UNIVERSITY OF THE WESTERN CAPE

ESSAYS ON FINANCIAL INCLUSION IN SOUTH AFRICA

by

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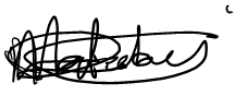
Declaration

I declare that "*Essays on financial inclusion in South Africa"* is my own work, that it has not been submitted for any degree or examination in any university, and that all the sources that I have used or quoted have been indicated and acknowledged by complete references.

Velenkosini Matsebula

Signature: 

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Abstract

South Africa is known to be troubled by numerous persistent economic problems of inequality, poverty and high unemployment. The country is simultaneously praised for a well-developed financial sector that provides a sophisticated array of financial products. Financial inclusion plays an important role to eradicate poverty and boost economic prosperity, yet financial inclusion is an under-researched topic in South Africa. With the growing recognition of the role financial inclusion plays on the economy, considerable increase in empirical work that seeks to examine its relationship with economic development has also been seen. A rather abandoned area is the macroeconomic relations of FI, particularly due to the fact that, until recent, there was little to no macroeconomic data on FI. This study adopts a threefold approach in examining FI in South Africa.

The first part of the study examined the usage of financial services and products using the first four waves of the National Income Dynamics Study (NIDS) data. OLS and Probit regressions are conducted to examine the impact of various personal- and household-level characteristics on the financial inclusion index and the probability of households being completely financially excluded, respectively. The second part of the study utilizes a vector autoregressive (VAR) model to analyse the relationship between financial inclusion and macroeconomic stability in South Africa, using quarterly time series data from year 2004 to 2019. To measure macroeconomic stability, the study used two macroeconomic factors, namely output and inflation, and commercial bank branches per 100,000 adults (CBB) was used as a measure of financial inclusion. The third and final part of the study employs the Engle-Granger approach to Error Correction Model (ECM) to examine the relationship between financial inclusion and financial stability in South Africa using quarterly time series data from year 2004 to 2020. The study uses two different variables to measure financial inclusion, namely Commercial bank branches per 100,000 adults (CBB) and number of ATMs per 100 000 adults (ATMs), which will be regressed separately against Bank Z-Score (BZS) used as a measure of financial stability.

The first part of the analysis finds that households headed by more educated, older individuals enjoyed significantly higher financial inclusion index, whereas households residing in rural areas, mostly constituted by black people, in Eastern Cape, KwaZulu-Natal and Limpopo, with low real per capita income and fewer employed members, were associated with a significantly

greater likelihood of complete financial exclusion. The empirical findings suggested that poverty was associated with financial exclusion, including discrimination by banks against the poor. Not only is financial inclusion observed to be associated with systemic inequalities in South Africa, there is also a clear need for its pursuit that is aimed at avoiding the widening of inter-group inequalities. These findings call into question the holy grail in development economics.

The second part finds a positive relationship between financial inclusion and output, a 1% increase in Commercial bank branches per 100,000 adults causes output to increase by 0.04%. Financial inclusion is also found to have a positive impact on inflation in the long run. Important policy implications from this chapter points to the importance of financial inclusion in impacting output and inflation and the need to find a balance between financial inclusion and inflation control. As such, Macroeconomic policy maker can use financial inclusion as a tool to retain macroeconomic stability.

The final fold of the study finds quite broad results, higher levels of financial inclusion either, positively or negatively impact financial stability, depending on the type of financial inclusion initiative. Recommendations emanating from this study were that financial inclusion should be considered as a key instrument to strengthen the foundation of building a stable financial system. Moreover, financial inclusion can be used to manipulate the stability of the financial system.

Keywords: Financial Inclusion; Macroeconomic Stability; Financial Stability; South Africa
JEL Codes: B22, G10, G20, G32, E5

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Finally, I would like to pass my deepest gratitude to my late father, Mr Nicholas N Matsebula for challenging me to do my PhD, your wisdom sparked my academic flame Mkholo**.**

Dedication

I dedicate this project to my children Sphumelele, Nkosinathi and Lutsandvo Matsebula, my late fathers Mr NN Matsebula and Mr JB Matsebula, as well as my entire family.

