central tendency adopted included the maximum, minimum, mean and standard deviation. The study then adopted inferential statistics where multivariate time series regression model was adopted to evaluate the effect of Fin-Tech on financial inclusion in Kenya. The study adopted the models presented in equations [1-3].The study adopted three models given that three aspects of dependent variable (financial inclusion) was to be examined including banks accounts, deposit facilities and credit.

$$LnNoBA_t = \beta_0 + \beta_1 lnMM_t + \beta_2 LnPOS_t + \beta_3 LnAB_t + \beta_4 LnDR_t + \beta_5 LR_t + \beta_6 MPP_t + \varepsilon_t \quad (1)$$

$$DepositGDP_t = \beta_0 + \beta_1 lnMM_t + \beta_2 LnPOS_t + \beta_3 LnAB_t + \beta_4 LnDR_t + \beta_5 LR_t + \beta_6 MPP_t + \varepsilon_t \quad (2)$$

$$CreditGDP_t = \beta_0 + \beta_1 lnMM_t + \beta_2 LnPOS_t + \beta_3 LnAB_t + \beta_4 LnDR_t + \beta_5 LR_t + \beta_6 MPP_t + \varepsilon_t \quad (3)$$

Where NoBA = Number of Bank account

DepositGDP= Volume of Deposits to Gross domestic product ratio

CreditGDP= Credit to private sector to Gross domestic product ratio

MM= Mobile Money

POS= Point of Sale

AB= Agency Banking

DR= Diaspora remittances

LR= Lending Rate of commercial banks

MPP = Mobile Phone Penetration

Ln= Natural Logarithm

$\beta 0$ = Intercept term

βi = parameter estimates

ε = Error term

t = unlagged time

The variables in the models will be operationalized as shown in Table 3.1

Table 3. 1: Operationalization of Study Variables

Variable	Notation	Measurement	Expected sign of relationship		
Dependent variable			NoBA	CreditGDP	DepositGDP
Financial Inclusion	NoBA	Number of Bank account			
	CreditGDP	Credit to private sector as a ratio of Gross Domestic Product			
	DepositGDP	Volume of deposits to Gross Domestic Product			
Independent Variables					
	MM	Value of mobile money transactions	[-]	[+]	[+]
	POS	Number of POS machines	[+]	[+]	[+]
	AB	Volume of agency banking transactions	[+]	[+]	[+]
Control Variables					
	DR	Value of remittances	[+]	[+]	[+]

	LR	Average lending rate b commercial banks	[+]	[-]	[+]
	MPP	Number of active sim cards	[+/-]	[+]	[+]

3.7 Diagnostic Tests

The study performed various diagnostic tests to ensure that the regression model is robust for purpose of parameter estimates. The study evaluated Ordinary least squares (OLS) regression assumptions including Normality, linearity, No multicollinearity, homoscedasticity, No serial correlation, No unit roots (Pagan, 1996). Normality is the assumption that data depicts normal distribution such that the mean and median are equal. Normality was tested using skewness and Kurtosis where skewness value equal to zero and Kurtosis equalling to three implies normality (Campbell, Lo, & MacKinlay, 2012). No multicollinearity is the assumption that the data regarding explanatory variables used in the study are not highly correlated (Hautsch, 2011). The study determined multicollinearity using Variance inflation factor (VIF) such that VIF lower than 10 signify low multicollinearity. Homoscedasticity is the assumption that the data used in the study have constant and finite variances. The study used residual plots to establish the absence or presence of heteroscedasticity. No serial correlation is the assumption that data about study variables at the current time are not highly correlated with previous successive data about same variables. Absence or presence of serial correlation was established using Durbin Watson alternative test where significance higher than 0.05 imply no serial correlation.

3.8 Test of Significance

The study examined whether or not the explanatory have significant effect on the dependent variable by comparing the p-value associated with the parameters with 0.05 level of significance. P-values less than 0.05 levels of significance implies significant effect of the explanatory variable on dependent variable.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The chapter presents the data analysis and discussion of results. The analysis proceeded with descriptive analysis, diagnostic tests and inferential analysis. The descriptive analysis adopted measures of central tendency. The diagnostic tests included normality, multicollinearity, heteroscedasticity and autocorrelation. The inferential analysis involved Ordinary Least Squares (OLS) regression analysis.

4.2 Descriptive Analysis

The preliminary analysis involves the adoption of descriptive statistics and graphs to represent the data about variables. The descriptive analysis was important in the identification of the general nature of the variables and any outliers in the study. This was critical to identify problems that might interfere with inferential analysis. The descriptive analysis is presented in table 4.1.

Table 4. 1: Summary Descriptive Statistics

	Deposits	CPS	MM	POS	AB	DR	LR	MPP	GDP	NOBA
Mean	931.24	1,997.50	758.52	1,684.72	85.75	464.72	15.24	39.39	1,672.52	39.01
SD	329.75	583.21	325.01	877.18	54.15	184.48	2.50	10.10	676.50	18.38
Min	482.37	939.98	240.77	518.49	2.19	196.46	11.88	24.97	379.07	14.24
Max	1,486.45	2,883.61	1,661.40	3,502.10	162.97	820.37	20.21	61.41	2,834.25	72.59
Count	40	40	40	40	40	40	40	40	40	40

In the table 4.1, the deposits include savings and deposits made by the population in the banking sector including commercial banks and deposits taking Sacco's. Deposits had a mean of Ksh.931.24 billion for 40 observations. The standard deviation showed that deposits in each quarter was spread around the mean with about sh.329.75 billion. The minimum deposits was sh. 482.37 billion while the highest deposits was Ksh. 1,486.45 billion. Credit to private sector (CPS) includes loans extended to the general population in Kenya apart from loans extended to government. The mean credit to private sector for the ten-year period was Ksh. 1,997.50 billion. The standard deviation showed that credit to private sector in each individual quarter was spread around the mean with Ksh. 583.21 billlion. The minimum credit to private sector was Ksh. 939.98 billion and the maximum credit to private sector was Ksh.2,883.61 billion.

The mobile money (MM) was the value of mobile money transactions carried out through the economy through the mobile money agents. The mean mobile money was Ksh. 758.52 billion and the standard deviation showed that mobile money in each quarter of the year was spread around the mean with Ksh.325.01 billion. The lowest mobile money was Ksh. 240.77 billion while the highest mobile money was Ksh.1,661.40 billion. Point of sale (POS) machines had a mean of 1,684,720 machines with a standard deviation of 877,180 machines around the mean. The minimum number of machines was 518, 490 machines and the maximum number of machines was 3,502,100 machines. Agency banking (AB) was the volume of transaction carried through the commercial banks and MFIs bank agents. The mean agency banking transactions was 85.75 million with standard deviation of 54.15 million transactions around the mean. The minimum agency banking volume of transactions was 2.19 million and the maximum volume of agency banking transactions was 162.97 million.

Diaspora remittances (DR) was the money sent bank home by Kenyans working or doing business abroad. The mean diaspora remittances was USD. 464.72 million with a standard deviation of USD. 184.48 million around the mean. The minimum diaspora remittances was USD.196.46 million while the maximum diaspora remittances was USD. 820.37 millions. The lending rate (LR) was the average lending rate per year across the 44 licensed commercial banks in Kenya. The mean lending rate 15.24% with a standard deviation of 2.50% around the mean. The minimum lending rate was 11.88% and the maximum lending rate was 20.21%. Mobile phone penetration (MPP) was the number of registered mobile phone sim cards within Kenya. The mean Mobile phone penetration was 39.39 million subscribers and the standard deviation showed that number of subscriptions per quarter was spread around the mean with 10.10 million sim card subscriptions. The minimum subscribed sim cards were 24.97 million while the maximum were 61.41 million subscriptions.

The gross domestic product (GDP) was the monetary value of all finished goods and services produced or offered within the Kenyan boundary. The mean GDP was Ksh. 1,672.52 billion with a standard deviation of Ksh.676.50 around the mean. The minimum GDP was Ksh.379.07 billion and the maximum GDP was Ksh.2,834.25 billion. The number of bank accounts (NBA) was the accounts opened with commercial banks and deposit taking MFIs in Kenya. The mean number of

accounts was 39.01 million with a standard deviation of 18.38 million banks accounts. The minimum banks accounts was 14.24 million and the maximum banks accounts were 72.59 million.

4.3 Diagnostic Tests

The study performed various diagnostic tests to ensure that the regression model is robust for purpose of parameter estimates. The study evaluated Ordinary least squares (OLS) regression assumptions including Normality, multicollinearity, homoscedasticity and serial correlation (Pagan, 1996).

4.3.1 Heteroscedasticity

Homoscedasticity is the assumption that the data used in the study have constant and finite variances. The study used residual plots to establish the absence or presence of heteroscedasticity.

