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Financial inclusion technologies and bank performance: Insights from Zimbabwe's banking sector

A Dissertation

presented to

The **Development Finance Centre (DEFIC)**
Graduate School of Business
University of Cape Town

In partial fulfilment
of the requirements for the Degree of
Master of Commerce in Development Finance

by

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FEBRUARY 2020

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COMMERCE FACULTY OFFICE

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ABSTRACT

The study examined the effect of financial inclusion technologies on the financial performance of Zimbabwean banks. The study employs ATM, mobile banking (MB), internet banking (IB) and point of sale (POS) transactions on the financial performance of banks as measured by return on assets. The study adopted the explanatory design and the target population of the study consisted of all the 13 commercial banks in Zimbabwe, with the study period being six years, from 2013 to 2018. The panel data was estimated using fixed and random effects. The findings of the research indicated that all the commercial banks in Zimbabwe at the time of doing this study were using POS, ATM, Mobile banking and Internet banking as they adopted digital forms of banking. In terms of financial performance, banks have been able to increase their return on assets between the years 2013 and 2018. In terms of regression analysis, the findings indicate that for every 1% increase in Mobile banking, ATM and Internet banking there will be an accompanying 0.6%, 0.9%, and 0.5% increase in financial performance respectively while for every 1% increase in POS, there will be a 0.7% decrease in financial performance. Therefore, the research recommended banks to go a step ahead in being innovative through designing new products which will only be accessible to clients who access banking through digital banking methods. Also, the research recommends the government of Zimbabwe to put in place sound macro-economic policies for the whole economy to recover so that the commercial banks in Zimbabwe can fully utilize the benefits associated with digital banking.

ACKNOWLEDGEMENTS

My sincere gratitude goes to my supervisor, Dr. Abdul Latif Alhassan for the cooperation, invaluable patience and technical guidance which has made this work complete. I cannot adequately thank my family for their steadfast love, support, and encouragement throughout this journey. I extend my profound gratitude to my late grandmother, Maria Hove, who has always been my source of inspiration, even in her absence. She fought to instil a tradition of education in our family, despite the many challenges she faced in her life. This tradition has managed to be passed on from one generation to the other in our family. It is her life journey that continues to grow my fascination around major social and economic questions which include inequality, growth, and development. This, I believe, has made it possible for me to be where I am today. This dissertation is dedicated to her!!

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CHAPTER ONE

INTRODUCTION

1.1 Introduction and background of the study

Financial inclusion implies that households and organizations across the globe have improved access to useful and affordable financial products and services that satisfies their financial needs and it ensures that those needs are delivered in a responsible and sustainable manner. Having a good network and access to transactional accounts is best to enhance broader financial inclusion since transactional accounts allows customers to store their money, send and receive payments. Again, global integrated transactional accounts provide an effective networking to other financial services, which is why ensuring that financial customers across the world will have a better access to a transaction account is the focus of financial inclusion, ‘’World Bank Group’s Universal Financial Access 2020 Initiative website.’ Financial inclusion has been used as a crucial instrument which can be used for reducing poverty among different populations, generating employment, creating wealth and improvement of well-being and a change in the living standards of people and development of the economy (Abimbola, Olokoyo, Babalola, & Farouk, 2018).

According to Iqbal and Sami (2017), financial inclusion (FI) now regarded as an emergent exemplar usable to explain the growth of economies and as such there are fewer people entangled in poverty thereby reducing wealth inequalities in a country. Therefore the thrust of FI is to allow the majority of the poverty-stricken population to get monetary facilities thereby facilitating inclusive societal growth (Iqbal & Sami, 2017). Although there is prominence which is attributed to FI as a precursor to the reduction of inequalities in income, Africa lags behind as about 80% of the adult population in Sub Saharan Africa (SSA) has no access to banking facilities (compared to global average of 50%, less 60% Asia and 8% in industrialised nation-states) (Masiyandima, Mlambo, & Nyarota, 2017). Financial systems that are inclusive offer the poor several services such as savings, management of risk, access to credit and in most cases, there should be limited price barriers on the usage of the service. Therefore there is a need to determine the extent to which the financial services have been useful to the Zimbabwean scenario towards bank performance(Fadun, 2014).

The advantage of an inclusive financial system is that most governments tend to benefit when more people are included, and it implies that more money is included in the system (less is left outside the system) and hence economy is boosted. It is from the need for FI that governments are developing policies which are targeting the poor part of the population which does not have access to banking services (Neaime & Gaysset, 2018). Although there is extensive reach out being made due to advancements in regulations and innovation technologically, there is existence of FI in most developing countries (Katoroogo, 2016). However, it needs to be reiterated that there is no unidirectional relationship that exists between FI, poverty, and distribution of income and most likely there is reverse causality which happens in the event that alleviation of poverty leads to increased demand for banking facilities (Neaime & Gaysset, 2018). Thus, there is a need to carry out this study in Zimbabwe as the prevailing social, political and economic environment in the country cannot be used to explain the different levels of financial inclusion despite the technological innovations that have been provided by banks and mobile network operators.

According to Fin Scope (2014), specifically in Zimbabwe, 30% of the adult population had access to formal banking facilities and more so there are more people of about 60% of the population failing to meet their daily needs and about 40% lacking money to buy food. The government of Zimbabwe has developed a National Financial Inclusion Strategy (NFIS) which gives priority to the promotion of increased access to financial services for the unbanked population. According to Rewilak (2018), the occurrence of financial crises leads to economic detrimental effects which can be in the form of reduced economic growth, high levels of unemployment. Zimbabwe from 2013 to the present moment is faced with a cash crisis, liquidity crunch and high levels of unemployment and how these have affected the banking sector have not been well researched (Rewilak, 2018) . Thus, this research intends to determine the impact of financial inclusion technologies on the financial performance of commercial banks, especially in the face of on-going financial and debt crises and political, social, and military turmoil that have been unfolding in Zimbabwe.

1.2 Problem definition

There is consensus among stakeholders driving the financial inclusion agenda in Zimbabwe that broadening access to and usage of financial services stimulates financial savings and investment, as well as increase the level of loanable funds (Reserve Bank of Zimbabwe,2016).

Financial inclusion has evolved over the last decade and has become a priority for central banks. The liquidity crisis in Zimbabwe has forced most banks to introduce innovative products and services to meet consumer needs in a very volatile economy. This has enabled banks to provide a diversified product portfolio which can ultimately reduce volatility in bank income. In Zimbabwe, mobile money and POS have been a game changer as they have made great inroads in both rural and urban areas to help ease the cash crisis. All banks in Zimbabwe have leveraged on the high mobile phone penetration rate of Zimbabwe's mobile penetration rate of 93%, (Postal Regulatory Authority of Zimbabwe, POTRAZ), although the mobile penetration rate dropped 9.8 percentage points in the first quarter of 2019 to 83.3 percent it's still significant to offer a range of efficient and safe digital financial services to different market segments, thereby broadening the consumer choices (Reserve Bank of Zimbabwe,2019). Financial inclusion technologies are the main pillar in achieving socio-economic stability in Zimbabwe. This potential necessitates the need for more research on use of FI technologies in the banking sector to ensure long-term sustainability.

Literature provides that financial inclusion can spearhead the welfare of households through enabling access to financial products by the disadvantaged groups (Sakarombe,2018). The need for financial inclusion to facilitate ushering of basic financial services the unbanked population can never be over-emphasized. However, stability of the banking sector should remain a prerequisite! Research has established that money transfer in rural and urban areas has transformed the lives of the banked and unbanked populace but its impact on the mobile money agents has not been investigated (Anyanzwa and Owino;2014). less attention has been channelled towards assessing the impact of financial inclusion technologies on the financial stability of banks and on the few studies done, there has been inconclusive and contradicting findings on how FI affects bank incomes (Sustiyo, 2016).

It is from the above-stated reasons that there is a need to carry out this study such that there is a contribution to the body of knowledge.

1.3 Statement of research objectives

The research objectives of the study were to:

1. Establish the effect of ATM use on the banks' financial performance.
2. Determine how mobile banking (MB) use affects banks' financial performance.
3. Ascertain the effect of internet banking (IB) on banks' financial performance.

4. Establish the effect of point of sale (POS) technologies on banks' financial performance.

1.4 Justification of the study

Researchers have however agreed that, despite a number of countries calling for effective financial inclusion, there has been little scientific research to develop the base on which strategies and policies for financial inclusion can be anchored (Noor, 2016). According to Noor (2016) Zimbabwe is having challenges due to high levels of poverty, unsustainable levels of unemployment, a liquidity crisis and a huge debt of around US$ 10 billion. Premised on the conditions in Zimbabwe, there is a need to determine how financial inclusion technologies affect revenues in banks. In this regard, this research will be there to provide knowledge for policymakers on financial inclusion.

There is also a need to carry out this study as there is need to understand how countries in financial and political crises can widen the provision of financial services to the unbanked population as a key input for formulating policies for members of the public (Liang, Huang, Liao, & Gao, 2017). There is a need to carry out this study so that governments can be guided policy-wise to enable a reduction in income irregularities. Thus, in the end, the use of FI will there to create an economic, social and politically stable country(Neaime & Gaysset, 2018). This research will be of importance in providing in the solution towards the use of FI technologies for enhancing bank revenues. With Zimbabwe being faced with a myriad of economic challenges, there is a need to carry out this study and determine how the rise of financial inclusion technologies has affected bank performance.

1.5 Organization of the study

The study is made up of five chapters which will be in the following order: Chapter, 1 Introduction, will present the background of the study. The chapter will provide an outline of financial inclusion technologies and bank performance. The chapter will also have the problem statement, objectives, justification of the study, limitations of the study and definition of terms. Chapter 2 will review the literature on financial inclusion, financial inclusion technologies and the banking sector, following a concentric approach which deals with international trends before coming down to regional, national and Zimbabwean trends. The chapter will also look at the guiding theoretical framework. Chapter 3 will look at the research methodology which will guide the study. The chapter will also deal with issues with regards to population, sample size calculation, research instruments, and data analysis. Chapter 4 will present and discuss the

research findings on the effects of financial inclusion on the financial performance of commercial banks in Zimbabwe. The findings will be presented based on the research questions which have been formulated in Chapter 1. The chapter will make an analysis of results following the objectives and the extent to which the results are supported by the proposed theories. The chapter will also look at how much the research findings will agree or disagree with the findings of previous studies. Chapter 5 will be summary and conclusions based on the findings of the study and how these will affect policy and future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter gives a literature review on financial inclusion technologies using a funnel approach ranging from global, regional and to Zimbabwean perspectives. The chapter will also provide a theoretical framework that will be used to explain financial inclusion technologies and its effects within Zimbabwe's banking sector. In this chapter, there is also an empirical review of financial inclusion and bank revenues.

2.2 Global Financial Inclusion organizations

Such organizations as The Consultative Group to Assist the Poor, (CGAP) which is an independent non-profit organization, through their dedication and their work have propounded to empower the poverty stricken across the globe to capture and realise opportunities brought about financial inclusion hence stablishing resilience through offering financial services. They also seek to develop innovative solutions through on going practical research to ensure that poverty reduction and alleviation is achieved. The organization is very crucial to this study since it seeks to build responsible and inclusive financial systems that reduces poverty and advance global development goals. The International Finance Corporation and the Centre for Financial Inclusion also are of paramount importance to this research paper since their vision and goals are of global financial inclusion in reducing poverty.

2.3 Financial Inclusion Models and Theories

Different models have been tried across the globe, include, no-frills accounts banking, branchless banking (business correspondent model), banking without a bank (using mobiles as conduits for financial transactions), microlending, for pursuing financial inclusion. Global experience has, however, revealed that there is no „one size fits all" type of solution to the problem of financial inclusion and the above models have succeeded differently across the world.

2.3.1 Private money theory

It stipulates that financial inclusion activities should be financed using private money because accountability is needed from the users of funds, and they ensure that private funds are utilized

efficiently, and that financial products and services are delivered to the intended financially excluded members of the society. The merits of private money theory include shorter approval time to obtain private funding for financial inclusion projects compared to the long approvals for public funding. This is because private lenders reach decisions easily and quickly since there are fewer processes through which the approval process go through.

2.3.2 Public money theory

This theory argues that financial inclusion programs and activities should be funded from government budgets. There is evidence that public funding for financial inclusion is growing faster than private funding (see Dashie et al, 2013). Funding financial inclusion objectives using public money can prevent unscrupulous individuals from hijacking the financial inclusion agenda for their own selfish benefit.