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List of Abbreviations

AIC	Akaike Information Criterion
ADF	Augmented Dickey-Fuller
AFI	Alliance for Financial Inclusion
ARMA	Autoregressive Moving Average
ATM	Automatic Teller Machines
BRICS	Brazil, Russia, India, China and South Africa
BZS	Bank Z-Score
CBB	Commercial Bank Branches
CPI	Consumer Price Index
CUSUM	Cumulative Sum
DIC	District Industries Centre
ECI	Error Correction Term
ECM	Error Correction Model
EXC	Exchange Rate
FA	Financial Analysis
FAS	Financial Access Survey
FE	Financial Exclusion
FEVD	Forecast Error Variance Decomposition
FI	Financial Inclusion
FII	Financial Inclusion Index
FII	Foreign Institutional Investors
FPE	Final Prediction Error
FSB	Financial Stability Board
GDP	Gross Domestic Product
HDI	Human Development Index
HQ	Hannan-Quinn Information Criterion
IES	Income and Expenditure Survey
IMF	International Monetary Fund
JB	Jarque-Bera
MCA	Multiple Correspondence Analysis
MENA	Middle East and North Africa
NIDS	National Income Dynamics Study

NPL	Non-Performing Loans
OIC	Organization of Islamic Corporation
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PP	Phillips Perron
SADC	Southern African Development Community
SALDRU	Southern Africa Labour and Development Research Unit
SARB	South African Reserve Bank
SC	Schwarz Information Criterion
SME	Small and Medium Sized Enterprises
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
WB	World Bank

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CHAPTER ONE: INTRODUCTION

1.1 Background and Context of the Study

Financial inclusion (FI) remains a topic of concern for the global community, governments, financial institutions, banks and policy makers. In fact, the body of research on the subject has grown in the recent years. One of the reasons why FI has sparked so much interest is that, it has been identified as a matter that is associated with positive results for economic development, economic growth, transformation, development and growth of small and medium businesses as well as probability of the poor to participate in the mainstream financial sector (Demirguc-Kunt & Klapper, 2012).

In the case of South Africa, despite its well-developed financial sector, the issue of FI is quite complex. Research on FI indicates that adoption of financial products is not an issue in South Africa, but the main problem is the actual usage and sustainability of these services (Kessler et al., 2017). Factors relating to costs and convenience of using financial products are seen as the reasons leading to the lack of sustainable use of financial products or services. Statistics show that over 70% of South African adults at least have a transaction account, which, if not for the lack of usage, would indicate that the country is somewhat more financially inclusive compared to counterpart countries, particularly considering that an account is a very important instrument of financial inclusion.

South Africa is also troubled with high rates of poverty, inequality and unemployment. High inequality and poverty rates are the legacy of the apartheid era, which perpetrated a system of exclusion based on race and class. This has seen majority of South Africans pushed into underpaying jobs, homelessness, unemployment, lack of basic services, shacks, and overall poverty. Since the end of apartheid more than two decades ago, the country has attempted measures to address the issues. However, recent statistics show that over 27% of the country's workforce remain unemployed and almost 50% of the population is living under chronic poverty. South Africa is also regarded as one of the most unequal economies in the world, with a Gini coefficient of 0.63 (Sulla & Zikhali, 2018; World Bank, 2018).

With the growing recognition of the role financial inclusion plays on the economy, considerable increase in empirical work that seeks to examine its relationship with economic development has also been seen. A rather abandoned area, particularly due to the fact that, until recent, there was little to no macroeconomic data on FI, is the macroeconomic relations of FI. Existing literature seems to show financial relationship to have a rather complex link to macroeconomic and financial stability. While there is a school of taught that advocates that increased financial inclusivity brings about growth and stability to the market and financial sector, there are also those who argues otherwise (Morgan and Pontines, 2014; Sarma & Pais, 2011). Argument from opposing point of view submit that vast access to finance, and thus FI, will brings about risks for economic and financial stability (García,2006). For the South African economy, the story of this relationship is yet to be told.