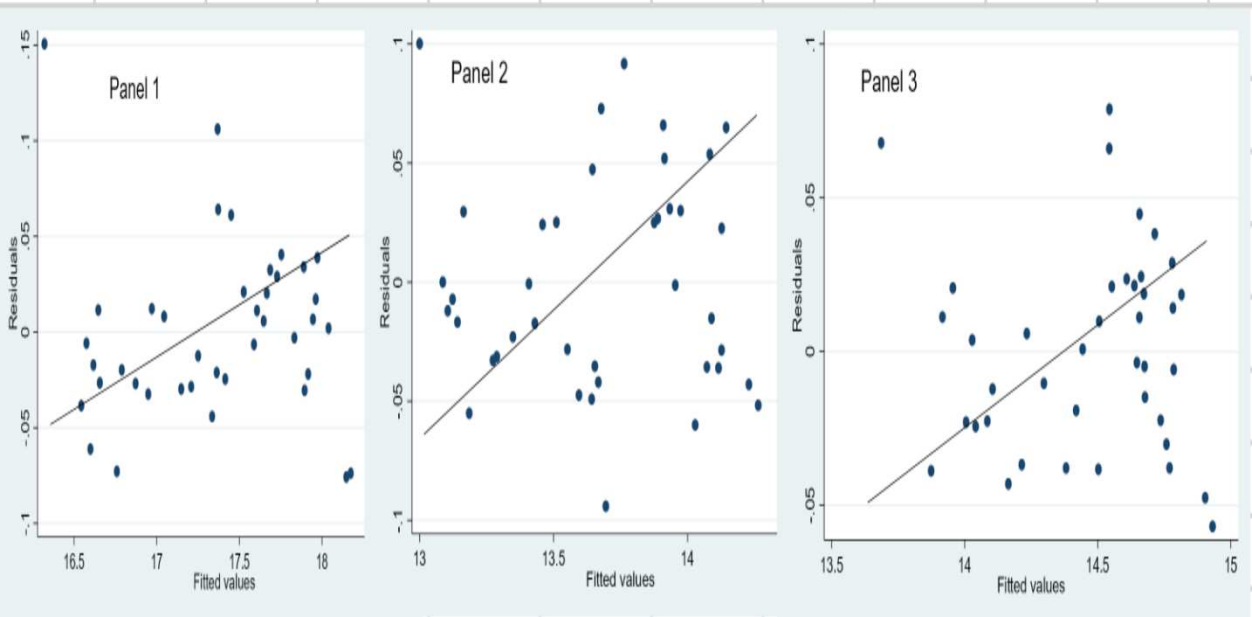

Figure 4. 1: Residual Plots for model 1, model 2 and Model 3

The results is presented in figure 4.4 based on panel 1, panel 2 and panel 3 shows that most of the residuals fall along and around the normal line hence there was minimal problem of heteroscedasticity in the three models used in the study.

4.3.2 Autocorrelation

No serial correlation is the assumption that data about study variables at the current time are not highly correlated with previous successive data about same variables. Absence or presence of serial correlation will established using Durbin alternative test where p-value greater than 0.05 level of significance imply no serial correlation. The p-values (0.315, 0.129 and 0.4) were all greater than 0.05 level of significance implying that there was no problem of autocorrelation as shown in table 4.2.

Table 4. 2: Durbin's alternative test for autocorrelation

Models	Durbin's alternative test for autocorrelation chi2	df	Prob>Chi2
Model 1	4.744	4	0.315
Model 2	7.133	4	0.129
Model 3	3.388	4	0.495

H0: no serial correlation

4.3. 3 Multicollinearity

The study determined multicollinearity using VIF such that VIF lower than 10 signify low multicollinearity. The results presented table 4.3 shows that there was no major problem of multicollinearity given that all the VIF values were less than 10.

Table 4. 3: Variance Inflation Factor Test for Multicollinearity

Variables	VIF	1/VIF
MPP	5.830	0.171
MM	4.410	0.226
DR	3.950	0.253
AB	2.440	0.409
POS	1.310	0.763
LR	1.089	0.918
Mean VIF	3.171	

4.3.4 Normality

Normality is the assumption that data depicts normal distribution such that the mean and median are equal. Normality was tested using skewness and Kurtosis where skewness value equal to zero and Kurtosis equalling to three implies normality (Campbell, Lo, & MacKinlay, 2012).

Table 4. 4: Skewness and Kurtosis

Variable	Skewness	Kurtosis
CreditGDP	-.1291889	2.928088
DepositGDP	-.2102806	2.875950
PoS	-.1535099	2.930881
DR	.0403526	3.015086
LR	.2329092	2.938423
NOBA	-.2908431	2.738168
MM	-.4538719	3.316663
MPP	.2501538	3.023432
AB	-.339452	4.258323

Skewness between -0.5 and 0.5 if fairly symmetrical data, skewness between -1 and -0.5 or and 0.5 and 1, data moderately skewed, skewness less than -1 and greater than 1, the data is highly skewed. Skewedness of 0 is perfectly symmetrical data. All the values of skewness were between -0.5 and 0.5 hence the data was fairly symmetrical and normal. A standard normal distribution has a kurtosis of 3 in what is referred to as mesokurtic. Values of kurtosis greater than 3 are referred to as leptokurtic and values less than 3 are referred to as platykurtic. All values of kurtosis were near three hence, the data is said to be normal. The study thus concluded that the data collected was normal.

4.4 Regression Analysis

The study carried out OLS regression to establish the contribution of financial technology to financial inclusion in Kenya. The study adopted ordinary least squares regression given that the assumptions of OLS were not breached. The study adopted three models capturing different aspects of financial inclusion as presented in tables [4.5-4.7].

Table 4. 5 Effect of Financial Technology on Number of bank Accounts

noba	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
MM	0.356	0.107	3.33	0.002	0.138	0.573	**
POS	0.198	0.047	4.20	0.000	0.294	0.102	**
AB	0.173	0.035	4.89	0.000	0.101	0.245	**
DR	0.162	0.118	1.38	0.178	0.402	0.078	
LR	-0.040	0.005	-7.41	0.000	-0.051	-0.029	**
MPP	1.114	0.233	4.78	0.000	0.639	1.588	**
Constant	8.479	1.989	4.26	0.000	4.432	12.526	**

Mean dependent var	17.356	SD dependent var	0.523
R-squared	0.952	Number of obs	40.000
F-test	718.332	Prob > F	0.000
Akaike crit. (AIC)	-120.604	Bayesian crit. (BIC)	-108.782

** *p<0.05*

The table 4.5 presented the effect of financial technology on financial inclusion (number of bank accounts) in Kenya. The coefficient of determination (R^2 = 0.952) implies that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) explains 95.2% of the total variation in financial inclusion (number of bank accounts) with the remaining 4.8% being explained by unobserved variables that were not part of the study. The analysis of variances (ANOVA) showed that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by number of banks accounts (F=718.332, p= 0.000<0.05). The value (β_0 = 8.479) is the level of financial inclusion, measured by number of bank accounts, when fin-tech and other covariates are held constant at zero.

Further, the effect of mobile money (MM) as an indicator of financial technology on financial inclusion measured by number of bank accounts was positive and significant (β_1 = 0.356, t= 3.33 and p=0.002< 0.05). The effect of Point of Sale (POS) on financial inclusion (number of bank accounts) was negative and statistically significant (β_2= 0.198, t= -4.20 and p=0.000< 0.05). The effect of agency banking (AB) on financial inclusion (number of bank accounts) was positive and statistically significant (β_3= 0.173, t= 4.89 and p=0.000< 0.05). The effect of diaspora remittances (DR) on financial inclusion (number of bank accounts) was inverse and but not statistically

significant (β_4 = 0.162, t= 1.38 and p= 0.178> 0.05). The effect of commercial banks' lending rate (LR) on financial inclusion (number of bank accounts) was inverse and statistically significant (β_5 = -0.040, t= -7.41 and p= 0.000). Finally, the effect of mobile phone penetration (MPP) on financial inclusion (credit to private sector) was positive and statistically significant (β_6 = 1.114, t= 4.78 and p=0.000). The model [1] is thus estimated as shown in equation (1).

$LnNoBA_t = 8.479 + 0.356\ lnMM_t + 0.198\ LnPOS_t + 0.173\ LnAB_t + 0.162\ LnDR_t - 0.040\ LR_t + 1.114\ MPP_t$ .....(1)

Table 4. 6: Table: Effect of Financial Technology on Deposits

depositgdp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
MM	0.281	0.107	2.63	0.013	0.064	0.499	**
POS	-0.043	0.047	-0.92	0.365	-0.139	0.053	
AB	0.106	0.036	2.98	0.005	0.034	0.178	**
DR	0.084	0.118	0.71	0.483	0.324	0.157	
LR	-0.041	0.005	-7.66	0.000	-0.052	-0.030	**
MPP	0.468	0.234	2.00	0.050	0.011	0.940	*
Constant	6.698	1.995	3.36	0.002	2.639	10.757	**
Mean dependent var		13.678	SD dependent var			0.375	
R-squared		0.885	Number of obs			40.000	
F-test		364.850	Prob > F			0.000	
Akaike crit. (AIC)		-120.377	Bayesian crit. (BIC)			-108.555	

*** p<0.05*

The table 4.6 presented the effect of financial technology on financial inclusion (value of deposits) in Kenya. The coefficient of determination (R^2 = 0.885) implies that the model 2 explains 88.5% of the variation in financial inclusion (deposits) hence financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) explains 88.5% of the total variation in financial inclusion with the remaining 8% being explained by unobserved variables that were not part of the study. The analysis of variances (ANOVA) showed that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by deposits (F=364.850, p= 0.000<0.05). The value (β_0 =6.698) is the level of financial inclusion, measured deposits to GDP ratio, when fin-tech and other covariates are held constant at zero.