2.3.3 Intervention fund theory

The intervention fund theory of financial inclusion states that financial inclusion activities and programs can be funded by special interventions from diverse related and unrelated funders rather than using taxpayers' money. It argues that many 'special funders' exist in the world such as philanthropists, nongovernmental organizations and foreign governments, and these special funders tend to support inclusive finance for the global population. In some economies, cross-border funding has the largest share of financial inclusion funding and much of these funding has been allocated to microfinance institutions (El-Zoghbi et al, 2011).

2.3.4 Financial literacy theory

The theory of financial literacy states that financial inclusion can be achieved through teaching, training and education that increases the financial literacy of customers. This theory argues that financial literacy will increase people's willingness to participate in the formal financial sector. Some of the advantages of financial literacy including making people aware of financial products and services that are available to them. When they become aware of existing financial products and services that can improve their welfare, they will be willing to participate in the formal financial sector by owning a bank account. Secondly, through increased financial

literacy, people can take advantage of other benefits in the formal financial sector such as investment and mortgage products.

Several models have been tried across the world, namely, no-frills accounts banking, branchless banking (business correspondent model), banking without a bank (using mobiles as conduits for financial transactions), microlending, etc. for pursuing financial inclusion. Global experience has, however, revealed that there is no „one size fits all" type of solution to the problem of financial inclusion and the above models have succeeded differently across the world.

2.4 Stylized facts on Zimbabwe's Financial Sector

The increased number of banks, branches, and competition in a more deregulated financial sector has meant higher risk-taking and at times weaker corporate governance practices by some financial institutions, posing risks of bank failures. Reacting to the effects of high sector competition, increased risk-taking and the general macroeconomic adverse shocks that beset the economy from the late 1990s to around 2009, the country experienced a series of multiple bank failures, mergers, and branch rationalization. The adverse episodes commenced with the collapse of a merchant bank (United Merchant Bank) in 1997 whose contagion effect also weakened the balance sheets of other banks. In 2004 alone, 9 financial institutions were put under curatorship due to several factors, including weak performance, excessive risk-taking and poor corporate governance (IMF, 2005). By the end of 2009, the number of banks in the country had fallen to 26, driven by liquidations or mergers. The adverse shocks on banks meant increased financial exclusion, with the country sliding backward in terms of efforts to access and provide financial services to marginalized individuals and areas (Masiyandima et al., 2017), as by the decline in the total number of financial institutions (Figure 2.1).

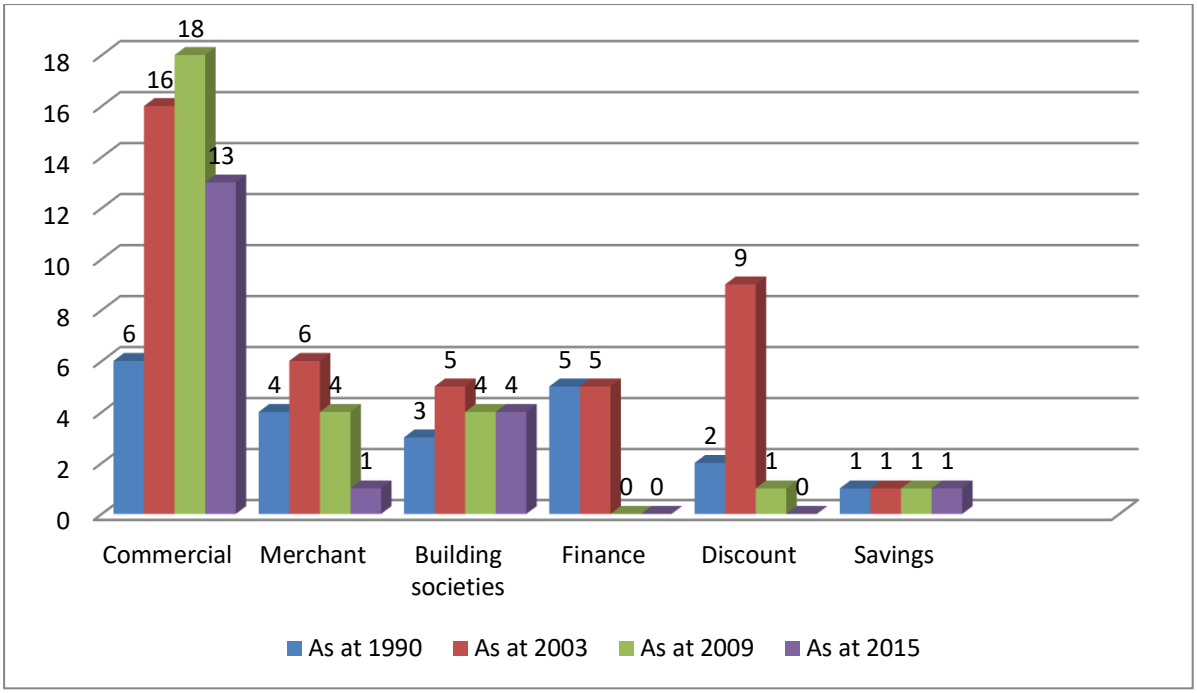


Figure 2.1 Number of financial institutions in Zimbabwe (1990-2015). Source; Masiyandima et al., (2017).

2.5 Effect of financially inclusive innovation technologies

Although Africa is touted for the revolution in mobile money, the continent has not risen to its full potential in terms of usage of financial services and resources. This situation is led by many people and their business which are not included in financial transactions, savings, credit and insurance services (Ulwodi, 2017). Technological innovations in the financial sector are increasingly playing an important role in providing financial services with reduced cost and limited risk. One aspect of financial innovation is branchless banking. Branchless banking is increasingly being used to refer to the shift from using the traditional banking halls while accessing financial services to using any of the outlets or virtual platforms for the same services offered by banks. This concept has shaped the financial sector landscape in a significant way over the last decade. Branchless banking is used to refer to services such as mobile banking, credit cards, debit cards, real-time gross transfer service (RTGS), internet banking, automated teller machines (ATMs) among others. These services form a large component of technological innovations prevalent in the financial sector in most economies. The use of mobile phones to transact, save, invest and manage risk has become an important part of the daily lives of many people. Although branchless banking encompasses a wide range of technological innovations, the most commonly used services are mobile banking and agency banking. This is mainly because of the widespread network coverage in many parts of developing countries.

There are a few studies that focus explicitly on the adoption of technologies for financial inclusion and poverty alleviation in Africa. For example, Uddin et al. (2012) conducted an empirical investigation on the relationship between banking sector technological development and poverty reduction during the period from 1976 to 2010. By adopting an ARDL approach, the study documented that there was a long-run relationship between banking sector development and poverty reduction. From a long-run perspective, the study found that poverty reduction is found to be the only variable explaining banking sector technological development. In a later study, Uddin et al. (2014) explored the causality between financial deepening, economic growth and poverty reduction using quarterly data over the period 1975-2011 in Bangladesh and found evidence of a long-run relationship between financial development, economic growth, and poverty reduction. Economic growth was also found to Granger cause financial development and poverty reduction. This finding of unidirectional causality running from economic growth to financial development supported a demand-side hypothesis where higher economic activities result in greater demand for financial services, thus giving further support to the financial sector.

In line with the role played by technologies in financial inclusion, Sanya and Olumide (2017) examined financial inclusion as an effective policy tool of poverty alleviation in Ekiti state, Nigeria, from 1980 and 2015. The findings from the study revealed that -poverty rate was higher among women since women accounted for about 58% of the poor while men accounted for 42%. The study discovered that the numbers of commercial banks across the three senatorial districts of the state were extremely low and that the size of the financially excluded population Ekiti state was high (45%) (Sanya and Olumide, 2017). The study showed that financially included population in Ekiti state was basically among civil servants and few businessmen during the study period and that employment, marital status, educational level, religion, financial discipline, use of banks products and services, distance, household size, access to political contract, gender, income level, and age were the determinant factors of financial inclusion (Sanya and Olumide, 2017). Similarly, Abimbola, Olokoyo, Babalola, and Farouk (2015) examined the role of financial inclusion in the reduction of poverty in Nigeria through studying the roles of government and financial institutions and the use of various mobile initiatives such as mobile banking, mobile money, and agent banking. They made use of time series analysis on data obtained from secondary sources between the periods of 1992 and 2016 was adopted and the paper covered financial inclusion as it relates to unbanked people in

Nigeria. The study found out that the majority of the unbanked in Nigeria are low-income people who do not have access to financial services and information on financial inclusion (Abimbola, 2015).

In a Ghanaian study, Ampah, Jagongo, Omagwa, and Frimpong (2017) sought to establish the effect of access to credit and financial services on poverty reduction using cluster sampling techniques on 370 innovative entrepreneurs of Micro Small and Medium Enterprises. The study found that access to credit and financial services had a fairly weak positive effect on growth in income, increase in consumption expenditure and acquisition of business assets and that, however, access to credit and financial services have a significant effect on ability to educate children as poverty indicators (Ampah et l., 2017). In South Africa, the Mzansi brand is a National banking initiative, launched in 2004 for banks to offer low-cost accounts in order to make banking affordable to most of the people (Kotler, 2010). Other banks like Standard Bank have introduced the branchless concept where they have replaced brick and mortar with Automated Teller Machines (ATMs) and other electronic channels. One barrier has been the charges that banks levy on account holders which the low-income earners cannot afford, and Standard Bank South Africa has introduced the Mzansi Blue Account as a solution for the low-income market (Kotler, 2010).

2.6 Financial inclusion in Zimbabwe

2.6.1 Overview of Zimbabwe's banking sector

Zimbabwe's banking sector is currently comprised of 19 operating financial institutions, of which 15 are registered commercial banks, one (1) merchant bank, three (2) are building societies and one (1) savings bank as well as 156 microfinance institutions (Reserve Bank of Zimbabwe, 2014). These include Banc ABC, MetBank, FBC Bank, NMB, ZB Bank, MBCA, Ecobank, Barclays Bank, Standard Chartered, Steward Bank, Stanbic Bank, CABS, CBZ, POSB, Agribank, Allied Bank, AfrAsia and Tetrad banks (Reserve Bank of Zimbabwe, 2014). Each of these financial houses is required to meet the minimum capital requirement determined by the central bank, which is shown in Table 2.1 below.

Table 2.1 Capital Requirements of Banks in Zimbabwe (as at 2014)

Segments	Type of Institution	Capital requirements		Activities
		Current	2020	
Tier I	Large Indigenous Commercial banks & all foreign banks	$25 million	$100 million	Core banking activities plus additional services such as mortgage lending, leasing & hire purchase
Tier II	Commercial banks, Merchant banks, Building societies, Development banks, Finance & Discount houses	$25 million	$25 million	Core banking activities only
Tier III	Deposit Taking Microfinance banks	$5 million	$7.5 million	Deposit Taking Microfinance activities

Source; Reserve Bank of Zimbabwe (2014)

Soon after the harsh economic climate in the country from the turn of the millennium, Zimbabwe fell into a liquidity crisis or crunch. The country's interbank rate ranged from 10% to 17% as compared to an average Treasury bill rate of 8.75% (Reserve Bank of Zimbabwe, 2014). In these periods the banking system faces severe funding shortages and the interest rate on loans among banks is increased relative to normal ones. Several banks have become weak or distressed and these include Metbank, Allied Bank, AfrAsia and Tetrad Investment Bank which continue to face critical liquidity and solvency challenges (Reserve Bank of Zimbabwe, 2014). This translates to major restrictions in the banking system where the ability to satisfy the liquidity needs of firms is constrained.