This study adopts a threefold approach in examining FI in South Africa. The first focus will be on the usage of financial services and products to study the extent and trend of FI in South Africa. The second fold looks at the relationship between FI and macroeconomic stability, and lastly it looks at how FI affects financial stability in South Africa. In so doing, FI in South Africa is examined from both a micro and macro-economic perspective.

1.2 Problem Statement

South Africa has one of the most sophisticated financial sectors in the world, that provides advanced series of financial products, ranging from insurance, to lending and borrowing. Through the sector, customers are presented with a range of options they can utilise to better their daily consumption practices as well as manage risk. Above all this and as previously stated, literature shows that a sound financial system contributes positively to economic growth and development. It also helps reduce poverty and inequality.

In South Africa, however, while there is a high rate of adoption of financial products compared to other developing countries (making it appear as if most people are banked on the surface), the usage of these products is very low, and the country largely remains a cash society (Kostov et al., 2015). It is mostly because consumers have little trust in financial services and are wary of service fees (Kessler et al., 2017). Majority of the options supplied by the financial sector in South Africa, are mainly for those households who are earning at the upper end of the income distribution who can afford these products.

Generally, such formal financial inclusion products are offered by commercial banks and other regulated financial service providers. The problem that most emerging economies face is that, commercial banks traditionally do not provide services to consumers who are regarded as uncreditable or not credit worthy and these mainly consist of emerging or small entrepreneurs, low-income earners and the poor (Schoombee, 2004). It is because of the high cost that comes with the risk of rendering financial services to this group, namely unbanked, that makes it unattractive. It is only until the beginning of the 1990s that commercial banks considered entering this segment of the market and become more open in offering some of their goods and services to the unbanked population (Schoombee, 2004). While the number of unbanked adults decreased from 17 to 14 million between 2003 and 2017 (Schoombee, 2004; Statistics South Africa, 2018), the latter number remains high, representing 38% of the working-age population.

There is also a growing debate and differing views on the macroeconomic impacts of FI, especially for developing countries. Empirical evidence shows that increased FI leads to improved economic growth, SMEs development, accelerates transformation and advances the ability for the poor segments of the population to partake in the financial sector (Demirguc-Kunt & Klapper, 2012), While at the same time, there are sentiments that vast financial inclusivity may bring about potential market instabilities Garcia (2016). There is also a concern that, increased financial inclusivity poses a threat for the economy's financial stability, especially in developing economies (WB 2011). There is a need to investigate thoroughly the relationship FI has with macroeconomic and financial stability, particularly since this space is very under-researched, due to the lack of data on this subject.

1.3 Objectives of the study

The main objective of this study is to conduct three quantitative essays aimed at examining the impact of financial inclusion on economic growth and development in South Africa. The following specific objectives are observed:

- To utilise the first four waves of the National Income Dynamics Study (NIDS) data to conduct comprehensive descriptive and econometric analysis aimed at examining the impact of various personal- and household-level characteristics on the financial inclusion index and probability of households being completely financially excluded, respectively.

- To analyse the relationship between FI and macroeconomic stability in South Africa.
- To examine how FI affects financial stability in South Africa.

1.4 Significance of the study

The FI question is distinctly topping the list of many countries' agendas and has become a key issue of concern on a local and international scale. However, due to its multinational nature, the effects of FI both on a microeconomic and macroeconomic perspective are somewhat not easily measurable, it greatly depends on the FI dimension being observed. As such, large literature gaps on FI still exist, especially its macroeconomic effects, which is also largely due to the shortage of macro-level data supply prior to the 2007 financial meltdown. This study is significant as it will contribute to the growing body of empirical literature on FI and help address the shortage of research on the effects of FI both on a microeconomic and macroeconomic level, especially in emerging economies such as South Africa.

Understanding the microeconomic and macroeconomic effects of financial inclusion is crucial as existing literature from developed economies shows differing sentiments on whether or not financial inclusion increases economic growth, improves the standard of living of individuals, or improves the stability of financial systems (Pham & Doan, 2020; Sahay et al., 2014; Sarma & Pais, 2011; Demirgüç-Kunt et al., 2017).