Further, the effect of mobile money (MM) as an indicator of financial technology on financial inclusion measured by deposits was positive and significant (β_1 = 0.281, t= 2.63 and p= 0.013<

0.05). The effect of Point of Sale (POS) on financial inclusion (deposits) was negative and not statistically significant (β_2= -0.043, t= -0.92 and p=0.365 > 0.05). The effect of agency banking (AB) on financial inclusion (deposits) was positive and statistically significant (β_3= 0.106, t= 2.98 and p= 0.005< 0.05). The effect of diaspora remittances (DR) on financial inclusion (deposits) was positive but not statistically significant (β_4 = 0.084, t= 0.71 and p= 0.483). The effect of commercial banks' lending rate (LR) on financial inclusion (deposits) was inverse and statistically significant (β_5 = -0.041, t= -7.66 and p= 0.000). Finally, the effect of mobile phone penetration (MPP) on financial inclusion (deposits) was positive and statistically significant (β_6 = 0.468, t= 2.00 and p=0.050). The model [2] is thus estimated as shown in equation (2).

$$DepositGDP_t = 6.698 + 0.281\ lnMM_t - 0.043\ LnPOS_t + 0.106\ LnAB_t + 0.084\ LnDR_t - 0.041\ LR_t + 0.468\ MPP_t \quad (2)$$

Table 4. 7: Effect of Financial Technology on Credit to Private Sector

creditgdp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
MM	0.390	0.077	5.09	0.000	0.234	0.546	**
POS	0.184	0.034	5.46	0.000	0.253	0.116	**
AB	0.154	0.025	6.07	0.000	0.103	0.206	**
DR	0.290	0.085	3.43	0.002	0.462	0.118	**
LR	-0.013	0.004	-3.34	0.002	-0.021	-0.005	**
MPP	0.683	0.167	4.08	0.000	0.342	1.023	**
Constant	7.850	1.429	5.50	0.000	4.943	10.756	**
Mean dependent var		14.459	SD dependent var			0.327	
R-squared		0.920	Number of obs			40.000	
F-test		542.940	Prob > F			0.000	
Akaike crit. (AIC)		-147.096	Bayesian crit. (BIC)			-135.274	

** *p<0.05*

The table 4.7 presented the effect of financial technology on credit to private sector. The coefficient of determination (R^2 = 0.920) implies that the model 3 explains 92% of the variation in financial inclusion (credit to private sector) hence financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) explains 92% of the total variation in financial inclusion with the remaining 8% being explained by unobserved variables that were not part of the study. The analysis of variances (ANOVA) showed that financial technology (MM, POS and AB) and other

covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by credit to private sector (F=542.940, p= 0.000<0.05). The value (β_0 =7.850) is the level of financial inclusion, measured credit to private sector to GDP ratio, when fin-tech and other covariates are held constant at zero.

Further, the effect of mobile money (MM) as an indicator of financial technology on financial inclusion measured by credit to private sector was positive and significant (β_1 =0.390, t= 5.09 and p=0.000< 0.05). The effect of Point of Sale (POS) on financial inclusion (credit to private sector) was negative and statistically significant (β_2= 0.184, t= 5.46 and p=0.000< 0.05). The effect of agency banking (AB) on financial inclusion (credit to private sector) was positive and statistically significant (β_3= 0.154, t= 6.07 and p=0.000< 0.05). The effect of diaspora remittances (DR) on financial inclusion (credit to private sector) was inverse and statistically significant (β_4 = 0.290, t= 3.43 and p= 0.002). The effect of commercial banks' lending rate (LR) on financial inclusion (credit to private sector) was inverse and statistically significant (β_5 = -0.013, t= -3.34 and p= 0.002). Finally, the effect of mobile phone penetration (MPP) on financial inclusion (credit to private sector) was positive and statistically significant (β_6 = 0.683, t= 4.08 and p=0.000). The model [3] is thus estimated as shown in equation (3).

$$CreditGDP_t = \mathbf{7.858} + \mathbf{0.390}\ \ln MM_t + \mathbf{0.184}\ LnPOSt + \mathbf{0.154}\ LnAB_t + \mathbf{0.290}\ LnDR_t - \mathbf{0.013}\ LR_t + 0.683\ MPP_t \quad \text{.....(3)}$$

4.5 Discussion of the Findings

The section presents the discussions on the effect of financial technology on financial inclusion in Kenya. The financial inclusion was measured using three proxies including number of bank accounts, deposits and credit to private sector.

4.5.1 Effect of Financial Technology on Number of Bank Accounts

The study sought to establish the effect of financial technology on financial inclusion (number of bank accounts) in Kenya. The coefficient of determination (R^2 = 0.952) showed that financial technologies (MM, POS and AB) and other covariates (DR, LR and MPP) explains 95.2% of the total variation in financial inclusion measured by number of bank accounts with the remaining

4.8% being explained by unobserved variables that were not part of the study. The analysis of variances (ANOVA) revealed that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by number of banks accounts ($F=718.332$, $p= 0.000<0.05$). This implies that financial technology and other covariates explains the financial inclusion as measured by bank accounts.

Further, mobile money (MM) as an indicator of financial technology had a significant positive effect on financial inclusion measured by number of bank accounts ($\beta_1 = 0.356$, $t= 3.33$ and $p=0.002< 0.05$). The positive effect of mobile money (MM) on financial inclusion measured by number of bank accounts implies that increased access to mobile money leads to improved financial inclusion in Kenya in terms of enhanced usage of banks accounts. The mobile money accessed through mobile phone sim cards enables users to open banks accounts. The mobile technology allows users to open bank accounts through their phones hence the positive effect. Additionally, an improvement in value of mobile money accessed through mobile money agents by 0.356 units leads to improvement in financial inclusion by improved access to banks accounts. The effect of Point of Sale (POS) on financial inclusion (number of bank accounts) was positive and statistically significant ($\beta_2= 0.198$, $t= 4.20$ and $p=0.000< 0.05$). The positive effect of Point of Sale (POS) on financial inclusion through number of bank accounts implies that increased access to POS machines through cards including debits and credit cards encourages the use of banks accounts. Thus POS is associated with improvement in financial inclusion through opening of more banks accounts because access to money through POS machines depends on having a bank account hence opening of banks accounts for saving purposes. Further, an increased access to POS machines by one unit, leads to increased opening of banks accounts by 0.198 units.

The study also established that the effect of agency banking (AB) on financial inclusion through number of bank accounts was positive and statistically significant ($\beta_3= 0.173$, $t= 4.89$ and $p=0.000< 0.05$). The positive effect of agency banking (AB) on financial inclusion through number of bank accounts implies that agency banking enables ease access and use bank accounts especially in places that are far away from the brick and mortar banking halls. People who cannot access the banking halls can access bank services such as savings and withdrawals via the bank agents. Agency banking is thus a facilitator and a reason for people living far away from banking halls to

open banks accounts. Further, an improvement in agency banking through more banking agents one unit leads to improvement in financial inclusion through opening of bank accounts by 0.173 units.

The study also revealed that diaspora remittances (DR) had a positive but not statistical significant effect on financial inclusion through number of bank accounts ($\beta_4 = 0.162$, t= 1.38 and p= 0.178> 0.05). The positive effect of diaspora remittances (DR) on financial inclusion through number of bank accounts implies that increased diaspora remittances leads to increased opening of banks accounts. Most of the money received from abroad from Kenyans working and doing business outside the country are usually received through local bank accounts hence does lead to improvement in opening of more bank accounts. Further, an increase in diaspora remittances by one unit leads to increase in financial inclusion through opening of more banks accounts by 0.162 units.

The research also revealed that the effect of lending rate (LR) on financial inclusion through number of bank accounts was inverse and statistically significant ($\beta_5 = -0.040$, t= -7.41 and p= 0.000). The inverse relationship between commercial banks' lending rate and financial inclusion implies that increased lending rate on commercial banks loans is associated with reduced financial inclusion through opening of banks accounts. Most individuals open bank accounts with sole purpose of saving to improve their credit worthiness for eventual loan application. Increased lending rate discourages people from applying for loans therefore no motivation to open banks accounts. An increase in lending rate by one unit leads to reduction in financial inclusion through opening of new bank accounts.