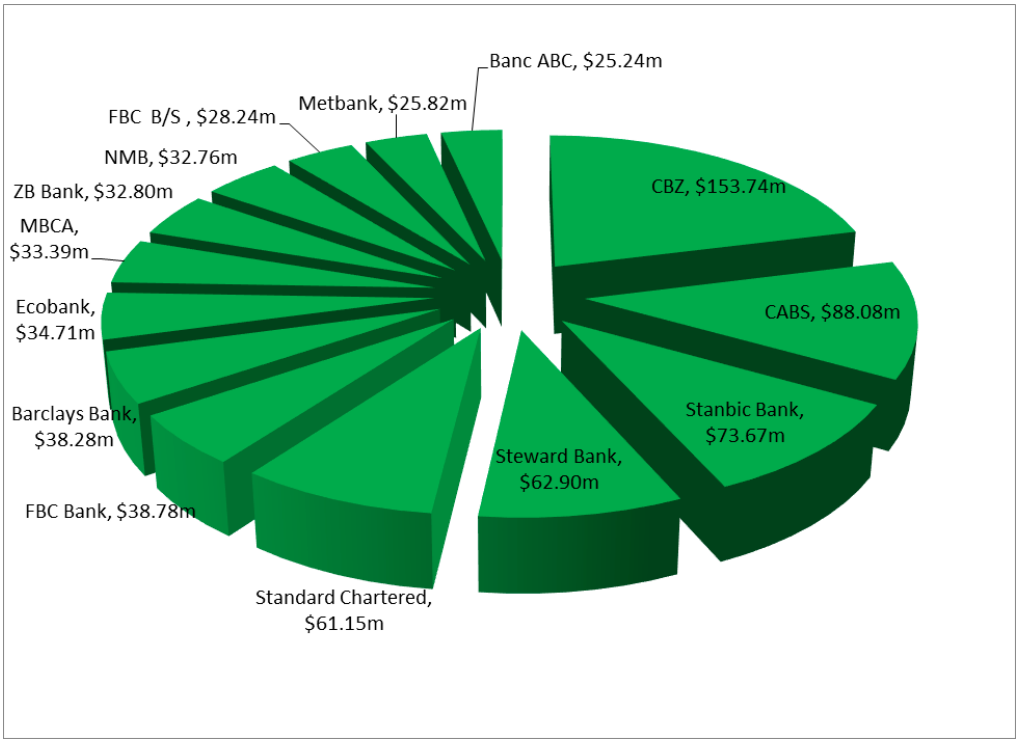


Figure 2.2 Capitalization of Zimbabwe's Banks (Source; RBZ, 2014)

The underperforming real economy has exacerbated liquidity constraints in the economy because there is a symbiotic relationship between the real sector and the financial sector. A largely well-performing real sector builds the financial sector in that it places profits and reserves into the financial system and it honors obligations it has with banks. Currently, industry capacity is at about 40% while there is a high level of non-performing loans which suffocates financial sector liquidity. The current estimate of nonperforming loans is at 15.92% on a capital base of US$25 million for the banks (Reserve Bank of Zimbabwe, 2014). This means that there is near insolvency in many banks as compared to a healthy NPL ratio of below 5% (Ashok, 2014).

Due to the liquidity crunch in Zimbabwe's banking sector, there has been a 0.5% decline in loans to the private sector, from US$3 627.0m as at February 2014 to $3 610.4m as at March 2014. This reflects constrained lending by banks on the back of the liquidity crisis, a low deposit base and risk aversion due to increasing non-performing loans in the banking sector (Ashok, 2014). Non-performing loans have since reached 17% of total loans advanced. Of the $3 610.4m advanced to the private sector, key sectors such as mining received only 6.3% while construction received 1.6% (Ashok, 2014).

Most banks have resorted to withdrawal limits for their clients due to liquidity constraints. The liquidity crunch has been worsened by the country's negative balance of payment position, with the country importing more than it is exporting (Keith, Chigumura and Chipumho, 2013). There is no stability in the economy and markets because most deposits are transitory deposits as they are funds held in bank accounts from which they can be withdrawn at any time without any advance notice and 83% of total deposits in the country are transitory.

2.6.2 Financial inclusion in Zimbabwe

From a Zimbabwean perspective, FI is defined as effectively using a diverse range of cheap and reachable financial services which are given to the people in a reasonable and clear manner using official and regulated through formal and regulated companies for all Zimbabweans (RBZ, 2016). More than half (67%) of the registered MFIs are domiciled in Harare, 15% are based in Bulawayo, with the remainder spread within smaller towns and cities. In other words, FI tends to encompass all the programmes, policies and activities which are carried out to reach out to the unbanked populations. However, regardless of the above-named benefits, the bulk of the Zimbabwean population still lacks access to formal financial intermediaries and with that in mind, there was the introduction of the National Financial Inclusion Strategy (NFIS) for the purposes of welfare improvement of the unbanked part of the population. For the purposes of this study, there is a need to look at how the current services providers are adhering to the demands of the NIFS towards an improvement in the banking sector.

Due to the prevailing economic and political conditions in Zimbabwe, the operations of most financial institutions have been negatively affected. This has led to the closure of most of the financial institutions leading to a reduction in the number of financial service providers thus affecting individuals and corporates through losses. Moreover, the closure of these financial institutions also led to a reduction in the confidence towards those offering financial services leading to huge sums of money circulating in the informal sector. According to Masiyandima, Mlambo and Nyarota (2017), Zimbabwe's financial sector had 19 banks, 16 Asset Management Companies (AMCs) and at least 158 microfinance institutions. In total, the country had about 400 bank branches countrywide, excluding agents. However, the country's banks and bank branches are highly geographically concentrated in urban areas, with at least 80 percent of the bank branches located in urban areas and only 20 percent in rural areas (Gambe and Sandada, 2018). The country's two major cities; namely, Harare and Bulawayo host close to 50 percent of the country's total bank branches (Figure 2.3).

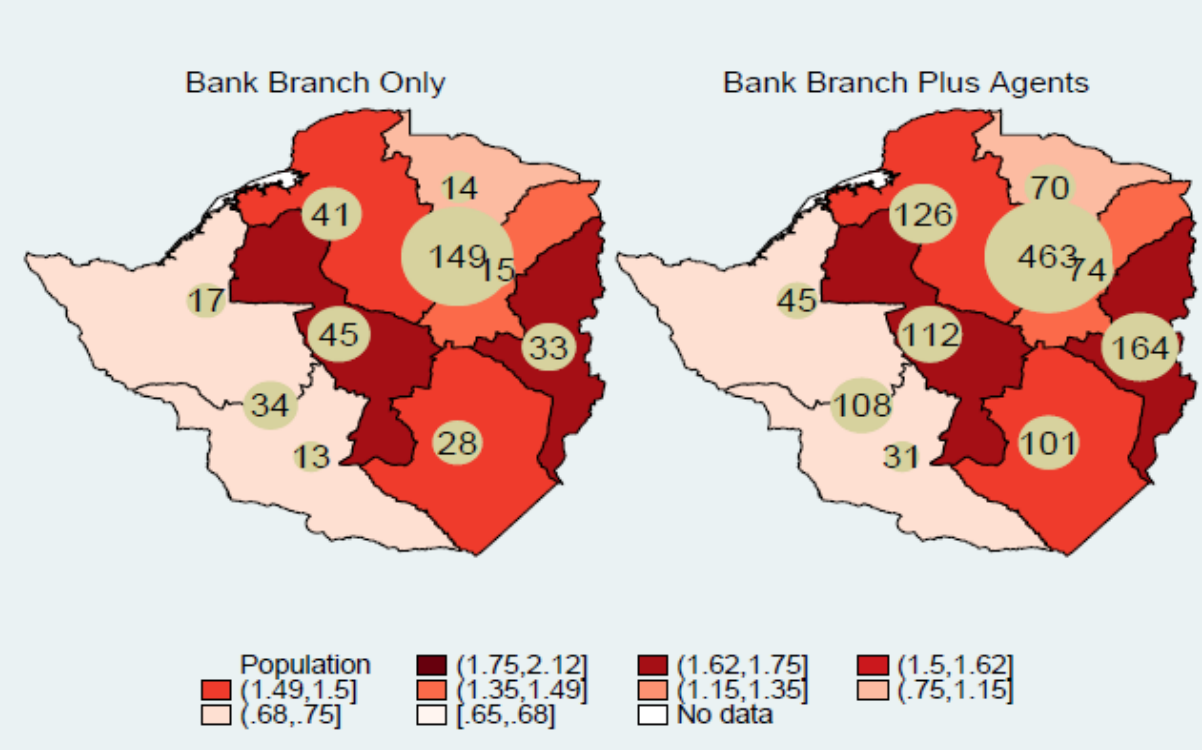


Figure 2.3 Zimbabwe's population distribution and bank branch network. Source: Masiyandima et al., (2017).

Figure 2.3 informs on the degree to which most households and individuals in Zimbabwe's rural areas are likely to be excluded from accessing and utilizing financial services. The gravity of the country's financial sector challenges and the degree of lost financial inclusion becomes even clearer when the evolution of Zimbabwe's financial sector over time is compared with other countries in the region. Zimbabwe had significant losses in terms of financial inclusion between 2004 and 2011. Over the same period and beyond 2015, other countries in the region progressed significantly well, gaining milestones in terms of financial inclusion, as shown in Figure 2.4.

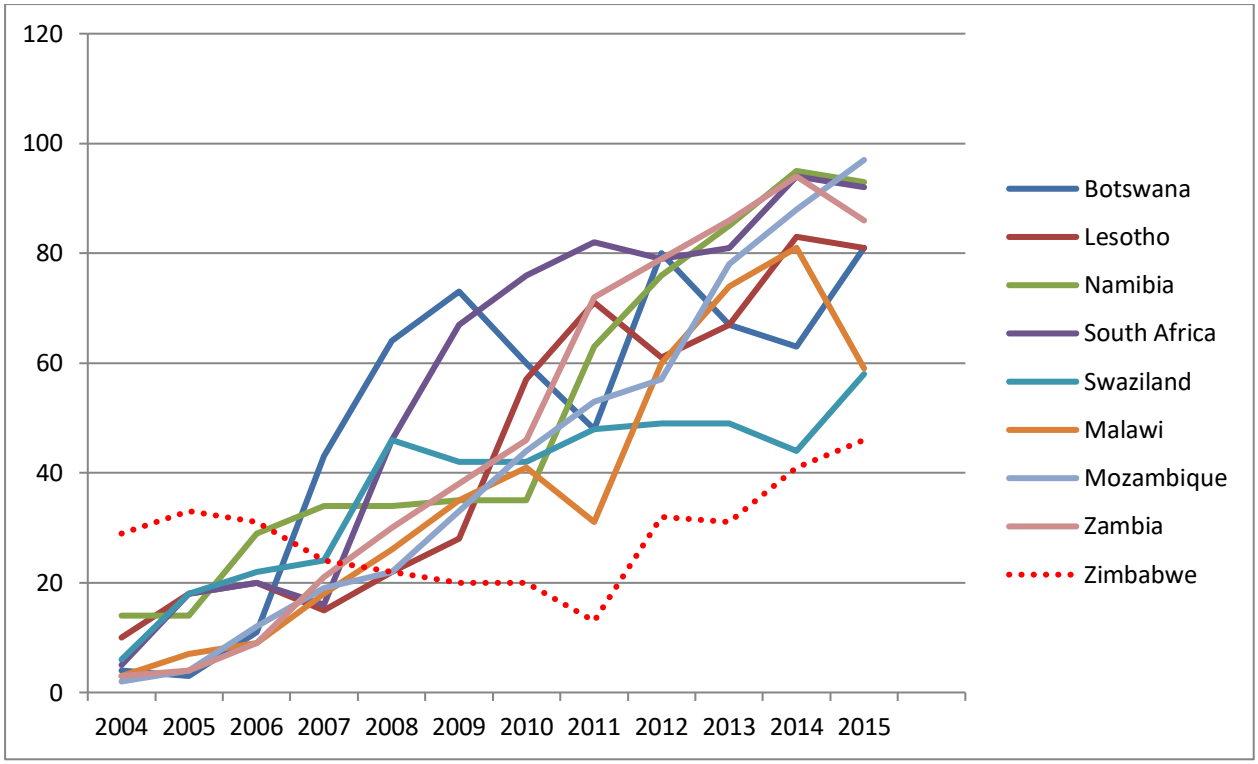


Figure 2.4. Within country indices of financial inclusion in Sub-Saharan Africa. Source; Gambe and Sandada (2018).

In Zimbabwe, the Reserve Bank has been on the forefront urging financial institutions to adopt strategies meant to promote financial inclusion. The Reserve Bank of Zimbabwe (RBZ)'s (2006) Monetary Policy Statement affirmed that most Zimbabweans has no access to financial services. A study by FinMark (2012) revealed that 65% of the Zimbabwean population stays in the rural area and that only 5% of rural people have access to a bank which is within 30 minutes' reach. A Framework for Financial inclusion was put in place by the Reserve bank, the banking industry, and other stakeholders. The thrust of the framework is to encourage banks to be accessible by 'unbanked' poor societies by opening rural branches or harnessing technology to come up with products that are accessible and affordable to the majority. The RBZ has taken a keen interest in financial inclusion and has continually, through monetary policy pronouncements, urged banks and financial institutions to be innovative and embrace the financially excluded. This is commendable as the financial activity in these areas will stimulate development through the provision of finance for economic activities.

Gambe and Sandada (2018) sought to establish the effectiveness of financial inclusion strategies namely National Microfinance Policy, Post Office Savings Bank loans, mobile financial services, Agency Banking, Shared Infrastructure Network, Insurance policy

provisions. A Hypothetic-deductive approach was used to survey randomly selected 118 Micro, Small to Medium enterprise owners/managers in Zimbabwe. The study established that National Microfinance Policy, Post Office Savings Bank loans, mobile financial services have statistically significant effects on financial inclusion. Agency Banking, Shared Infrastructure Network, and Insurance provisions exhibited negative effects on financial inclusion (Gambe and Sandada, 2018).