CHAPTER TWO: AN ANALYSIS OF FINANCIAL INCLUSION IN SOUTH AFRICA[1]

2.1 Introduction

Financial inclusion has become a topic of interest for the global community, governments, financial institutions, banks and policy makers. Most established economies have acknowledged the social and political importance of financial inclusion, which has become one of the key socioeconomic challenges on the agenda of major institutions in most economies globally. Widely regarded as a path for pursuing inclusive development, achieving universal financial inclusion is one of the World Bank's objectives to be achieved by the year 2020 (World Bank, 2018).

South Africa provides a good test case for these claims. Not only is the country one of the most unequal, it has also developed the most complex financial system in Africa. Research has shown that 70% of South African adults have transaction accounts (Kessler et al., 2017), a very important instrument of financial inclusion, and this indicates the country is somewhat financially inclusive, compared to other counterpart countries. While this may be evidence of the adoption of financial products, usage and sustainability of such products is weakened by factors relating to costs and convenience. As a result, the country remains mostly a cash society (Kessler et al., 2017). The weak usage of financial products shows that there is a need to investigate the usage of financial products in the country.

The benefits of a financially inclusive environment are not only seen through direct access to financial service and its subsequent use, it is also very visible through the not so direct but positive impact that financial development has on the population at the lower end of income distribution, especially through labour markets. This has been shown by empirical studies that the regulation of bank branching does not only provide a conducive environment in which banks are able to showcase their performance and competition, but also positively impacts the income of the poor, while in the process intensifying income distribution through increasing relative wages and hours work for the less skilled labour (Jayaratne & Phillip, 1996).

[1] Chapter two of this work has been published as: Matsebula, V. & Yu, D. (2020). An analysis of financial inclusion in South Africa. African Review of Economics and Finance. 12(1): 171-202. An approval to have this work as a chapter of the dissertation was obtained from the journal editor.

It is, however, very important to point out that, the relationship between financial development and economic development seems quite unclear, as the literature also shows both in South Africa and internationally. Financial development does not always lead to economic development, at times the poor are left worse off after some financial development initiatives (De Haan & Sturm, 2017; Bateman, 2019). In fact, the reality that South Africa has a very sophisticated financial sector and high levels of poverty makes this relationship questionable.

Nonetheless, the role played by the financial system is often said to be axiomatic, with research (Babajide et al., 2015) suggesting that it improves economic development and grows productivity through financial intermediation by channelling money or income from the surplus units to deficit ones. Poverty and inequality are reduced through financial inclusion, this is because, people can invest in their future, smoothen consumption and manage financial risks better when financially included (Demirguc-Kunt et al., 2017). Even financial assets that are not necessarily large in size provide individuals with cushion that protects them from economic shocks and the possibility of income loss later in life. Research has also shown that financial exclusion can deprive households from taking part in various ways of saving and limit their ability to accumulate wealth (Searle & Koppe, 2014). This can range from interest earning to saving through paying bills via direct debit, as well as having access to favourable credit (Kempson & Collard, 2012). Access to financial services such as credit is usually said to improve the quality of life for poor households in South Africa (Ntsalaze & Ikhide, 2016).

However, such formal financial inclusion products are generally offered by commercial banks and other regulated financial service providers. The problem that most emerging economies face is that, commercial banks traditionally do not provide services to consumers who are regarded as uncreditable or not credit worthy and these mainly consist of emerging or small entrepreneurs, low-income earners and the poor (Schoombee, 2004).