Finally, the study revealed that the effect of mobile phone penetration (MPP) on financial inclusion through opening of bank accounts was positive and statistically significant ($\beta_6 = 1.114$, t= 4.78 and p=0.000). The positive effect of mobile phone penetration (MPP) on financial inclusion implies that increased mobile phone penetration leads to increased access to bank accounts. Individuals with smart phones can easily access their banks accounts via internet banking or sim cards hence improved usage of bank accounts. Further, banks allows mobile phone users to create electronic banks accounts via the mobile phone device thus increase penetration of mobile phones especially

the smarts phones is associated with increased usage of banks accounts as well as opening of more banks accounts.

The study findings agree and are contrasted with various empirical studies. The finding agrees with Ozili (2018) on the influence of digital finance on financial inclusion that revealed that digital finance via Fin-Tech has vital positive outcomes for financial inclusion in developing and developed nations. Further, the finding on effect of agency banking on financial inclusion agrees with Gorham and Dorrance (2017) who established that Fin-Tech through agency banking has the potential to expand access to safe and reasonable money services to additional customers. The benefits of agency baking included quicker deposits into bank accounts and expenses mirrored in account balances. Sindani, Muturi and Ngumi (2019) supports the study findings when they established that ATM banking accessed through POS enhanced financial inclusion by banking institutions through increasing access to bank accounts.

Arthur, Musau and Wanjohi (2020) just like in the study findings revealed that remittances from diaspora had direct and major effect on financial inclusion. However, Uchenna, Osabuohien and Oluwatobi (2015) contradicts this findings with their study noting that diaspora remittances have no influence on intention to open a bank account by the recipient, hence diaspora remittances has no impact on financial inclusion through opening of bank accounts. Oyelami, Saibu and Adekunle (2017) and Caballero-Montes (2020) supported the study findings on effect of lending rate on financial inclusion when they revealed that that financial inclusion is affected by interest rate. On effect of mobile phone on financial inclusion through number of banks accounts, Senou, Ouattara, and Houensou (2019), Boro (2017) and Chinoda and Kwenda (2019) showed that that mobile phone penetration and internet usage are critical financial inclusion. However, Fanta and Makina (2019) had contrary findings with mobile subscription rate having a major inverse causal effect relationship with financial inclusion through bank account ownership.

4.5.2 Effect of Financial Technology on Deposits

The study also examined the effect of financial technology on financial inclusion through value of deposits in Kenya. The coefficient of determination ($R^2 = 0.885$) implied that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) explains 88.5% of the total variation in financial inclusion with the remaining 8% being explained by unobserved variables that were

not part of the study. The analysis of variances (ANOVA) further showed that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by deposits ($F=364.850$, $p= 0.000<0.05$).

Further, the study revealed that the effect of mobile money (MM) on financial inclusion via deposits was positive and significant ($\beta_1 = 0.281$, $t= 2.63$ and $p= 0.013< 0.05$). The positive effect of mobile money on financial inclusion via deposits implies that improved access and usage mobile money results to improved financial inclusion through more deposits in bank accounts. Increased access to mobile money through mobile money agents enables ease in transferring hard currency to mobile money for further deposits into banks accounts. Individuals can easily transfer mobile money to their banks accounts hence improvement in value of deposits in financial institutions. Mobile money thus improves access and usage of bank savings products. Additionally, improvement in mobile money access by one unit leads to improvement in value of deposits in bank accounts by 0.281 units.

The study also showed that the effect of Point of Sale (POS) on financial inclusion through deposits was negative but not statistically significant ($\beta_2= -0.043$, $t= -0.92$ and $p=0.365 > 0.05$). The negative effect of Point of Sale (POS) on financial inclusion through deposits implies that increased access to POS is associated with declining financial inclusion through deposits. POS machines enables easy access to deposited money in bank accounts hence discourages savings inform of bank deposits. Further, increased access to POS machines by one unit leads to reduced bank deposits both time and time demand deposits by 0.043 units.

The study also showed that the effect of agency banking (AB) on financial inclusion through deposits was positive and statistically significant ($\beta_3= 0.106$, $t= 2.98$ and $p= 0.005< 0.05$). The positive relationship implies that increased access to agency banking leads to increased financial inclusion through access to deposit facilities. Agency banking enables easy access to bank savings facilities especially in areas that do not have access to banking halls. Bank customers can easily deposit funds into their banks accounts through bank agents hence increased deposits in the banking system. Further, increased access to agency banking by one unit leads to increased financial inclusion through bank deposits by 0.106 units.

The effect of diaspora remittances (DR) on financial inclusion through deposits was positive but not statistically significant ($\beta_4 = 0.084$, t= 0.71 and p= 0.483). The positive relationship means that increased diaspora remittance was associated with increasing financial inclusion through bank deposits. The direct relationship implies that increasing monetary remittance by nationals abroad is often directed to banks accounts in form of deposited before final investment. Most diaspora remittance are often deposited in bank accounts before they are finally directed at investment opportunities such as real estate, financial assets among other investments. Further, an increase in diaspora remittances by one unit leads to increase in financial inclusion through bank deposits by 0.084 units. Mandatory minimum remittance requirements were only successful where the government played an active role in the process by directly assisting local companies win contracts abroad.

The research also revealed that commercial banks' lending rate (LR) had a significant negative effect on financial inclusion through deposits in Kenya ($\beta_5 = -0.041$, t= -7.66 and p= 0.000). The inverse relationship between lending rate had and financial inclusion through deposit implies that increasing lending rate leads to reduced overall deposits in the banking system. Increasing lending rate often responds to increasing CBK benchmark rate. Increasing lending rate due to increased CBK benchmark rate implies reduced circulation on money in the economy and spending power hence reduced amount of deposits in the banking system. Further, rising lending rate discourages savers from depositing money in financial institutions if the purpose of deposits was to qualify for loan facilities like in deposit taking Sacco's. An increase in lending rate by one unit leads to reduced financial inclusion through deposits in the banking sector by 0.041 units.

Finally, the effect of mobile phone penetration (MPP) on financial inclusion through deposits was positive and statistically significant ($\beta_6 = 0.468$, t= 2.00 and p=0.050). The direct relationship between mobile phone penetrations on financial inclusion through deposits implies that increasing mobile phone penetration through sim card subscription leads to improving financial inclusion through bank deposits. Increasing mobile phone penetration accompanied by mobile money means increased ease in depositing money in bank accounts. Mobile phone users can easily transfer mobile money into their bank accounts without have to visit the banking halls. Mobile phone penetration thus encourages financial inclusion through banks deposits. Increases mobile phone

penetration by one unit results to increased financial inclusion through banks deposits by 0.468 units.

The findings of the study have basis in the literature. Durai and Stella (2019) agrees with study findings when they noted that digital finance has a significant effect on financial inclusion via easy interbank transactions like deposits. However, Agufa, Midika & Michelle (2016) established contrary findings revealing digital finance has no association with financial inclusion Kenya given that banks adopt digital finance for their purpose of enhancing profitability and not to enhance financial inclusion. Hove and dubus (2019) disagreed with study findings on effect of mobile money on financial inclusion through deposits when they noted that Mobile money in the form of Mpesa has not effectively encouraged financial inclusion through savings enhancement given that there are large number of people who have access to mobile money accounts but do not save in those accounts. Mulwa (2017) supports the study findings on effect of on the effect of internet banking accessed via mobile phones acknowledged that internet banking has the potential to transform financial services and banking industry. Regarding effect of agency baking on financial inclusion via deposits, Kithinji (2017) supported the study findings when they showed that agency and online banking significantly affected financial inclusion measured by deposits value. Gibson (2015) was in congruence with the study findings on effect of point of sale on financial inclusion via bank deposits by showing that financial technologies like POS had modified the approach money services are delivered to the shoppers when making transactions.

Arthur, Musau and Wanjohi (2020) agrees with study findings on effect of diaspora remittance on financial inclusion through deposits when they revealed that remittances from diaspora had direct and major effect on financial inclusion via bank deposits. However, Brown, Carmignani, and Fayad (2013) had contrary findings when they established that when diaspora remittance level is very low, any increase in diaspora remittances reduces the volume bank deposits as most money received is taken to consumption expenditure with little being saved in financial institutions. Further with respect to effect of lending rate on financial inclusion through deposits, Oyelami, Saibu and Adekunle (2017) and Uddin and Islam (2017) revealed that that financial inclusion is affected by interest rate inversely. Caballero-Montes (2020) also revealed that interest rate caps have a significant positive effect on financial inclusion. However, Mehrotra and Yetman (2015)

had contrary findings noting that financial inclusion is improved by increase in in interest bearing bank deposits hence they implied that interest rates can directly affect financial access. The findings on effect of mobile phone penetration agrees with Ouma, Odongo and Were (2017) that revealed that that accessibility and use of mobile phones in delivering financial products enhances the chances of saving at household level. However, Bayar, Gavriletea and Păun (2021) revealed an inverse association between mobile cellular phone subscriptions and financial institution access.