Mago and Chitokwindo (2014) examined the impact of mobile banking on financial inclusion in Zimbabwe, specifically focusing on the Masvingo District. The results revealed that low-income people are willing to adopt mobile banking and the reasons are that it is easily accessible, convenient, cheaper, easy to use and secure (Mago and Chitokwindo, 2014). The study also concluded that poor people have been traditionally located in the informal sector where they hardly enjoy banking services.

2.7 Financial inclusion technologies in Zimbabwe

The major financial inclusion technologies used in Zimbabwe are mobile money transfers. The cash deficit in the country has led to a lower use of ATMs and an increase in the use of POS machines. ATMs continue to lie idle as banks no longer have cash to disburse through ATMs and the introduction of bond coins has made it difficult to continue using ATMs. This has led to consumers choosing to use mobile money, POS, and internet banking. Mobile money transfer schemes in Zimbabwe started more than ten years ago. The services on the market include FBC Bank's Mobile Moola and Central Africa Building Society 's Text-a-Cash both powered by Telecel Zimbabwe and Net One's One Wallet. Evidently, Econet Wireless' EcoCash has been the fastest and widely adopted mobile money transfer scheme in Zimbabwe (Techzim 2014). Launched in August 2011, EcoCash grew to more than 1,7 million subscribers by November 2012. To support the growth of the EcoCash facility, the company acquired a 100% shareholding in the Zimbabwe Stock Exchange-listed TN Bank, prompting its de-listing.

Zimbabwe, like the majority of Africa, has 70% majority of its population living in rural areas. The rural areas have poor road and transport networks and infrastructure problems. Due to the inaccessibility of most rural areas, traditional banks have avoided these areas, leaving the rural communities unbanked (Anyanzwa and Owino 2014, Techzim 2014). The People's Own Savings Bank (POSB) Bank, which has for years, serviced most rural areas, partnering with its

postal services has closed several branches due to viability problems especially with the mail facility largely out of business in 2011 only 11% of the banks' total branch network service the rural areas, despite the fact that 70% of the total population live in the rural areas (Anyanzwa and Owino 2014). Among the reasons cited by banks are high information, transaction and monitoring costs, poor infrastructure, dispersed and intermittent demand and seasonality of deposits. The FinScope survey on financial inclusion in Zimbabwe conducted in 2011 found that 24 percent of the total population is banked and of this only 12 percent of the rural population is banked. There is a large population not having access to financial services at all either through the formal or informal system, 40 percent in the case of the whole population and 51 percent in the case of the rural population (Makina, Chiwunze and Ndari 2014).

Mobile networks have in recent years made great inroads into rural and urban areas. With Econet Wireless currently targeting 100% mobile coverage in Zimbabwe, EcoCash availability to the rural populace is definitely a game-changer. Research has established that money transfer in rural and urban areas has transformed the lives of the banked and unbanked populace but its impact on the mobile money agents both in rural and urban areas has not been investigated (Anyanzwa and Owino 2014). Being unbanked in today's financial market place can be problematic (Cisco 2014), and non-participation in the formal financial sector can perpetuate poverty (Chinakidzwa, Mbengo and Nyatsambo 2015). Mobile money transfer facilities, like Econet Wireless' EcoCash, have made an inroad into the unbanked populace to service the glut of banking needs available. In addition, the rate of mobile phone adoption in Africa is predicted to grow exponentially (Han 2012).

2.7.1 Ecocash

EcoCash is an innovative mobile payment solution that enables Econet customers to complete simple financial transactions such as sending money, buying prepaid airtime for yourself or other Econet subscribers and paying for goods and services. The service transfers (sends) money to Econet customers only. It also serves the following functions:

Agents are vital to the success of mobile money in emerging markets, and Econet Wireless has invested heavily to build a robust agent network. By 2012 Econet had over 1 million 90-day active users and 4.000 active Ecocash agents in only 18 months of the product launch. By 2014 Econet had 3.3 million registered Ecocash customers (Techzim 2014, GoZ 2015). Ecocash began by building a broad network of agent outlets, particularly in semi-urban and rural areas

where users cash-out the transfers they receive. It also had to ensure that the agent network had enough cash and float liquidity to meet the demands of its rapidly growing customer base, and for this, they provided bonuses and special incentives to motivate them to invest in EcoCash and educate new customers. EcoCash launched with a simple product: a basic USSD interface that allowed customers to deposit, withdraw, and send money from their mobile phone or agent outlet. The initial focus on P2P transfers was driven by two inputs: a survey of existing money transfer options for Zimbabwe's large informal sector and qualitative customer research conducted prior to launching the product. The survey of existing options, including cash transfers through bus companies or the post office, revealed that EcoCash could provide a better offering in a range of areas, including price, security, and convenience (Cisco 2014).

Econet had to quickly build an agent network to contend with the deluge of new EcoCash users brought in through the field activities and promotions described above. However, it had to carefully control the growth of the network in order to manage the ratio of active subscribers to active agents and to ensure agent quality. Too few agents would have reduced service coverage across the country and created long queues where it was available. Too many agents would have had two negative effects: it may have forced EcoCash to compromise on quality and it would have spread the commission benefit too thinly across a large network and reduced the incentive to invest in the service and educate customers. This controlled distribution channel growth has allowed EcoCash to maintain a ratio of 250–600 active subscribers per agent and ensure these agents meet their standards for quality (Cisco 2014).

At the inception of the EcoCash product, Econet made a strategic decision to sacrifice short-term margins and paid out 80% of its revenue in agent commissions. This provided agents with strong liquidity and motivated them to make higher capital investments and open new outlets, which allowed the network to cope with the rapidly growing customer numbers. Some agents extended their operating hours to capture additional transaction revenue, with a few even operating 24-hours (Levin 2013). One of the most innovative EcoCash incentives has been to award top-performing agents with solar kiosks. Operated by agent staff, these kiosks have allowed agents to quickly expand their footprint into high traffic areas. In addition to attracting foot traffic, these solar kiosks provide solar charging for mobile phones to avoid any lost mobile money or GSM usage due to dead batteries (Levin, 2013).

2.7.2 Telecash

When Telecash was launched in January 2014 it had 1 600 agents and merchants countrywide but by March the number of Telecash agents and merchants had increased by a thousand, to 2 600 (Techzim 2014). Telecash allows subscribers to use their cell phone as an electronic wallet to transfer money, pay for airtime, buy groceries, pay bills and pay for other goods and services. Telecel subscribers can register for Telecash and deposit money into and withdraw money from their Telecash account at any registered Telecash agent. They can also use Telecash to pay for goods and services provided by any of the 2 600 Telecash agents and merchants countrywide (Telecel News Release, 2014).

2.7.3 One Wallet

One Wallet is mobile banking through one's mobile handset and a NetOne SIM Card. It is Branded One Wallet principally for money transfer service, airtime top-up and utility bill payments. The product allows subscribers to deposit, send and withdraw cash via mobile phone. Transactions can be done from anywhere where there is NetOne transmission from a handset. A transaction can be done from any OneWallet or accredited OneWallet Money Agent for cash deposits and withdrawals (Techzim 2014). OneWallet only accounts for a disappointing 1% of the market share in mobile wallet against a 27% subscriber market share subscriber base. Despite having this large subscriber base, this pathetic 1% indicates a failing product. OneWallet has only 200 000 subscribers and it's about 7.4% of NetOne's 2.7 million total subscribers. And just to compare it to the most successful mobile money service locally; EcoCash has 3.5 million subscribers, about 40% of its total subscribers. And to understand more why it's important to compare, OneWallet was introduced to the market months ahead of EcoCash, January 2011 and September 2011 respectively (Techzim 2014).

OneWallet has a small agency network of only 1.612 for a mobile wallet in contrast to an estimated 23.379 agents for all networks combined. The opportunity to operate with every potential mobile money agent popped up when the Postal and Telecommunication Regulation Agent of Zimbabwe (POTRAZ) disallowed agency exclusivity which put all EcoCash and TeleCash agents at its disposal. Potentially, OneWallet can be offered by all these agents. In addition, they might consider enhancing its agency experience by offering not only a mobile phone to assist agents but adding an agent mobile application that makes it simpler to process transactions on the go (Techzim 2014).

2.8 Financial inclusion technologies and financial stability

According to literature, financial inclusion can have both positive and negative impact on financial stability. The importance of financial inclusion has become a very topical issue in developing countries. In Zimbabwe, due to the economic challenges in mainstream banking, most commercial banks have turned to concentrate more on financial inclusion technologies to increase their revenues and keep afloat. A study carried out by Sakarombe (2018) to investigate the relationship between financial inclusion and bank stability in Zimbabwe found that financial inclusion can increase stability in the banking sector. According to Kamau and Oluoch (2016), most commercial banks in Kenya have intensified their profitability by developing new products which are incorporated in operations and they have minimized operational costs and increased efficiency and consequently their profitability.

With the rising need for financial inclusion, central banks have continued to play an active role in the provision of more financial inclusion technologies to help stabilize their economies while also reaching out to the unbanked population. Thus, financial inclusion has grown into an explicit policy objective for many developing countries. Shihadeh and Liu (2019) go on to ascertain that enhancing use of financial inclusion indicators such as ATM, mobile banking, internet banking, credit cards and debit cards is very essential for banks in decreasing their risk and enhancing financial performance. It is recommended that commercial banks should take an active role in increasing financial inclusion as it is supporting the profit motive (Nthambi, 2015)

Khan (2011) and Thorat (2010) elaborated on several ways that FI can contribute towards achieving a stable financial system. The first way is through financial institutions working to increase the volume of transactions to take advantage of economies of scale. Value and volume of transactions can be improved by use of agents which reach a wider number of consumers, even in remote places. This will provide a diversified product portfolio which will ultimately reduce volatility in income. Secondly, FI can contribute to a stable financial system as it creates a better level of formalisation of the banking sector, thereby discouraging informal systems which undermine the monetary policy. Lastly, an increase in FI also improves household income as well as small business profitability, thus helping to create savings which can translate to sustainable investments in the economy. Growth in savings and investments will also contribute to stability in the banking sector as deposits rise.

There are also other theories which argue that financial inclusion technologies can pose a risk on financial stability. According to Triki and Faye (2013), financial inclusion also entails risks to financial stability because banking the poor and the unbanked typically involves high operating costs as financial intermediaries invest in new distribution channels, new products and new risk management systems. They go on to argue that most FI innovations in developing countries are not fully tested which can give rise to reputational risk which can negatively affect financial stability.

2.8.2 Overview of Zimbabwe's financial performance

As part of the post-hyperinflation period, there was an adoption of a number of currencies by the Zimbabwean government in 2009 (Buigut, 2015) which consisted of the US dollar, Euro, UK Sterling pound, South African Rand and Botswana Pula. In the beginning of 2014, more currencies were added to the multi-currency basket and these were the Australian Dollar, Chinese Yuan, Indian Rupee, and Japanese Yen (Southall, 2018). The year 2013 meant the lapsing of the Government of National Unity (GNU) and elections were held. Soon after the elections, there was a decline in foreign investment and there was a decline in economic growth and there was a renewed liquidity crisis faced by the majority of the Zimbabweans (Southall, 2018). Money for economic development was no longer available especially the informal sector where the bulk of the population is dependent on. At the end of the day, there was the imposition of withdrawal limits by the Reserve Bank of Zimbabwe (RBZ) further increasing lack of confidence in the monetary authorities (Dube & Gumbo, 2017).

The RBZ at the end of 2016 introduced "bond notes" which was a local currency that was pegged in value with the US dollar as a way of dealing with the severe cash shortage existing in the country. The bond notes were rejected by most of the Zimbabweans, under the fear of the 2008-2009 hyper-inflation through which people's savings were eroded. Thus, in this case, it was an indication that the public had no trust and confidence in the monetary authorities in Zimbabwe based on the events of the period were worthless papers were printed (Maziva, 2016). Monetary institutions have been weakened by the dollarization system with banks failing to make international payments for their account holders as a result of limited reserves for US Dollars. Thus, the RBZ must ration the availability of foreign currency by developing a priority list for foreign payments. Due to the rationing of foreign currency by the RBZ, customers did not have access to forex to buy goods and eventually were not able to import products and there was a failure to earn the much-needed foreign currency. Therefore, the

importers must resort to buying foreign currency on the informal market at exorbitant rates. As there has been a decline in exports, the Zimbabwean government had to increase its borrowing trends and eventually they resorted to printing bond notes. The RBZ resorted to providing depositors with small amounts of money yet they were given hard currency in the first place for example as of October 2016, withdrawals were capped at USD$ 50-00 per day (Maziva, 2016). All the challenges being faced have led to the development of illegal markets for trading foreign currency, whereby there was an acceptance of bond notes at higher discount rates against the USD. According to Tanyanyiwa (2015), the situation in Zimbabwe ignited memories of 2008-2009 where there were inflation and assets devalued.