It is because of the high cost that comes with the risk of rendering financial services to this group, namely unbanked, that makes it unattractive. It is only until the beginning of the 1990s that commercial banks considered entering this segment of the market and be more open in offering some of their goods and services to the unbanked population (Schoombee, 2004). While the number of unbanked adults decreased from 17 to 14 million between 2003 and 2017 (Schoombee, 2004; Authors' calculations using the 2017 General Household Survey (GHS)

data released by Statistics South Africa, 2018), the latter number remains high, representing 38% of the working-age population. With the emergence of the National Income Dynamics Study (NIDS) as an alternative data source, this study aims to examine the extent and trend of financial inclusion in South Africa in 2008-2015, focusing on usage of financial services and products. We found that households headed by more educated, older individuals enjoyed significantly higher financial inclusion index, whereas households residing in rural areas, mostly constituted by black people, in Eastern Cape, KwaZulu-Natal and Limpopo, with low real per capita income and fewer employed members, were associated with a significantly greater likelihood of complete financial exclusion. Lastly, the empirical findings suggested that poverty was associated with financial exclusion, including discrimination by banks against the poor. Not only is financial inclusion observed to be associated with systemic inequalities in South Africa, there is a clear need for it to be pursued in a manner that avoids the widening of inter-group inequalities. These findings call into question the holy grail in development economics, complementing recent critiques, is Obeng-Odoom (2018) who argues that it is out of touch with the realities in Africa. These findings are fleshed out in the following three sections.

2.2 Literature review

2.2.1 Conceptual framework

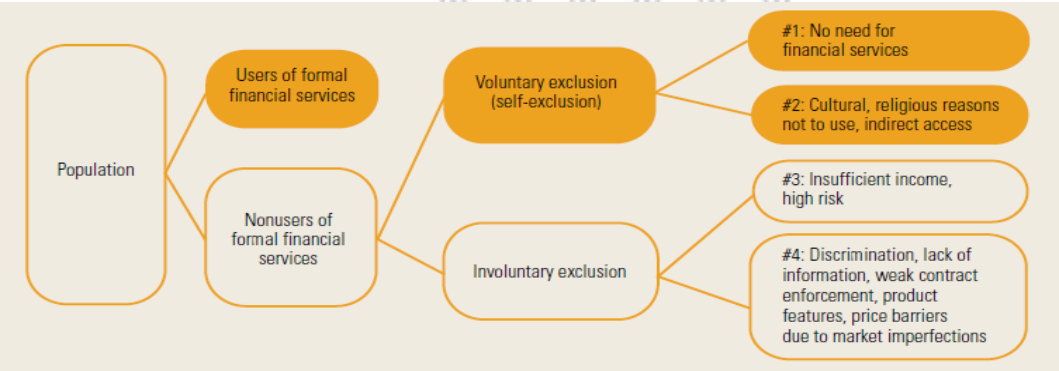
Financial inclusion is defined by scholars in different but related ways. Kim, Yu, and Hassan (2018) distinguish financial inclusion as the ease of accessibility and availability of the formal financial services; Sinclair et al. (2009) define it as the ability to access essential financial services in an appropriate form, whereas the World Bank (2008) claims that financial inclusion means the absence of price barriers in the use of financial services (i.e. broad access to financial services and products). Access to financial services refers to the supply of these services, while use of these services is determined by both demand and supply factors (World Bank, 2008).

There are some complications that come with understanding financial inclusion. One challenge is to distinguish individuals who are involuntarily from those who are voluntarily financially excluded (World Bank, 2008). The latter group refers to those who are excluded because they are poor or regarded as asymmetric problems, and those who are excluded as they see no need for the financial services or choose not to use the services due to cultural or religious reasons

(Demirgüç-Kunt et al., 2008). As such, through these concepts a bridge is created between those who have access to financial services and those who are the actual users of these services.

Figure 2.1 provides a clear picture of access to and use of financial services. It expresses the narrative that some consumers may be excluded involuntarily from using financial services. One prominent group is comprised of households and firms that were earlier distinguished as unbankable. This group is excluded as it does not have sufficient funds income or represent a lending risk that is seen to be excessive. In this case, market and/ or government failure are not the causes for lack of use. Another group stands for those who may not have access due to other reasons, ranging from discrimination, contract enforcement shortcomings, lack of information, an environment with lack of information and shortcomings in product features that may make a product seem inappropriate to customers, to price barriers due to market imperfections, religion, regulations that are ill-informed, culture and political capture of regulators (World Bank, 2014).

Figure 2.1: Use of an access to financial services



Source: World Bank (2014:16).