4.5.3 Effect of Financial Technology on Credit to private sector

The study also sought to establish the effect of financial technology on credit to private sector. The coefficient of determination ($R^2 = 0.920$) implied that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) explains 92% of the total variation in financial inclusion with the remaining 8% being explained by unobserved variables that were not part of the study. The analysis of variances (ANOVA) showed that financial technology (MM, POS and AB) and other covariates (DR, LR and MPP) have a significant effect on financial inclusion as measured by credit to private sector ($F=542.940$, $p= 0.000<0.05$).

Further, the study revealed that the effect of mobile money (MM) on financial inclusion credit to private sector was direct and significant ($\beta_1 = 0.390$, $t= 5.09$ and $p=0.000< 0.05$). The positive relationship means that increased access to mobile banking was associated with increased financial inclusion through credit to private sector. Further, increasing access to mobile money implies that population can easily access mobile phone based credit facilities. Moreover, the value and volume of mobile money transactions improves the credit worthiness of would be borrowers hence increased access to credit facilities from the banking institutions. The improvement in access to mobile money by one unit is associated with improving financial inclusion through access to credit facilities in Kenya by 0.390 units.

The research also revealed that the effect of Point of Sale (POS) on financial inclusion through credit to private sector was positive and statistically significant ($\beta_2= 0.184$, $t= 5.46$ and $p=0.000< 0.05$). The positive relationship between POS and financial inclusion through credit to private sector implies increasing access to POS machines leads to increasing financial inclusion through credit to private sector. Increased access POS machines encourages more lending through credit cards. When the population has access to POS machines, more people are likely to take credit cards

that leads to increased credit to private sector. Increased access to POS machines by one unit implies increasing financial inclusion through credit to private sector by 0.184 units.

The study also showed that the effect of agency banking (AB) on financial inclusion through credit to private sector was positive and statistically significant (β_3= 0.154, t= 6.07 and p=0.000< 0.05). The positive relationship agency banking and financial inclusion through credit to private sector implies that increased access to agency banking enhances transactions through the banks account that qualifies individuals for credit from financial institutions. Access and usage of agency banking thus leads to improved credit worthiness of would be borrowers in Kenya and ease of access to credit facilities. Further, increasing access and use of agency banking by one unit leads to increased financial inclusion through access to credit facilities by 0.154 units.

The study also showed that the effect of diaspora remittances (DR) on financial inclusion through credit to private sector was positive and statistically significant (β_4 = 0.290, t= 3.43 and p= 0.002). The positive association between diaspora remittances and financial inclusion through credit to private sector means that increasing diaspora remittances in Kenya is associated with increasing credit to private sector. Diaspora remittances is associated increased deposits in local banks accounts. The increased deposits in bank accounts implies more finds available for lending purposes especially the time deposits that are not needed for immediate use by depositors. Further, increasing diaspora remittances by one unit leads to increasing credit to private sector by 0.290 units.

The effect of commercial banks' lending rate (LR) on financial inclusion through credit to private sector was inverse and statistically significant (β_5 = -0.013, t= -3.34 and p= 0.002). The relationship between lending rate and financial inclusion through credit to private sector was inverse given that increasing lending rate discourages borrowing hence reducing credit to private sector. Increasing lending rate means increased cost of bowing funds from financial institutions hence borrowers shy away from expensive loans. Increasing lending rate by one unit is associated with reducing credit to private sector by 0.013 units.

Finally, the study established that mobile phone penetration (MPP) had a significant effect on financial inclusion through credit to private sector was positive and statistically significant (β_6 =

0.683, t= 4.08 and p=0.000). The positive relationship between mobile phone penetration and financial inclusion through credit to private sector implies that increasing number of mobile phone sim card subscription leads to increasing access to financial inclusion through credit to private sector. The increased access to mobile phone leads to increased access to qualification for loans. Access to mobile phones thus enhances access credit facilities especially those accessed via the mobile phones. Increasing adoption of mobile phone by one unit leads to increased financial inclusion via credit to private sector by 0.683 units.

The study findings on effect of financial technology on financial inclusion via credit to private sector is has basis in literature. The study findings agrees with Demir, Pesqué-Cela, Altunbas and Murinde (2020) that revealed that FinTech lowers income inequality indirectly through its enhancing impacts on financial inclusion. Further, Okiro and Ndungu (2013) supported that study findings on the effect of mobile money on financial inclusion via credit to private sector when they revealed that rapid development of mobile money had made banking tasks more efficient and cheaper. Regarding effect of agency banking on financial inclusion via credit to private sector, Byegon, Cheboi and Bonuke (2019) showed that financial innovations like agency banking enhanced financial inclusion making it easy for clients to get access to loans.

Further, Ocharo (2014) and El Qorchi, Maimbo and Wilson (2003), regarding effect of diaspora remittances on financial inclusion via credit to private sector, noted that that remittance was positive and statistically significant and it enhanced financial inclusion through improved access to loanable funds in the domestic economy. However, Akumbo, Nyaaba, and Akologo (2018) had a contrary finding with their study showing that diaspora remittances it had no predictive power over loan application and qualification. Uddin and Islam (2017) supported the study findings on effect of lending rate on financial inclusion via credit to private sector when they established that lower loan interest rate could encourage population to access financial services like loans. However, Wokabi (2018) established that Interest rates had direct and insignificant effect on financial inclusion measured by credit to private sector. Further regarding effect of mobile phone penetration on financial inclusion through credit to private sectors, the findings agrees with Senou, Ouattara, and Houensou (2019), Boro (2017) that showed that mobile phone penetration and internet usage are critical financial inclusion through encouraging lending.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Given that, Kenya is still grappling with high number of unbanked population. Furthermore, Credit reference bureaus have listed most Kenyans for failure to pay mobile-based loans hence limiting their access further. The study therefore sought to establish the impact of Fin-Tech on financial inclusion in Kenya. The study was based on Porter's Model of Generic Strategies for Competitive Advantage, theory of financial innovation and financial intermediation theory. The study adopted descriptive research design where quarterly secondary data was collected for the period 2011-2020. Data collected was analyzed based while adopting descriptive and inferential statistics. Descriptive statistics included, mean, standard deviation, minimum and maximum. The study then adopted OLS model to evaluate the effect of Fin-Tech on financial inclusion in Kenya. The study adopted the models [1-3], where each model had a different measure of financial inclusion. The financial inclusion proxies included number of bank accounts, deposits to GDP ratio and Credit to private sector to GDP ratio. The explanatory variables were same in the three models and they included mobile money, agency banking, point of sale, diaspora remittances, lending rate and mobile phone penetration.

Overall, based on ANOVA test, the study revealed that financial technology (mobile money, agency banking and point of sale) other covariates (diaspora remittances, lending rate and mobile phone penetration) have a significant effect on financial inclusion as measured by number of banks accounts, deposits and credit to private sector. Based on regression coefficients, the study established that mobile money had a significant positive effect on financial inclusion measured by number of bank accounts, deposits and credit to private sector. Agency banking had a significant effect on financial inclusion through number of bank accounts, deposits and credit to private sector. Point of Sale had a significant positive effect on financial inclusion through number of banks accounts opened and credit to private sector, however, Point of Sale had negative and insignificant effect on financial inclusion through deposits. Diaspora remittances had a positive but not statistical significant effect on financial inclusion through number of bank accounts, deposits and credit to private sector. However, diaspora remittances had significant effect on financial inclusion

measured by credit to private sector. The effect of lending rate on financial inclusion through number of bank accounts, deposits and credit to private sector was inverse and statistically significant. Finally, the effect of mobile phone penetration on financial inclusion through credit to private sector, deposits and number of bank accounts was positive and statistically significant. The study thus concluded that financial technology and other covariates have major effect on financial inclusion via number of banks accounts, deposits and credit to private sector. The study recommends to the Central Bank, Communication Authority of Kenya, communication firms and banking institutions to strengthen and deepen mobile money and agency banking. The CBK should put policies in place for securing transactions carried over the point of sale as well as improved POS technology. The study also recommends to the government to put in place policies and strategies for ease of the remittance money by Kenyans working and doing business abroad. The study also suggests to the Central Bank of Kenya, Sacco Regulatory Authority, commercial banks, deposit-taking MFIs to continue lowering the cost of borrowing.

5.2 Conclusion

The positive and major effect of mobile money on financial inclusion proxies implies that money mobile money accessed through mobile phone sim cards improves financial inclusion by enabling users to easily open banks accounts via their phones, transfer of money into mobile accounts and improved access to loans especially the mobile phone based loans. The positive effect of Point of Sale (POS) on financial inclusion through number of bank accounts and credit to private sector means that increased access to POS machines through cards including debits and credit cards encourages the opening and use of banks accounts. Further, increased number of POS machines encourages more lending through credit cards. However, POS had a negative effect on financial inclusion through deposits implying that more use of POS machines leads to reduced savings and deposits into bank accounts given that POS machine only enables spending of money already in the bank account.