The other highlight of the financial services in Zimbabwe was through the introduction of the bond notes, which government officials are giving equivalence to the United States dollar to ease the liquidity crunch. Such government policies have led to more lack of confidence in the financial services sector and the exchange rate on the parallel market is way higher than the government rates and this also has led to the lack of confidence in the financial service providers. Thus, the study intends to determine how FI can be used as a tool for poverty reduction under the economic and political conditions prevailing in Zimbabwe.

2.9 Research gaps

The contribution of the financial sector to economic development and poverty reduction has been of major interest among researchers and policymakers in the last few decades. Despite this, existing studies on the relationship between the financial sector and poverty alleviation have been found to be largely inconclusive. Some studies recorded a positive contribution by the financial sector development on poverty reduction (Beck et al. 2007; Shahbaz et al. 2015), while others have found otherwise, including cases where financial sector development was found to result in an increase in the poverty level (Dhrifi 2014). The positive correlation between financial and economic development is well known, yet the direction of causality, as well as the channels of transmission, remain difficult to establish (Thol, 2016). On the one hand, finance could cause economic growth by facilitating capital accumulation. On the other hand, financial institutions could move where they expect higher growth to occur in the future (Thol, 2016). Further, most studies have only established financial inclusion strategies but have not gone further to establish the effectiveness of such strategies (Gambe and Sandada, 2018).

2.10 Empirical Framework

Previous studies such as Nthambi (2015) researched financial inclusion, bank stability, bank ownership and financial performance of commercial banks in Africa, Kenya and argued that financial inclusion has an impact on the performance of banks. Others such as Simboley (2017) studied the effects of Agency Banking on the financial performance of commercial banks in Kenya. Cherungong (2015) conducted a study on the effects of financial literacy programs on the performance of small and medium scale enterprises in Trans Nzoia County. KipNgetich (2013) studied agency banking and financial inclusion in Kisumu. Kithaka (2014) studied the effects of mobile banking on the financial performance of commercial banks in Kenya. Despite all these studies and many others, this area still remains grey and with minimal studies and no published study on financial inclusion and how that influences performance of listed banks in Kenya and hence the need to fill this gap by conducting this study in Zimbabwe.

2.11 Chapter summary

The chapter provided a review of literature which deals with financial inclusion at an international scale to the Zimbabwean scale. The study wants to contribute to the growing debate about financial inclusion from a Zimbabwean context linking it with the revenues of the banking sector. It was also noted from the chapter that there is no clearly stated theory that provides a linkage between financial inclusion and bank revenues. More so there has been a review of the financial services in Zimbabwe and how they have changed over time to the present scenario and how the changes in the financial sector has provided financial inclusion and how they have affected bank revenues thereafter. The last component of the chapter reviewed empirical literature showing the deficits of the studies on the link between financial inclusion and bank revenues. In the next chapter, the methodology of the study is presented.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter sets out the method employed in conducting the research. The choice of method was made based on the nature of the research problem. The purpose of this research is to discover if any, the impact of financial inclusion technologies on the revenue performance of commercial banks in Zimbabwe. This chapter presents descriptions of the research design, the research population, methods of data collection, the description of variables, as well as methods of data analysis, among others.

3.2 Research design

This research was an explanatory quantitative study. The motivation behind explanatory research is to understand a problem that was not well-researched in the past, to generate operational definitions, to focus on priorities and to come up with a better model for understanding causality amongst study variables (Given, 2008). The explanatory design was adopted in this study owing to the need to explain the causal pathways and extents amongst the study variables as laid out in the objectives of the research. The objective of this study was to determine the relationship between financial inclusion technologies and the net income performance of commercial banks in Zimbabwe.

3.3 Study population

In connection with the topic matter of the study, the target population of the study consisted of 19 Banks from which a sample of 13 commercial banks were picked (See appendix) in Zimbabwe. Annual data for six years, from 2013 to 2018, was used in the study. The study used secondary data obtained from annual reports published by the Reserve Bank of Zimbabwe from 2013 to 2018. These secondary data sources significantly came up with relevant results for this study.

3.4 Model Specification

The econometric model to consider in this study takes ROA, ATM, POS, IB, and MB as the explanatory variables and HI as dependent variable respectively. Shehu et al., (2013) specified a model for the relationship between electronic banking products and income as;

$$FP_{i,t} = \beta_0 + \beta_1 ATM_{it} + \beta_2 POS_{it} + \beta_3 MB_{it} + \beta_4 IB_{it} + \beta_5 BS_{it} + \beta_6 LEV_{it} + \varepsilon_{it}$$

Where:

FP = the financial performance of the bank measured as the return on assets (ROA)

β_0 =Interception

$\beta_1 - \beta_4$ = slope coefficient

ATM = The total annual revenue from Automated teller machine use

POS = Total annual Point of Sale transaction revenue

MB = The total annual revenue from the use of Mobile Banking

IB= Total annual revenue from Internet Banking Transactions

BS= The bank size by capitalisation level, which is a control variable

RE= The retained earnings which is a measure of the equity level of the bank, and is a control variable

ε_{it} = Error term.

Given this regression equation, a P-value less than 0.05 for an estimated parameter of a predictor variable will imply that the variable is a statistically significant determinant of the growth of the pensions industry. Likewise, a P-value greater than 0.05, imply a statistically insignificant explanatory variable.

The study was based on the following hypotheses:

$H_0$1: ATM use has no significant effect on banks' performance.

$H_0$2: MB use has no significant effect on banks' performance.

$H_0$3: IB has no significant effect on banks' performance.

$H_0$4: POS has no significant effect on banks' performance.

3.5 Description of variables

The variables were dependent and independent variables. The description of the study variables is contained in Table 3.1 below.

Table 3.1 Variables

Variable(s)	Measurements	Notation	Expectation
Dependent variable			
Bank performance	Ratio of net income to total assets	FP	
Independent variables			
Financial technologies	Annual automated teller machine revenues	ATM	Positive
	Annual revenues from point sales	POS	
	Annual revenues from internet banking	IB	
	Annual mobile banking revenues	MB	
Control Variables			
Size	Total assets	BS	Positive/negative
Leverage	Total liabilities	LEV	Positive/negative

Financial performance (FP): In this study, return on assets (ROA) was used as a proxy for bank financial performance.

The ROA is the ratio between the operating profit and the assets employed, an increase of which shows higher organisational efficiency and increased shareholder value.

Automated teller machine (ATM): ATM is described in the study as the total value of ATM transactions in Zimbabwean commercial banks. Banks have invested heavily in ATMs, due to their cost advantages on a per-transaction basis, where it is less than teller or telephone human operator (Scholnick, 2006). Therefore; in this study, the variable was also expected to influence bank performance positively.

ATM =Total value of ATM transactions

Point of Sale (POS): POS is described as the total value of POS transactions in Zimbabwean commercial banks. Technological innovation or electronic delivery channels such as Point of Sale have contributed positively to the provision of banking services and the growth of the banking industry (Abor, 2005). Therefore; in this study, the variable was also expected to influence bank performance positively.

POS = total value of POS transactions

Internet Banking (IB): Simpson (2002) reveals that internet banking is motivated largely by the prospects of operating costs minimization and operating revenues maximization. As such the variable was expected to have an impact on the performance of banks. IB is described as the total value of internet banking payment transactions in Zimbabwean commercial banks.

IB = Total value of internet payment transactions.

Mobile Banking (MB): Rayhan, Sohel, Islam, and Mahjabin (2012) in their study on mobile banking in Bangladesh concluded that Mobile banking is real-time online banking, available anytime, anywhere throughout the country, it is convenient, affordable and secure and therefore it is much more effective in developing savings habits and hence leading to increase in bank deposits. Therefore, the variable was also expected to influence bank performance positively in this study. MB is described as the total value of mobile banking transactions in Zimbabwean commercial banks.

MB= total value of mobile banking transactions.

Bank size (BS): the bank size is a measure of the extent of bank capitalisation. This is as expressed by the natural algorithm of the value of total bank assets (Laeven, Ratnovski, and Tong, 2014). Bank size was a relevant variable in this study as it is related to profitability since increasing bank size can increase profitability by allowing banks to realise economies of scale, reduce risks and to have more efficient use of resources (Regehr and Sengupta, 2016). As such, the bank size was an important proxy which could not be left out in this study owing to its high impact on the level of bank profitability.

Leverage (LEV): The leverage variable quantifies the extent to which a bank can fund its assets using borrowings instead of equity. The leverage ratio of a given bank is the financial position of the bank as per its debt and its capital or assets, calculated as Tier 1 capital divided by consolidated assets, with Tier 1 capital being the common equity, reserves, the retained

earnings and other securities minus goodwill (Sgambati, 2019). A higher level of leverage means that the bank will have more capital for the financing of its assets, relative to its total borrowed funds.

3.6 Estimation Techniques

To determine and test the relation between the dependent variable and each of the independent variables, the instrument of data analysis for this study was regression analysis making use of panel data which incorporates both the cross-sectional and time-varying nature of the data. According to Matri and Balboa (2001), panel data analysis is superior to individual cross-sectional or time series analysis as it results in efficient handling of research data. Panel data analysis allowed the researcher to control for individual heterogeneity and reduce the problem of multicollinearity through allowance for increase in the degrees of freedom (Hsiao, 1986; Jenilek, 2013).

Since naturally, a panel of countries has significant heterogeneity which results in biased estimates if not normalized, absolute research variables values were divided by the respective bank size values to normalize the data and increase data homogeneity (Oino, 2014; Matri and Balboa, 2001). Banks differ significantly in terms of their sizes and this leads to higher observed variability and consequently, the problem of heteroscedasticity (Matri and Balboa, 2001) and thus normalizing the data allowed the researcher to manage the heteroscedasticity problem.

Empirical estimation using fixed effect and random effect model estimation can be applied depending on the assumption of the nature of unobserved factors relation with predictor variables; and policy intervention using this kind of estimation is becoming common for controlling unobserved interbank variations (Wooldridge 2012). The selection of the right model to use between the fixed and random effects model is be based on the cross-sectional effects of the nature of ui.t in relation to explanatory variables under consideration. The study will employ the Hausman test to decide on which model to use between a fixed effects or random effects model. Generally, the following parameters guide model selection;

- If covariance between Xi.t and ui.t is not equal to zero (cov (Xi.t, ui.t) ≠ 0), when the variation across the region is correlated with the explanatory variable; a fixed effect model gives a consistent and unbiased result.

- If covariance (ui.t, Xi.t) =0 which is variation across the region is assumed to be random and uncorrelated with the predictor or independent variables; a random effects model gives consistent and unbiased estimators.

3.6.1 Diagnostic Tests

It is important in statistical analysis not to violate the regression assumptions of homoscedasticity, no auto-correlation and no multicollinearity amongst the explanatory variables. The study employed the Breusch-Pagan LM test to test for heteroscedasticity with the null-hypothesis that data is homoscedastic. Carrying on regression with heteroscedastic data can result in the estimated standard errors being underestimated and the t-statistics being inflated and thus it is paramount to determine first the nature of the data to apply the correct regression specifications deal with the nature of the data.

To test for multicollinearity, the study used correlation analysis. Specifically, the correlation analysis measures the nature and strength of association amongst two variables. A correlation coefficient greater than 8 implies the presence of multicollinearity amongst the predictor variables. Presence of multicollinearity results in the estimated standard deviations of the regression coefficients becoming very large.

The study, before running the final regression, checked for the possibility of serial correlation within the model using the Wooldridge test for autocorrelation. Serial correlation decreases the fit of the model. Hence the estimation of the variance and standard errors is lower. This can lead the researcher to conclude a relationship exists when in fact the variables in question are unrelated. The researcher thus to ensure validity and reliability had to check for serial correlation to ensure increased model accuracy in the prediction of results.

CHAPTER FOUR

RESULTS PRESENTATION AND DISCUSSIONS

4.1 Introduction

The study was aimed at examining the impact of financial inclusion technologies on the performance of commercial banks in Zimbabwe. While the previous chapter of this study outlined the methodology for the study, this chapter presents and analyses the findings obtained from the study. Secondary data was used for the study. Secondary data was gathered from published financial statements of the banks while other authentic information which analysed the mode of transactions used by the banks and the performance of the banks financially were also used. Some of the headings covered in the chapter include the correlation test findings and regression test findings. On the regression test findings, a description of research data is first presented, followed by regression in panel data for fixed and random effects as well as the findings of the Breusch and Pagan Lagrangian multiplier test and of the Hausman test undertaken.

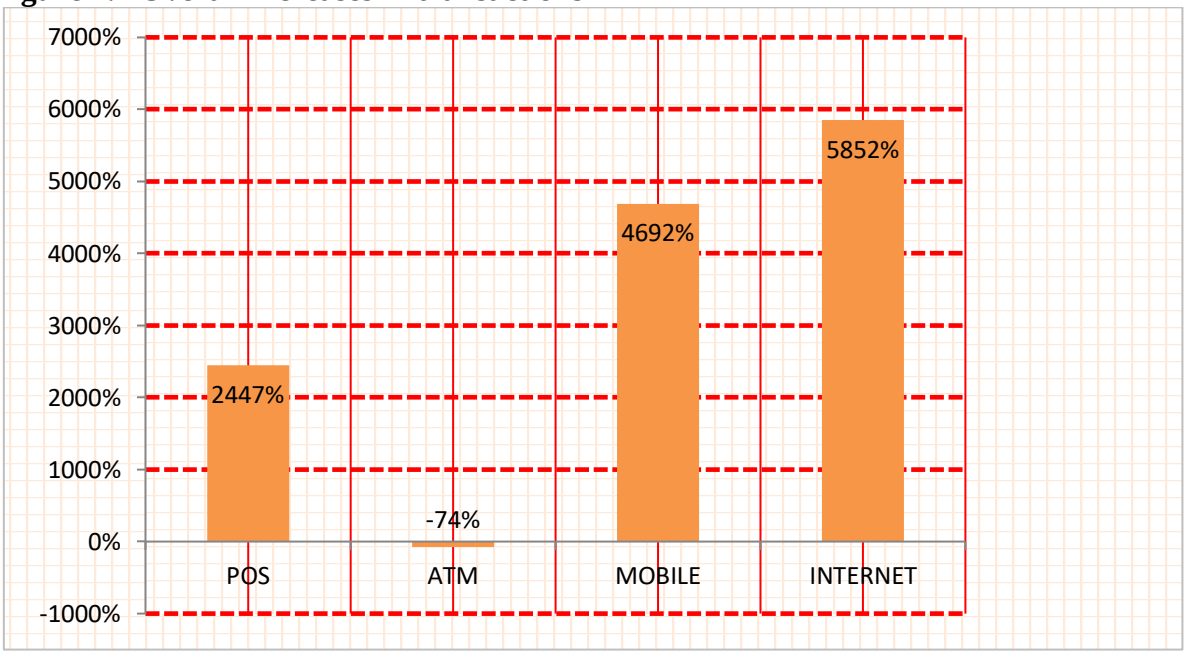
4.2 Analysis of Bank Performance

This study, as reflected in the conceptual framework of the study relied on the assumption that technology was the fountain for all the innovations of the banks in Zimbabwe as it was the case with the banking sectors across the entire globe. The usage of point of sale (POS), automated teller machines (ATM), mobile banking and internet banking was analysed regarding their usage by banks in Zimbabwe from the year 2013 to the year 2018. Figure 4.1 presents the increases recorded in the volumes of each platform separately:

Internet banking recorded the highest increase over the 6 years, recording an increase of approximately 5852% although it was not the most used platform. The sharp increase may be since it offered advantages which companies would not forgo. Mobile banking, although it was the most used platform, it had the second most increase of approximately 4692% over the 5 years. The increase in internet banking and mobile banking is expected to continue as citizens are more and more beginning to appreciate them as platforms for holding financial transactions to the advantages of the banks and the clients of the banks. POS had the third most increase over the same period with a record of 2447%. Finally, ATM's have recorded a decline of about -74% over the same period. The decline in ATM volumes can be directly attributed to the

inability of banks to disburse cash due to the liquidity crisis that has been heightening continuously.

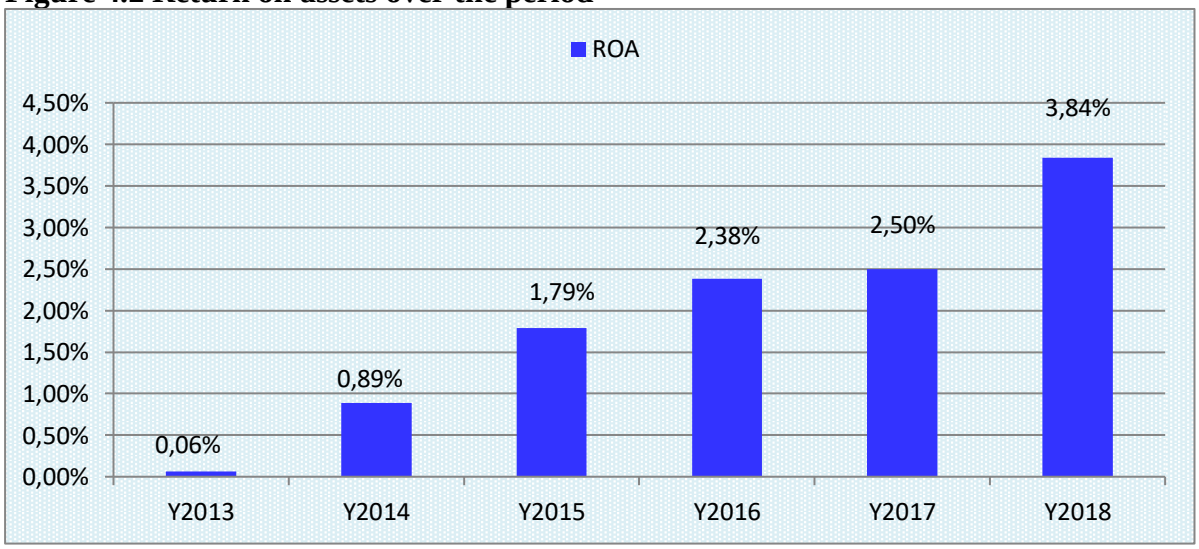
Figure 4.1 Overall increases in transactions



Notes: Authors design from research data

Bank profitability of the banks as measured by Return on Assets (ROA) was the form of bank performance selected for the banks in this study. The ratio was calculated from the net profit and total assets of the commercial banks in Zimbabwe. After recording the movement in the values of metrics used to calculate ROA, figure 4.2 depicts the ROA percentages.

Figure 4.2 Return on assets over the period



Notes: Authors design from research data

Figure 4.2 indicates that ROA has been 0.06% for all the banks in the year 2013. This figure increased to 0.89%, 1.79%, 2.38%, 2.5% and 3.84% for the years ending 2014, 2015, 2016, 2017 and 2018 respectively. The increases in ROA were in line with the increases in total assets and net income from which it is calculated. However, this increase can be interpreted to mean that the increase in net income was more as compared to the increase in assets that influenced it.

4.3 Descriptive statistics

Descriptive statistics analysis was performed to have a preliminary understanding of the characteristics of the banks enrolled in the sample. The study dwelled on four statistics that are the mean, which measures the central tendency, and the standard deviation, minimum and maximum, which are measures of the dispersion of data points. The descriptive statistics of the regression variables are presented in Table 4.1. As presented in Table 4.1, there were even variables in the dataset. The time variable (year) had 78 observations which spanned from 2013 to 2018.

Table 4.1 Summary statistics

	Mean	Min	Max	Std Dev
ROA	0.012577	-0.055038	0.072957	0.044093
POS	2.83E+08	5.62E+06	4.88E+09	6.07E+08
MB	9.93E+08	4.14E+06	7.96E+09	1.49E+09
ATM	1.36E+08	4.52E+06	5.04E+08	1.38E+08
IB	3.30E+08	2.86E+06	2.56E+09	4.66E+08
BS	807.8323	15.2561	5816.24	866.2189
LEV	42863.52	140	155898	35091.57

Notes: ROA=Return on assets; POS=Point of Sale; ATM= Automated Teller Machine; MB= Mobile Banking; IB= Internet Banking; BS= Bank Size (Total Assets); LEV=Leverage (Total liabilities)
Source: Author's Compilation

Summary statistics show that for the 2013 to 2018 period the commercial banks in zimbabwe performed poorly with an average ROA of 1.25%. The standard deviation in returns was very low at 0.04. thus there was little variation in returns and the banks thus performed almost the same as shown also by the smaller difference between the minimum (-5%) and a maximum (0.07). In terms of size as measured by total assets, the mean size was US$ 0.87 million with a minimum of US$ 15 million and a maximum of US $ 5.8 billion. Bank leverage as measure varied wildly over the period and across the units of analysis with a standard deviation of 35091, a minimum of US$0.14 million and a maximum of US$ 1.5 billion.

All financial inclusion technologies have high standard deviations mainly because there has been very significant growth in the implementation of these technologies by banks. Also use

of these technologies has grown as a result of cash shortages which have made use of these technologies a necessity rather than an option. Mobile banking had the highest volume of transactions mainly because of low transaction costs, convenience and integration with Ecocash (mobile money transfer platform). The lowest volume of transactions was through ATMs. Low usage of ATMs was mainly due to foreign currency shortages with most of the machines running idle for the past four or more years. The average volume of transactions stood at US$ 283 million for POS transactions, US$ 136 million for ATM transactions, US$ 992 million for mobile banking and US$ 329 million for internet banking.

4.4 Correlation Test Results

The Pearson correlation test was used to test the strength and nature of the relationship between the dependent variable and independent variable since the data was ordinal. According to Cohen (1988), correlation coefficients ranging between 0.5 and 1 were interpreted to represent a large correlation between the variables considered in the research. Correlation tests were directed at describing the strength and direction of the linear relationship between the independent variables namely POS, ATM, Mobile banking and Internet banking and the dependent variable return on assets. Pearson correlation coefficients were established. Table 4.2 provides the correlation results from the correlation tests conducted.

Table 4.2 Correlation Analysis Results

VARIABLE	ROA	LNPOS	LNATM	LNMB	LNIB	LNBS	LNLEV
ROA	**1.0000**						
LNPOS	0.3022 0.0072	**1.0000**					
LNATM	0.0402 0.7270	-0.1111 0.3329	**1.0000**				
LNMB	0.3022 0.0072	0.8234 0.0000	-0.2408 0.0337	**1.0000**			
LNIB	0.4039 0.0002	0.8553 0.0000	-0.1817 0.1114	0.8846 0.0000	**1.0000**		
LNBS	-0.0689 0.5490	0.1423 0.2139	0.0538 0.6398	-0.0324 0.7781	-0.0135 0.9063	**1.0000**	
LNLEV	-0.0494 0.6676	0.0486 0.6729	0.1957 0.0860	-0.0792 0.4908	0.0941 0.4126	0.2380 0.0359	**1.0000**

Notes: ROA= LNPOS=Natural logarithm of POS; LNATM= Natural logarithm of ATM; LNMB= Natural logarithm of MB; LNIB= Natural logarithm of LIB; LNBS= Natural logarithm of total assets; LNLEV=Total liabilities;

The results from correlation analysis show the presence of statistically significant positive correlation between bank performance and the growth in financial inclusion strategies as shown by the positive correlation coefficients. A relatively high positive correlation is between bank performance and the volume of internet banking transactions with a correlation coefficient of 0.4. The volume of POS transactions and mobile money transactions come second with a correlation coefficient of 0.3. The results show a very weak relationship between the volume of ATM transactions and bank performance as shown by a coefficient of zero implying that there is no relationship between the two variables. It is important to note that ATM usage had a negative correlation with all the other bank financial inclusion technologies. This again can be attributed to the issue of the liquidity crisis which saw ATMs being substituted with the other financial inclusion technologies. The coefficient, however, is statistically insignificant with a p-value of 0.7 which is above the 5%.

The correlation coefficients for both control variables are statistically insignificant and thus it can be concluded that there is no relationship between bank size and performance as well as leverage and bank performance. However, it is important to note that correlation does not imply causation and thus the study went on to perform regression analysis. The correlation analysis results also imply that there could be a potential problem of serial autocorrelation as shown by the correlation coefficients between POS and Internet banking, POS and Mobile Banking, and Mobile Banking and Internet Banking, the coefficients are above the 0.8 threshold. The study thus went on to further test for the presence of serial autocorrelation using the Wooldridge technique.

4.5 Regression Analysis

The study sought to explore the impact of the use of ATMs, POS machines, mobile banking and, internet banking as financial inclusion technologies on the performance of Zimbabwean banks. The study first performed diagnostic tests for heteroscedasticity and auto-correlation.