The positive and major effect of agency banking on financial inclusion through number of bank accounts, deposits and credit to private sector implies that agency banking enables ease access of bank accounts especially in places that are far away from the brick and mortar banking halls. Further, agency banking enables improved deposit funds into their banks accounts through bank

agents. Increased access to agency banking also enhances transactions through the banks account hence improved credit worthiness of would be borrowers in Kenya and ease of access to credit facilities. The positive relationship between diaspora remittance and financial inclusion measured by number of bank accounts, deposits and credit to private sector implies that most of the money received from abroad are usually received through local bank accounts hence opening of more bank accounts as well as increased savings in deposit accounts before the money is finally spent on consumption and investment expenditure. Further, the increased deposits in bank accounts resulting from diaspora remittances implies more funds available for lending purposes especially the time deposits that are not needed for immediate use by depositors.

The inverse relationship between lending rate and financial inclusion through number of bank accounts, deposits and credit to private sector implies that increased lending rate discourages people from applying for loans therefore no motivation to open and maintain banks accounts through bank deposits. Further, an increasing lending rate discourages borrowing hence reducing credit to private sector given that increasing lending rate means increased cost of bowing funds from financial institutions hence borrowers shy away from expensive loans. The positive relationship between mobile phone penetration and financial inclusion through number of banks accounts, deposits and credit to private sector implies that individuals with smart phones can easily open and access their mobile phone based accounts. Further, they can easily deposit money into bank accounts (both conventional and mobile phone based accounts. Mobile phone users can easily transfer mobile money into their bank accounts without have to visit the banking halls. Moreover, increased access to mobile phone leads to increased access to credit facilities especially those accessed via the mobile phones like mobile phone based loans.

5.3 Recommendations to Policy and Practice

The study makes a number of recommendations based on study findings and conclusions. The study recommends to the Central Bank, Communication Authority of Kenya, communication firms and banking institutions to strengthen and deepen mobile money. The regulators should put in place policies that makes it possible for mobile money to be accessed at lowest possible transaction fees. The communication and banking firms should continue innovating in the area of mobile money with focus on security, transactions cost and ease of use of mobile money. Increased access

to mobile money improves financial inclusion through improved access to bank accounts, eased transfer of money into bank accounts and increased access to mobile-based loans.

The study also recommends to CBK and financial institutions to institute policies that are aimed at strengthening agency banking. The financial regulator and financial institutions should aim at increase in number of banks agents, increased security of transactions carried via bank agents and enhanced technology for carrying out agency banking. Improved uptake of agency banking results to increased financial inclusion through ease access to bank accounts, improved savings in banks accounts and enhanced activities in bank accounts that further improves the credit worthiness for access to credit facilities.

Regarding point of sale, the study suggests to the regulator and financial institutions to continue deepening the use of point of sale machines. The CBK should put policies in place for securing transactions carried over the point of sale as well as improved POS technology. The financial institutions issuing cards for use with POS machines should enhances their security features to protect transactions carried over the point of sale machines. The access to POS machines improves financial inclusion through motivation to open banks accounts, increased access to credit facilities through credit cards.

The study also recommends to the government to put in place policies and strategies for ease of the remittance money by Kenyans working and doing business abroad. The government should also put in place favourable investment climate both at national and county government to encourage Kenyans working abroad to remit their earnings back to Kenya to improved available investable funds. Further investment firms including banks should come up with innovative investment facilities targeting Kenyans living and working abroad. Diaspora remittances improves financial inclusion by motivating the opening and operation of bank accounts, improved deposits in the local banking system and enhanced loanable funds for the benefit of borrowers.

The study also suggests to the Central Bank of Kenya, Sacco Regulatory Authority (SASRA), commercial banks, deposit-taking MFIs to continue lowering the cost of borrowing. The regulators should continue encouraging and persuading banking institutions to offer loans at favourable interest rates to borrowers. The CBK does this through lowering central bank rate that further

enables commercial banks to offer loans at lowers rates. Reduced lending rate leads to improved financial inclusion through access to loans at lowers costs, improved savings and deposits and operation of banks accounts.

Finally, the study recommends to Communications Authority of Kenya and communication firms to continue improving mobile phones penetration rate. The communication Authority should continue putting in place policies aimed at encouraging uptake mobile phones as well as subscription to sim cards. The policies should also include improved security for Kenyans using mobile phones for communication and transfer of money. Mobile phone penetration improves financial inclusion through ease in transfer of mobile money into bank accounts, opening and operation of banks accounts and increased access to mobile-based loans.

5.4 Limitations of the Study

The study has a few limitations regarding its application for decision-making. First, the study was limited to three aspects of financial technology including agency banking, mobile money and point of sale hence the parameter estimates should be used with caution. Inclusion of more financial technologies would lead to change in the size of parameter estimates. Other financial technologies that were not within the breath of the study includes internet banking, ATM banking. Further, the meaning of financial technology was limited to end user financial technologies whereas there are other financial technologies targeting the internal use of financial institutions and Fin-tech companies.

Secondly, the study concentrated three proxies of financial inclusion including number of bank accounts, deposit to GDP ratio and credit to GDP ratio. Other proxies of financial inclusion exist which might mean differing results and conclusion thereof. Further, the proxies used for measuring financial inclusion were limited to access dimension of financial inclusion. Financial inclusion has other dimensions that were not within the scope of the current study including usage and barriers to financial inclusion. This implies that the study findings should be used in policy decisions targeting access dimension of financial inclusion.

Thirdly, the study was based on quarterly secondary data covering ten-year period, the period of time is not long enough to examine aspects of financial technology and financial inclusion that

needs long range data covering twenty years and above. Further, the secondary data alone cannot capture all aspects of financial technology and inclusion. There are qualitative aspects of financial technology and financial inclusion that cannot be adequately be measured using secondary data only. Quality decisions making should be driven by both qualitative and quantitative empirical findings.

Fourthly, the study was also analyzed based OLS model that is fixed model and does not capture the dynamic nature of most financial data. The study was thus based on stock measures of financial technology and financial inclusion. The stock data was captured as the end of each quarter in March, June, September and December of each financial years. The flow aspect of financial data was not considered. Flow data is based captured based on dynamic models that introduces the aspect of change in each variable. Financial data have both flow and stock aspects hence needs both static and dynamic models.

5.5 Areas for Further Research

The study suggest that future studies should include more financial technology variables to enhance the usefulness of the results for decision and policy purposes. Future studies should include other financial technologies that were not within the breath of the study including internet banking and ATM banking. Further, future studies should have an expanded meaning of financial technology including technologies targeting the internal use of financial institutions and Fin-tech companies.

Further, future studies should investigate the effect of financial technology on financial inclusion based on other aspects of financial inclusion beyond what is covered in the current study. Other proxies of financial inclusion should be considered. The proxies should include three dimensions of financial inclusion including access, usage and barriers to financial inclusion. Further, future studies can adopt financial inclusion index that captures all the three dimensions of financial inclusion.

The study also suggest that future studies can be carried out using both secondary and primary data so as to capture both qualitative and quantitative aspects of financial inclusion. Future studies should also adopt long-range data of twenty years and above a period of time that is long enough

to examine aspects of financial technology and financial inclusion that needs long range data. The primary data should be collected based on semi structured questionnaires collecting both qualitative and quantitative data.

Future studies should also be based on both static and dynamic models. The static models like OLS that was adopted in this study would enable in capturing the stock measures of financial technology and financial inclusion that was measured at the end of each quarter in March, June, September and December of each financial years. The dynamic model would capture the flow aspect of financial data. Flow data is based captured based on dynamic models that introduces the aspect of change in each variable. Models such as Vector Autoregressive (VAR) model, Error Correction Model (ECM), Generalized Linear Model (GLM) among others.

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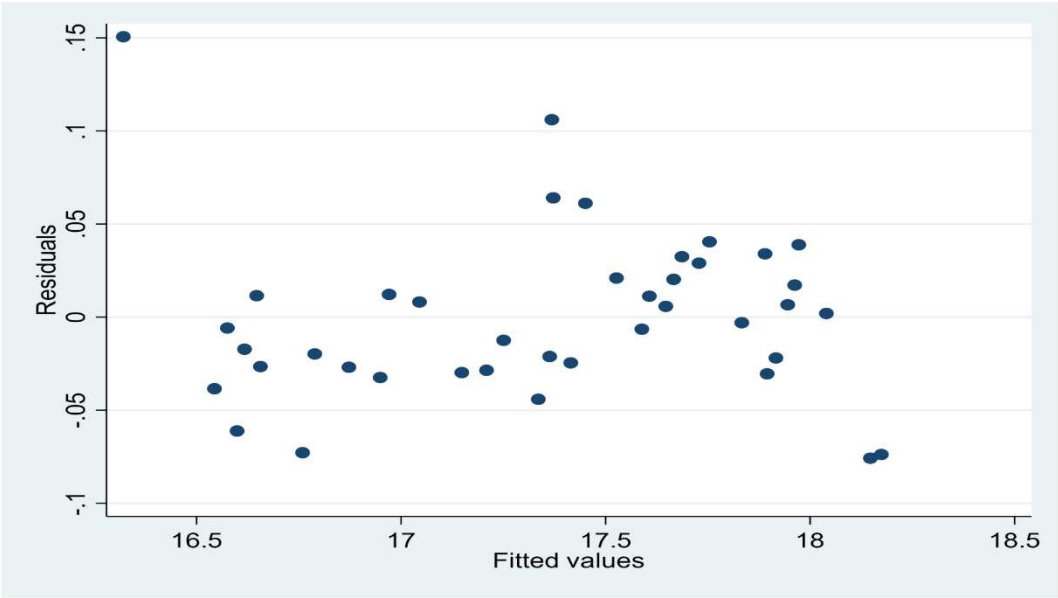
APPENDICES