4.5.1 Heteroscedasticity and Autocorrelation Test

The model diagnostics are performed for the three regression models based on the correlation results (Table 4.2). The first equation (Model 1) includes POS and ATM without IB and MB while the second equation (Model 2) includes ATM and IB without POS and MB. The last equation (Model 3) includes ATM and MB without POS and IB. The results for heteroscedasticity and autocorrelations for all three models are presented in Table 4.3. First, the study employed the Breusch Pagan test for heteroscedasticity with the null hypothesis that

‘variance of residuals is constant across all levels of predicted values. A statistically significant chi-squared value implies the absence of heteroscedasticity. The results show a probability of chi-square of 0.0000. Thus the null hypothesis of homoscedasticity was rejected and it was concluded that the model variables are heteroscedastic. To adjust for the problem of data heteroscedasticity which can result in biased coefficient estimates, the final regression was run with robust standard errors.

One of the assumptions of both simple and multiple regression analysis is that the error terms are independent of one another, that is they are uncorrelated. The study employed the Wooldridge autocorrelation test to check for the existence of autocorrelation within the research variables. The null hypothesis is that there is no autocorrelation. The results for the Wooldridge test show that the is autocorrelation within the model variables as signified by the statistically significant p-value which is less than 5%

4.5.2 Stepwise Regression Results

The findings of the panel data regression estimations are as presented in Table 4.3. The estimations are undertaken for three separate models based on the results of the correlation analysis. For Model 1 (which excludes internet banking and mobile banking), the Hausman specification rejected the null hypothesis of random effects (REM) implying fixed effects (FEM) is an efficient estimator. For Models 2 (which excludes point of sales and mobile banking) and 3 (which excludes point of sales and internet banking), the null hypothesis of random effects (REM) could not be rejected implying random effects (REM) is the efficient estimator.

The regression results presented in table 4.3 show that mobile banking usage has a positive impact on the performance of commercial banks in Zimbabwe. The variable has a regression coefficient of 0.0058, statistically significant at the 1% level. This implies that a percentage increase in the volume or in usage of mobile money platforms by clients will lead to a 0.6% increase in bank performance. The results are consistent with findings by Mustapha (2018) who in a study on the relationship between financial performance and adoption of electronic payment technologies, based on the time dimensional and panel least square models, finds that bank performance increased after the adoption of electronic payment technologies. A study by Chaarani (2018) however found mobile banking having no significant impact on bank performance.

Table 4.3 Stepwise Regression Results.

Dependent variable: Return on Assets			
	FEM (Model 1)	REM (Model 2)	REM (Model 3)
	Coef.	Coef.	Coef.
Constant	-0.0267	-0.0471**	-0.0745***
	(0.0379)	(0.0226)	(0.0278)
LPOS	-0.0071***		
	(0.0025)		
LATM	0.0099***	-0.0010	-0.0009
	(0.0028)	(0.0013)	(0.0010)
LIB		0.0054***	
		(0.0008)	
LMB			0.0058***
			(0.0013)
SIZE	-0.0009	-0.0011*	-0.0012*
	(0.0010)	(0.0006)	(0.0006)
LLEV	0.0004	-0.0013	-0.0001
	(0.0014)	(0.0014)	(0.0011)
Wald χ^2/F	3.41	212.98	32.02
Prob > F	0.0143	0	0
R-Squared	0.1903	0.2564	0.2511
Hettest χ^2	9.55	14.01	14.94
Prob > χ^2	0.002	0.0002	0.0001
Hausman χ^2	14.38	-0.48	1.07
Prob > χ^2	0.0062		0.8982
AR(1): F	0.305	0.002	0
Prob > F	0.6044	0.9696	0.9945
Banks	13	13	13
Observations	68	74	74

Note: LPOS=Natural logarithm of POS; LATM= Natural logarithm of ATM; LMB= Natural logarithm of MB; LIB= Natural logarithm of LIB; SIZE= Natural logarithm of total assets; LEV=Total liabilities. Hettest denotes the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity; AR (1) denotes Wooldridge test for autocorrelation in panel data; Hausman denotes the test for RE versus FE. ***, ** and * denotes significance at 1%, 5% and 10% respectively.

The results also show that internet banking is a statistically significant driver of bank financial performance. The variable has a beta coefficient of 0.0054 and is statistically significant at the 1% level. Thus, it can be concluded that a percentage increase in the volume of internet banking will lead to a 0.5% increase in bank performance as measured by return on assets ceteris paribus. The results are in line with findings by Chaarani (2018) who in a study on the impact of technological innovation factors on the performance of Lebanese banks during an eight-year period, from 2010 to 2017, found that internet banking is a significant driver of bank performance in Lebanon.

The study also finds the usage of point of sale machines having a negative impact on financial performance of Zimbabwean commercial banks. The variable has a beta coefficient of -0.0071.

Thus, it can be concluded that a percentage increase in the volume of point of sale transactions will lead to a 0.7% decrease in bank performance as measured by return on assets, ceteris paribus. The results are consistent with findings by Valahzaghard and Bilandi (2014). Their study, using 16 commercial banks found out that that usage of point of sale systems does not have a significant impact on bank performance. However, the results disagree with the findings by Wachira (2010) who found the positive and significant relationship between banks' performance in terms of profitability and adoption of various technological innovations by banks. The results also disagree with the findings by Mustapha (2018) who found that bank performance of Nigerian banks increased after the adoption of electronic payment technologies including POS systems.

The results also indicate a significant impact of automated teller machines in driving bank performance over the 2013 to 2018 period. The variable has a beta coefficient of 0.0099 and is statistically significant at the 1% level. Thus, it can be concluded that a percentage increase in the volume of point of sale transactions will lead to a 0.9% increase in bank performance as measured by return on assets, ceteris paribus. The variable had the highest impact on bank performance amongst the focus predictor variables. The results are consistent with findings by Mustapha (2018) who in a study on the relationship between financial performance and adoption of electronic payment technologies, based on the time dimensional and panel least square models, finds that bank performance increased after the adoption of electronic payment technologies. However, the results disagree with findings by Valahzaghard and Bilandi (2014). Using two regression techniques, their study using 16 commercial banks found out that that ATM usage does not have a significant impact on bank performance.

From the regression results, it can be concluded that adoption and increased usage of financial inclusion technologies have had a positive impact on bank performance as all the proxies of financial inclusion technologies, except for POS, had statistically significant and positive regression coefficients. Banks in Zimbabwe are lending less and less and their incomes are being driven more by non-interest income in the form of bank charges on the use of these payment or money transfer technologies. This has led these financial inclusion technologies significant in driving the performance of local commercial banks. the liquidity challenges which have been the order of the day in the country has led to increased use of these technologies save for ATMs and this has led banks to have high levels of non-interest income.

It is also important to note that both control variables (bank size as measured by total assets, and leverage) had no statistically significant regression coefficients. The probability values for the two variables were not significant even at the 10% level. Thus, it can be concluded that bank size and leverage have no impact on bank performance in the case of Zimbabwean commercial banks. This concurs with the findings from a study conducted by Kagecha (2014) which established that bank size, capital adequacy, liquidity, age and asset quality do not count in determining bank performance in Kenya. This implies that although scale economies are important for bank performance, local markets in Kenya do not always allow such scale economies to translate to higher profitability. This is also consistent with findings by Irawati and Marlina (2019) whose study analysed the impact of leverage, value-added and bank size on financial performance of Indonesian Shariah banking using data of 12 Shariah banks in Indonesia from 2012 to 2017. The study found that value-added, leverage and size have no significant effect on Return on Assets.

4.6 Chapter Summary

This chapter and presented the findings of the research in line with the methodology selected for the study. The chapter presented an analysis of the growth in the usage of financial inclusion technologies by banks as well as a brief analysis of the yearly performance of banks over the six-year period. The study went on to perform a descriptive analysis of the research variables to provide a summary of the research data. Diagnostic regression tests for heteroscedasticity, multicollinearity and serial correlation were performed to ensure validity and reliability of research regression results. Finally, the regression results were presented analysed and discussed. the chapter to follow presents the summary of research findings as well as the recommendations thereof.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

While chapter four presented and analysed the findings of the research according to the methodology prescribed in chapter three, this chapter presents an outline of the summary of the findings before concluding. The chapter then presents recommendations which in the opinion of the researcher would help banks and the country at large in terms of optimizing the benefits associated with financial innovations. Finally, the chapter provides suggestions for further research.

5.2 Summary and conclusion

The objective of the study was to discover the impact of financial inclusion technologies (POS, ATMs, Mobile banking and Internet banking) on the revenue performance of commercial banks in Zimbabwe, using panel regression analysis. The sample population included 13 commercial banks in Zimbabwe. Secondary panel data from 2013 to 2018 (6 years) was used for the study.

The findings of the research indicated that all the commercial banks in Zimbabwe at the time of doing this study were using POS, ATM, Mobile banking and Internet banking as they adopted digital forms of banking. This was as a result of the fact that the benefits associated with internet-based banking platforms were made aware to all bankers in the country. As such, there has been a continuous increase in usage of POS, Mobile banking and Internet banking over the 6 years which have had results analyzed. ATM's have declined in usage from the years 2017 and 2018. This was since banks would hardly be holding cash for withdrawals. In terms of financial performance, banks have been able to increase their annual return on assets invested between the years 2013 and 2018. The increase was met with increased investment in total assets over the entire period.

The regression results indicate that mobile banking usage has a positive impact on the performance of commercial banks in Zimbabwe. The variable has a regression coefficient of 0.0058, statistically significant at the 1% level. This implies that a percentage increase in the volume or in usage of mobile money platforms by clients will lead to a 0.6% increase in bank

performance. This finding concurs with previous studies that found that bank performance increased after the adoption of electronic payment technologies. Due to its convenience, mobile banking has enabled banks to improve their customer outreach, which has, in turn, increased banks' financial performance.

The study also found internet banking as a statistically significant driver of bank financial performance. The variable has a beta coefficient of 0.0054 and is statistically significant at the 1% level. This means that a percentage increase in the volume of internet banking will lead to a 0.5% increase in bank performance as measured by return on assets ceteris paribus. The results are in line with findings by Chaarani (2018) who in a study on the impact of technological innovation factors on the performance of Lebanese banks during an eight-year period, from 2010 to 2017, found that internet banking is a significant driver of bank performance in Lebanon.

The study also finds the usage of point of sale machines having a statistically significant and negative impact on the financial performance of Zimbabwean commercial banks. The variable has a beta coefficient of -0.0071 and is statistically significant at the 1% level. Thus, it can be concluded that a percentage increase in the volume of point of sale transactions will lead to a 0.7% decrease in bank performance as measured by return on assets, ceteris paribus. The results are consistent with the findings by Valahzaghard and Bilandi (2014), who in their study using 16 commercial banks found out that that usage of point of sale systems does not have a significant impact on bank performance.

The relationship between bank performance as measured by return on assets and automated teller machines proved to be the most significant with a positive impact on bank performance over the 2013 to 2018 period. The variable has a beta coefficient of 0.0099 and is statistically significant at the 1% level. This means that a percentage increase in the volume of point of sale transactions will lead to a 0.9% increase in bank performance as measured by return on assets, ceteris paribus. The variable had the highest impact on bank performance amongst the focus predictor variables, implying that automated teller machines are a significant driver of bank performance.

In conclusion, the adoption and increased usage of financial inclusion technologies, except for POS, by commercial banks in Zimbabwe has had a positive impact on bank performance. Considering the current currency crisis, banks in Zimbabwe are lending less and less and their

incomes are being driven more by non-interest income in the form of bank charges on the use of these payment or money transfer technologies. This has led these financial inclusion technologies significant in driving the performance of local commercial banks. Financial inclusion technologies are increasingly reducing the cost of serving customers and opening a potentially significant growth opportunity for banks. The use of financial inclusion technologies has not only increased revenue for banks, but for the government. It has greatly eased pressure on the RBZ to meet cash demands and has also presented a mode of revenue for the government through transaction tax.

5.3 Recommendations

- The research recommends banks to go a step ahead in being innovative through designing new products and customizing their offerings to meet consumer needs and the rapidly volatile economic conditions in Zimbabwe. There is a need for banks to structure inclusive financial products that are affordable and meet different consumer needs. This will require banks to carry out adequate research to obtain a deeper understanding of their consumers to provide a portfolio with a balanced mix of innovative products and services. This will help to enhance bank performance through increased net incomes. Moreover, the rapidly changing consumer preferences signify a rise in the demand for technology in the future. Therefore, banks should ensure the design of personalized products and services, which satisfy the growing demand, sufficiently.
- To increase awareness of the importance of digital banking to the customers of the banks, promotions and training should be considered where customers who transact using digital methods for the first time can participate in draws from which prices can be won. This will give a chance to the other customers to taste digital banking transacting, thereby having a platform to increase the net incomes of banks.
- There is a need for the government to provide regulatory incentives and create an enabling environment for banks to allow full financial inclusion and achieve vision 2030 goals through financial inclusion technologies. The Reserve Bank of Zimbabwe should allow for simplification of onboarding requirements and documentation for small balance accounts. The government of Zimbabwe should put in place sound

macro-economic policies for the whole economy to recover so that the commercial banks in Zimbabwe can fully utilize the benefits associated with digital banking.

- The study recommends that for banks to remain competitive, they should ensure high-quality customer service; personalized services, 24/7/365 availability of resources, quickened transaction processing, increased bank turnover and profitability, reduced marketing and advertising costs and expanded geographical reach. Banks should come up with low-cost innovative ways to reach their customers. This should be achieved through mobile banking application or further advancement of such applications where the technology is already employed. For example, they can introduce other services such as cash deposits and RTGS transfers on ATMs.
- Banks should ensure strong customer safeguards, especially an increase in the security of online-based transactions, which is a threat to technology use in banks. Implementation of stringent customer protection laws that enhance financial integrity, transparency, simplifying legal documents and an effective platform for grievances will go a long way in building trust in the financial system, thus encouraging greater use of financial inclusion technologies by consumers.

5.4 Research Limitations

The research had a few limitations, one of which included the fact that there were time constraints to undertake the study and limited scope. This limitation was overcome by starting the research early in the period set aside. The findings of the research covered only commercial banks in Zimbabwe. Zimbabwe has many other financial institutions using digital banking to service the population of Zimbabwe at large like building societies. It is not possible to tell from these findings whether the same findings would apply to all other financial institutions in Zimbabwe.

The research was limited in that it used secondary data without using primary data. This was a limitation in that we have not been able to hear the voices of officials of the banks who could have contributed valuable information useful in terms of answering research problems while achieving the objectives set for the study.

5.5 Areas of Further Research

The purpose of this study was to determine the impact of financial inclusion technologies on the revenue performance of banks using a sample of 13 commercial banks in Zimbabwe. The

study only covered 13 commercial banks in Zimbabwe which is not large enough to make conclusive remarks and reduces the power of universally applying the results. Thus, further studies should consider increasing the sample size to cover all banks in Zimbabwe to validate their findings.

There is also an opportunity for further research on the availability and support of technology by banks and their stakeholders. Based on this research, technology gives competitive advantage, further research would be important for the banks and stakeholders to establish whether they play an important role in supporting technology and technology-based innovations. Such research would also help policymakers in evaluating existing policies.

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APPENDICES

Appendix 1: List of commercial banks used in the study

1	AGRIBANK
2	Banc ABC
3	CBZ
4	ECOBANK
5	FBC
6	FIRST CAPITAL
7	METBANK
8	NED BANK
9	NMB
10	STANBIC
11	STANDARD CHARTERED
12	STEWARD BANK
13	ZB BANK

Appendix 2: Panel data for Stata analysis.

Bank	Year	POS	ATM	MB	IB	ROA	Total equity and liabilities	Total Assets	Liabilities
Agribank	2013	9568869	36330901	45232174	5585831	-0.05295	910.4674	910.4674	26982
Agribank	2014	33495377	1.56E+08	1.89E+08	36314381	-0.03445	1071.44	1071.44	98138
Agribank	2015	49989936	2.03E+08	2.45E+08	85731410	-0.02724	1502.214	1502.214	87078
Agribank	2016	92094406	34563214	3.17E+08	37898867	0.017636	1347.677	1347.677	90752
Agribank	2017	68734171	8327815	2.47E+08	1.86E+08	0.019002	418.6146	418.6146	67105
Agribank	2018	2.58E+08	4516540	1.41E+09	1.8E+08	0.040007	1426.273	1426.273	30356
Banc ABC	2013	45295945	45846137	70341649	38329737	0.022193	1292.243	1292.243	11149
Banc ABC	2014	1.6E+08	2.43E+08	2.94E+08	1.11E+08	-0.00952	812.4763	812.4763	101023
Banc ABC	2015	1.53E+08	2.29E+08	2.77E+08	96702633	0.003732	987.2925	987.2925	36719
Banc ABC	2016	1.86E+08	1E+08	2.47E+08	1.1E+08	0.005185	806.6618	806.6618	34452
Banc ABC	2017	1.38E+08	13041274	4.13E+08	2.41E+08	0.006697	2429.018	2429.018	21153
Banc ABC	2018	4.42E+08	5872135	1.14E+09	3E+08	0.018091	3182.133	3182.133	20915
CBZ	2013	1.13E+08	59974820	95521361	70293599	0.011199	111.8286	111.8286	70877
CBZ	2014	4.51E+08	3.3E+08	4E+08	3.81E+08	0.008949	786.7046	786.7046	27615
CBZ	2015	5.25E+08	4.27E+08	5.17E+08	1.81E+08	0.013911	0.0134	0.0134	32775
CBZ	2016	8.42E+08	3.56E+08	6.21E+08	3.91E+08	0.016647	1553.779	1553.779	133427
CBZ	2017	4.88E+09	64064994	2.08E+09	5.51E+08	0.00124	819.797	819.797	21957
CBZ	2018	1.79E+09	25445919	3.01E+09	1.51E+09	0.022749	553.1091	553.1091	12103
Ecobank	2013	8599847	26383154	1.07E+08	6186554	0.007819	98.374	98.374	13364
Ecobank	2014	51660585	3.69E+08	4.47E+08	52301612	0.016875	408.9594	408.9594	24899
Ecobank	2015	71997764	1.7E+08	2.05E+08	71762586	0.017785	619.9225	619.9225	53248
Ecobank	2016	1.71E+08	1.03E+08	7.86E+08	1.13E+08	0.020411	951.7192	951.7192	58797
Ecobank	2017	1.6E+08	21263406	2.87E+09	1.05E+09	0.035611	70.7262	70.7262	21947
Ecobank	2018	8.46E+08	11129818	7.2E+09	2.09E+09	0.037901	565.8485	565.8485	24944
FBC	2013	5615006	56514734	39613270	16228497	0.072957	874.5708	874.5708	59792
FBC	2014	1.06E+08	1.37E+08	1.66E+08	76305991	0.002095	1758.086	1758.086	41895

FBC	2015	1.05E+08	2.82E+08	3.41E+08	1.19E+08	0.018188	198.0377	198.0377	61836
FBC	2016	2.02E+08	1.89E+08	3.43E+08	2.07E+08	0.020149	313.1071	313.1071	0
FBC	2017	1.35E+08	29337582	8.83E+08	4.57E+08	0.01817	125.6478	125.6478	13088
FBC	2018	7.24E+08	14848204	3.16E+09	6.42E+08	0.028799	298.7353	298.7353	65994
First Capital	2013	25730438	74103504	69323223	5696561	0.008314	142.43	142.43	140
First Capital	2014	87264959	2.4E+08	2.9E+08	72245102	0.020462	543.888	543.888	12137
First Capital	2015	99451731	3.94E+08	4.77E+08	1.67E+08	0.010453	1039.585	1039.585	72887
First Capital	2016	2.14E+08	2.61E+08	4.97E+08	2.86E+08	0.022105	392.5043	392.5043	146876
First Capital	2017	1.62E+08	53095106	1.25E+09	6.1E+08	0.030143	185.9269	185.9269	19845
First Capital	2018	5.77E+08	13416593	4.35E+09	9.08E+08	0.035569	508.6977	508.6977	50207
Metbank	2013	12655589	25921809	4143941	10754741	0.008434	903.6079	903.6079	99808
Metbank	2014	42657930	14337448	17338665	31539929	-0.02969	520.2358	520.2358	50612
Metbank	2015	43417483	1.4E+08	1.69E+08	59112707	0.036017	15.2561	15.2561	48792
Metbank	2016	85975664	1.89E+08	1.19E+08	2.07E+08	0.004084	117.6975	117.6975	155898
Metbank	2017	82331507	18283147	4.97E+08	2.43E+08	0.016351	99.6087	99.6087	31188
Metbank	2018	3.36E+08	5903808	1.98E+09	3.61E+08	0.057324	204.863	204.863	12728
Ned Bank	2013	13154847	26945418	31395624	7271442	0.021705	695.9246	695.9246	0
Ned Bank	2014	54053207	1.09E+08	1.31E+08	48720566	0.026851	522.4738	522.4738	0
Ned Bank	2015	67068140	1.4E+08	1.69E+08	59052755	0.021808	2268.239	2268.239	0
Ned Bank	2016	1.33E+08	1.06E+08	2.27E+08	1.16E+08	0.013518	886.681	886.681	23438
Ned Bank	2017	92821083	12386040	9.34E+08	2.99E+08	0.016912	243.05	243.05	10578
Ned Bank	2018	3.58E+08	7272072	1.7E+09	6.79E+08	0.034943	2318.87	2318.87	9528
NMB	2013	19208867	45125285	61562113	15354310	-0.00072	308.2044	308.2044	35007
NMB	2014	80296339	2.13E+08	2.58E+08	66358998	0.004733	5816.24	5816.24	27103
NMB	2015	91348991	3.02E+08	3.66E+08	1.28E+08	0.018255	730.7778	730.7778	28616
NMB	2016	1.44E+08	43548337	3.18E+08	47751134	0.017313	324.6604	324.6604	10118
NMB	2017	1.04E+08	18262011	7.57E+08	4.01E+08	0.023636	463.8784	463.8784	40123
NMB	2018	4.43E+08	9748884	1.98E+09	5.5E+08	0.01949	439.1758	439.1758	60046
Stanbic	2013	35138721	78140271	1.06E+08	16004346	0.037281	466.9496	466.9496	13983

Stanbic	2014	1.76E+08	3.68E+08	4.45E+08	1.42E+08	0.031816	1345.816	1345.816	92262
Stanbic	2015	1.95E+08	4.47E+08	5.41E+08	1.89E+08	0.032865	385.7158	385.7158	100246
Stanbic	2016	3.69E+08	1.16E+08	6.44E+08	1.27E+08	0.025524	766.724	766.724	96309
Stanbic	2017	3.79E+08	53708067	3.52E+09	9.23E+08	0.017806	658.094	658.094	38748
Stanbic	2018	1.43E+09	22449673	2.85E+09	2.56E+09	0.022183	1602.223	1602.223	56336
Standard chartered	2013	36605192	1.01E+08	1.33E+08	11745487	0.018145	884.3974	884.3974	51805
Standard chartered	2014	1.4E+08	4.59E+08	5.55E+08	98023882	0.013744	893.5098	893.5098	40545
Standard chartered	2015	1.35E+08	5.04E+08	6.1E+08	2.13E+08	0.001059	555.736	555.736	15049
Standard chartered	2016	2.2E+08	3.19E+08	6.78E+08	3.5E+08	0.025077	417.8576	417.8576	19934
Standard Chartered	2017	2.13E+08	35805378	1.43E+09	4.1E+08	0.013182	562.0204	562.0204	10884
Standard chartered	2018	7.64E+08	9983263	7.96E+09	1.04E+09	0.01956	943.9674	943.9674	15924
Steward	2013	8872403	11360615	60016914	2860160	-0.33504	416.562	416.562	30687
Steward	2014	57712304	2.08E+08	2.51E+08	39280905	0.039048	128.588	128.588	1046.27
Steward	2015	54073617	2.06E+08	2.49E+08	87050355	0.01856	2755.782	2755.782	72866
Steward	2016	79625047	2.21E+08	3.99E+08	2.42E+08	0.030848	1544.189	1544.189	98372
Steward	2017	1.04E+08	59182443	1.75E+09	1.08E+09	0.047846	197.904	197.904	29194
Steward	2018	5.89E+08	26389768	2.91E+09	1.27E+09	0.043652	212.176	212.176	26564
ZB Bank	2013	20105552	72661801	98471286	14350116	0.000392	214.5004	214.5004	10354
ZB Bank	2014	86873813	3.41E+08	4.12E+08	67436534	-0.01565	258.539	258.539	3726
ZB Bank	2015	92832315	4.36E+08	5.28E+08	1.85E+08	0.006725	208.215	208.215	86739
ZB Bank	2016	1.6E+08	2.45E+08	6.17E+08	2.69E+08	0.018076	249.142	249.142	10276
ZB Bank	2017	1.15E+08	41216344	1.37E+09	5.7E+08	0.024239	185.1608	185.1608	38637
ZB Bank	2018	4.34E+08	13866347	4.5E+09	9.99E+08	0.026236	265.2154	265.2154	274.0358