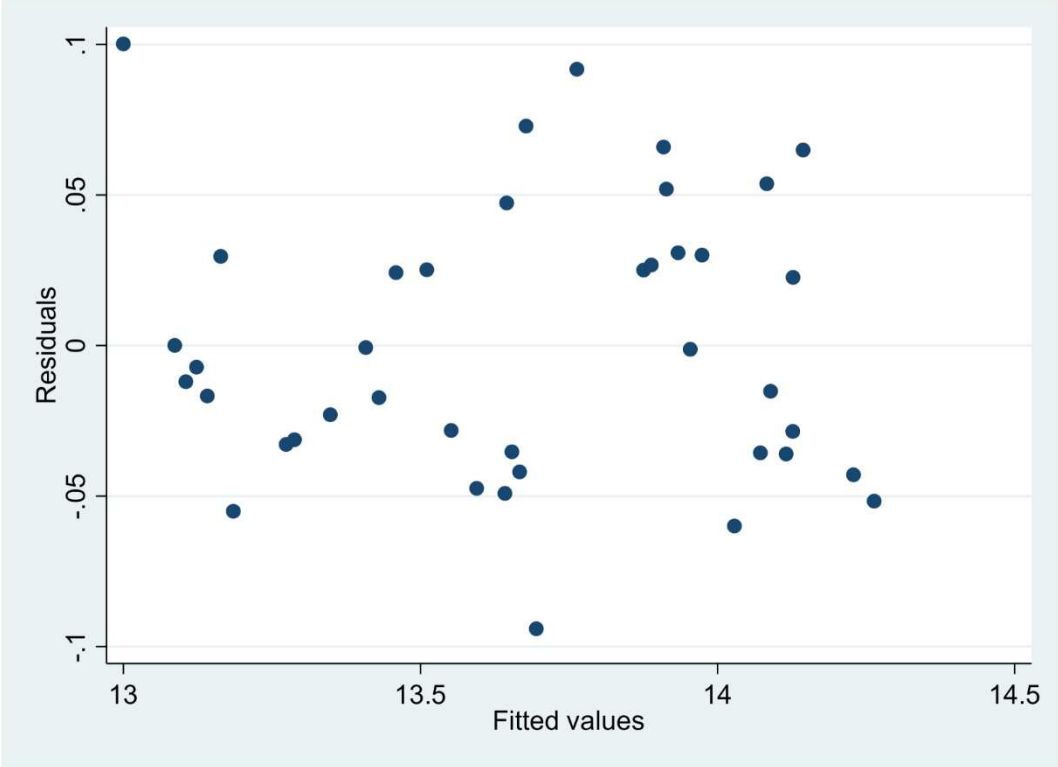
Appendix I: Data Collection Sheet

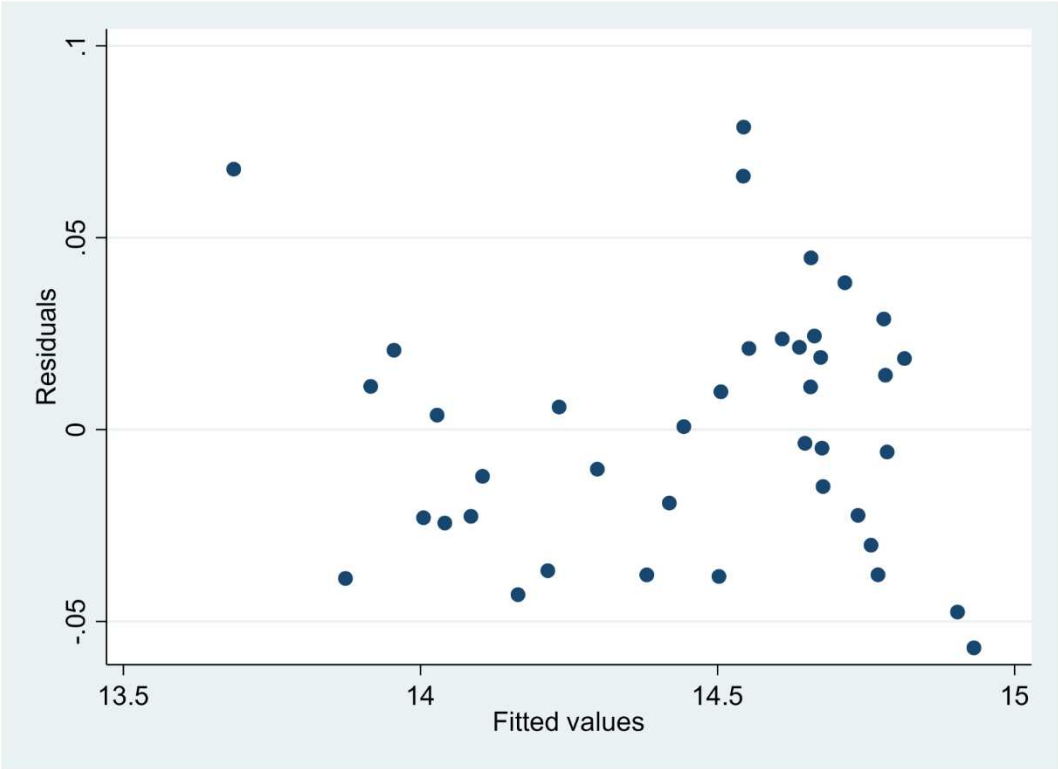
Time	Volume of Deposits	Credit to private sector	Mobile Money	Gross domestic product	number of POS machines	Volume of agency banking transactions	Diaspora remittances	Lending Rate	Mobile Phone Penetration
2011Q1									
2011Q2									
2011Q3									
2011Q4									
2012Q1									
2012Q2									
2012Q3									
2012Q4									
2013Q1									
2013Q2									
2013Q3									
2013Q4									
2014Q1									
2014Q2									
2014Q3									
2014Q4									
2015Q1									
2015Q2									
2015Q3									
2015Q4									
2016Q1									
2016Q2									

2016Q3									
2016Q4									
2017Q1									
2017Q2									
2017Q3									
2017Q4									
2018Q1									
2018Q2									
2018Q3									
2018Q4									
2019Q1									
2019Q2									
2019Q3									
2019Q4									
2020Q1									
2020Q2									
2020Q3									
2020Q4									

Appendix II: Data Analysis Reports







. estat durbinalt, lags(4)

Durbin's alternative test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
4	4.744	4	0.3146

H0: no serial correlation

. estat durbinalt, lags(4)

Durbin's alternative test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
4	7.133	4	0.1290

H0: no serial correlation

```
. estat durbinalt, lags(4)
```

Durbin's alternative test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
4	3.388	4	0.4952

H0: no serial correlation

```
.
```

```
. estat vif
```

Variable	VIF	1/VIF
mpp	5.83	0.171526
mm	4.41	0.226757
dr	3.95	0.253164
ab	2.44	0.409836
pos	1.31	0.763358
lr	1.08	0.925925
Mean VIF	3.17	

```
regress noba mm pos ab dr lr mpp
```

Source	SS	df	MS		
Model	10.5707361	6	1.76178935	Number of obs	= 40
Residual	.080936281	33	.002452615	F(6, 33)	= 718.33
Total	10.6516724	39	.273119805	Prob > F	= 0.0000
				R-squared	= 0.9524
				Adj R-squared	= 0.9410
				Root MSE	= .04952

noba	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mm	.3557579	.1067907	3.33	0.002	.1384906	.5730252
pos	.1979327	.0470882	4.20	0.000	.2937343	.102131
ab	.173309	.0354482	4.89	0.000	.101189	.2454289
dr	.1620843	.1178623	1.38	0.178	.4018769	.0777083
lr	-.0399341	.0053872	-7.41	0.000	-.0508944	-.0289738
mpp	1.113666	.2331033	4.78	0.000	.6394135	1.587918
_cons	8.479018	1.989383	4.26	0.000	4.431588	12.52645

```
. regress depositgdp mm pos ab dr lr mpp
```

Source	SS	df	MS	Number of obs	=	40
				F(6, 33)		364.85
Model	5.39950886	6	.899918143	Prob > F	=	0.0000
Residual	.081395881	33	.002466542	R-squared	=	0.8851
				Adj R-squared	=	0.8824
Total	5.48090474	39	.140536019	Root MSE	=	.04966

depositgdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mm	.2814735	.1070935	2.63	0.013	.0635902	.4993569
pos	-.0434014	.0472217	-0.92	0.365	-.1394746	.0526719
ab	.1058755	.0355487	2.98	0.005	.0335511	.1781999
dr	.0838873	.1181964	0.71	0.483	.3243598	.1565851
lr	-.0413873	.0054024	-7.66	0.000	-.0523787	-.030396
mpp	.4646487	.2337642	1.99	0.055	.0109482	.9402455
_cons	6.698081	1.995023	3.36	0.002	2.639175	10.75699

```
. regress creditgdp mm pos ab dr lr mpp
```

Source	SS	df	MS	Number of obs	=	40
				F(6 ,33)		542.94
Model	4.1199807	6	.68666345	Prob > F	=	0.0000
Residual	.041735398	33	.001264709	R-squared	=	0.9200
				Adj R-squared	=	0.9181
Total	4.1617161	39	.106710669	Root MSE	=	.03556

creditgdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mm	.3900294	.0766857	5.09	0.000	.2340113	.5460475
pos	.1844619	.0338137	5.46	0.000	.2532563	.1156674
ab	.1544708	.0254551	6.07	0.000	.102682	.2062596
dr	.2900395	.0846361	3.43	0.002	.4622329	.1178461
lr	-.0129203	.0038685	-3.34	0.002	-.0207908	-.0050498
mpp	.6825164	.1673898	4.08	0.000	.3419592	1.023074
_cons	7.84979	1.428562	5.49	0.000	4.943359	10.75622

	Deposits	*Credit*	*MM*	*POS*	*AB*	*DR*	*LR*	*MPP*	*GDP*	*NOBA*	Depositgdp	Creditgdp
Mean	931237.4	1997496	758.5166	1684716	85752102	464716	15.24175	39.39148	1726025	39013468	0.536894989	1.174076
Standard Error	52138.32	92213.17	51.38924	138694.6	8561295	29168.15	0.395794	1.597336	92630.29	2906511	0.004883642	0.01539
Median	855333	2226715	766.195	1379776	82927393	408724.1	14.995	38.125	1633398	38093598	0.537693835	1.162557
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Standard Deviation	329751.7	583207.3	325.0141	877181.6	54146382	184475.6	2.503219	10.10244	585845.4	18382392	0.030886865	0.097333
Sample Variance	1.09E+11	3.4E+11	105634.2	7.69E+11	2.93E+15	3.4E+10	6.266108	102.0593	3.43E+11	3.38E+14	0.000953998	0.009474
Kurtosis	3.361672	4.268466	3.316663	2.930881	4.258323	3.015086	2.938423	3.023432	3.229143	2.738168	2.87595	2.928088
Skewness	0.140818	-0.24643	-0.45387	-0.15351	-0.33945	0.040353	0.232909	0.250154	0.216669	-0.29084	-0.2102806	-0.12919
Range	1004080	1943636	1420.634	2983613	1.61E+08	623910.7	8.336667	36.44	1988889	58351294	0.122652252	0.379484
Minimum	482371	939975	240.766	518490	2190426	196455.1	11.87667	24.97	845362	14243060	0.47318167	1.017415
Maximum	1486451	2883611	1661.4	3502103	1.63E+08	820365.8	20.21333	61.41	2834251	72594354	0.595833922	1.3969
Sum	37249494	79899857	30340.67	67388643	3.43E+09	18588642	609.67	1575.659	69040998	1.56E+09	21.47579955	46.96303
Count	40	40	40	40	40	40	40	40	40	40	40	40

Appendix II: Raw Data

Time	Volume of Deposits(Millions)	Credit to private sector (millions)	Mobile Money(billions)	Number of POS machines (Millions)	Agency banking	Diaspora remittances(USD '000)	Lending Rate(%)	Mobile Phone Penetration (Millions)	GDP (millions)	No of bank accounts (millions)
2011Q1	489023	939975	240.766	518490	2,190,426	196455.09	13.956667	24.97	845,362	14243060
2011Q2	501068	1019682.7	273.1038	526401	5,476,065	210083.14	13.903333	25.67	857,463	14730266
2011Q3	503829	1118452.3	315.7494	634125	7,118,884	237214.93	14.416667	26.49	975,635	15217471
2011Q4	485607	1174374.3	339.531	646055	8,761,703	247357.29	17.92	28.08	1,000,036	15704677
2012Q1	482371	1181417.7	356.844	600267	14,073,190	299924.02	20.053333	29.21	1,014,820	16191883
2012Q2	496757	1222813.7	369.783	747717	19,384,678	296108.16	20.213333	29.7	1,049,823	16679089
2012Q3	536839	1241423.7	391.35	1342420	24,696,165	280074.43	20.003333	30.43	1,069,318	17166294
2012Q4	562991	1279999.7	426.83	1500159	30,007,652	294787.76	18.323333	30.73	1,143,343	17653500
2013Q1	571843	1318871.7	418.225	1204610	33,019,703	308733.71	17.9	29.85	1,159,272	19176840
2013Q2	612484	1357361.7	453.879	1216953	36,031,753	314950.61	17.43	30.55	1,158,375	20700180
2013Q3	664860	1436276.3	496.45	1276210	39,043,804	327334.66	16.946667	31.3	1,203,302	22223519
2013Q4	668514	1527646.7	533.005	1344318	42,055,854	339555.42	16.96	31.31	1,242,614	23746859
2014Q1	717130	1602928.7	543.97	1125187	46,040,659	340974.78	17	31.83	1,288,420	25473792
2014Q2	755984	1694826.7	574.706	891707	50,025,464	349129.87	16.676667	32.25	1,336,387	27200725
2014Q3	746772	1793497	614.053	867220	54,010,269	373325.88	16.403333	32.77	1,372,385	28927658
2014Q4	764653	1874718	639.065	1031266	57,995,074	365051.35	15.976667	33.63	1,421,752	30654591
2015Q1	800573	1912912.3	650.508	978029	63,468,651	364137.95	15.62	34.79	1,489,263	32330674
2015Q2	826463	2013703.7	671.819	1141458	68,942,229	389537.63	15.573333	36.11	1,552,004	34006757
2015Q3	806851	2134976.3	734.524	1292658	74,415,806	392487.93	16.083333	37.87	1,600,011	35682840
2015Q4	821266	2211748.7	759.248	1346952	79,889,383	401868.68	17.346667	37.715	1,662,041	37358923

2016Q1	884203	2241682	773.142	1440845	85,965,402	415579.55	17.926667	38.38	1,604,755	38828273
2016Q2	937153	2263383.7	818.733	1259440	92,041,421	436943.78	18.146667	39.78	1,787,942	40297623
2016Q3	1040332	2289037.7	863.138	1412600	98,117,440	424593.99	16.54	39.784	1,819,640	41766973
2016Q4	1088871	2325028	900.092	1783281	104,193,459	447185.81	13.686667	38.982	1,827,474	43236323
2017Q1	1104954	2344550	899.052	1846004	113,082,892	432598.66	13.653333	39.146	1,951,518	44822723
2017Q2	1172957	2333069.3	912.674	1855334	121,972,324	454981.06	13.66	40.259	2,059,661	46409124
2017Q3	1162141	2352472.3	896.151	1793429	130,861,757	494819.16	13.68	41.028	2,099,557	47995524
2017Q4	1160489	2391449.5	930.597	2094423	139,751,189	564504.89	13.676667	42.815	2,065,506	49581924
2018Q1	1147171	2403216	960.946	1995678	144,126,465	641505.69	13.606667	44.119	2,141,714	51520600
2018Q2	1207270	2426596.3	959.64	2070391	148,501,740	737022.09	13.236667	45.56	2,202,213	53459276
2018Q3	1165164	2456223.7	1008.927	2167988	152,877,016	635959.66	12.846667	46.63	2,274,317	55397951
2018Q4	1247182	2491014.3	1054.857	2464923	157,252,291	682974.95	12.556667	49.501	2,287,946	57336627
2019Q1	1295050	2500896.7	1064.557	2780213	158,681,507	665832.68	12.493333	51.03	2,340,872	59085306
2019Q2	1378555	2552470.3	1071.317	3233835	160,110,722	783869.83	12.48	52.2	2,392,711	60833985
2019Q3	1301998	2622161	1100.798	3362294	161,539,938	653454.98	12.44	53.2	2,461,726	62582663
2019Q4	1326625	2667640	1109.092	3502103	162,969,153	693449.68	12.35	54.5	2,565,103	64331342
2020Q1	1396850	2699700.3	1086.892	3301635	151,920,686	707195.42	12.19	55.21	2,613,522	66397095
2020Q2	1482057	2766574.3	1057.533	2512789	140,872,218	754912.17	11.92	57.03	2,566,855	68462848
2020Q3	1448143	2831474.3	1407.718	2831389	129,823,751	811798.52	11.876667	59.84	2,702,089	70528601
2020Q4	1486451	2883610.7	1661.4	3447847	118,775,283	820365.8	11.996667	61.41	2,834,251	72594354