In South Africa, while there is a high rate of adoption of financial product compared to other developing countries, making it appear as if most people are banked on the surface, the usage of these products is very low, and the country largely remains a cash society (Kostov et al., 2015). This is mostly due to the fact that consumers have little trust in financial services and are wary of service fees (Kessler et al., 2017). This trajectory is also pointed out by Kostov et al. (2015), when studying the contribution of the Mzansi account initiative to financial inclusion in South Africa, they point out that, the Mzansi account only addresses the penetration question and it is not sufficient to cater for the unrealised demand for financial services for the people it is directed to.

A somewhat more detailed definition of financial inclusion can be extracted from Finscope (2010). According to that study, two groups are distinguished, based on the usage of financial products: financially included and financially excluded. The former represents adults who have or use financial products and services in either the formal or informal sector, while the latter refers to individuals who do not have or use any financial products and services. The financially excluded segment manages their financial lives without using any financial mechanism external from their personal relationships.

The financially included is further divided into two groups: the formally served and informally served segments. The first group represents individuals who have or use financial products and services provided by a financial institution (e.g. banks), whereas the second group includes those who have or use financial products and services which are not regulated (e.g. private money lenders) (Grundling and Kaseke, 2010). In South Africa there is a high participation in the informal financial market, especially within the Africans (Ardington et al., 2004). Informal credit from loan sharks, stokvels and between family and friends make up a fraction larger than the formal channel in the local credit market. In fact, the South African informal personal credit growth rate is higher than that of the country's GDP (World Bank, 2016; Abrahams, 2017).

2.2.2 Theoretical framework

Stiglitz and Weiss (1981) develop a prominent theory of financial inclusion known as credit rationing. This theory essentially speaks to the act of providers of credit (banks) limiting the supply of additional funds to borrowers who demand credit, even though the borrowers are willing to pay at a higher interest rate. The theory depicts that, in the presence of imperfect information, a competitive loan market may be characterised by credit rationing. This suggests that among borrowers of the same identity, some receive loans while others do not, even though the rejected potential borrowers can pay higher than the market interest rate. There are two reasons why banks would not raise interest rate for borrowers as a response to the excess demand for loanable funds: at a higher interest rate the non-risky borrowers are discouraged from borrowing, thereby resulting in a higher loan default risk; secondly, a high interest rate leads to borrowers investing in riskier projects. While the lack of access to credit does not necessarily suggest that one is financially excluded, credit is a very important financial inclusion variable and has been observed to improve the lives of poor households, as shown by Ntsalaze and Ikhide (2016).

The theory also argues that in the existence of excess demand for credit, some unsatisfied borrowers bargain to borrow at a higher interest rate. The banks would, however, not lend to these borrowers, because they know that the borrowers undertake a riskier project when facing higher interest rate or that there is a change in the mix of people applying for the loan. In either case, a higher interest rate lowers the bank's expected return (Stiglitz and Weiss, 1981). Credit rationing is therefore an outcome of the sorting and incentive effects of interest rate, as this rate affects quality of the loan, but doesn't clear the market.

Other theories of financial inclusion are, amongst others, the free market model and the theory of asymmetric information. According to the free market model, the market economy has an inherent tendency to move closer to Pareto optimum. If the government intervenes, the economy is taken away from the path of attaining growth followed by the removal of all type of imbalances (Kumar, 2013). Regarding the theory of asymmetric information (Stiglitz, 1975), absence of correct information may lead to financial exclusion. Information tends to be asymmetric when one party has more information about a financial product; should the situation persists, it adversely affects the exchange of financial products in the economy. As a result, some groups of individuals are denied usage of these products (Stiglitz, 1975). Another way in which imperfect information exists is the case where the potential borrowers provide misleading credit worthiness information to lenders and in so doing raising the loan default rate. This results in financial institutions being extra vigilant and end up excluding people who would otherwise be included.

2.2.3 Review of past empirical studies

At the time of writing, only few local studies were conducted to briefly examine financial inclusion using the NIDS data, but none of these studies used a vast cohort of financial inclusion related variables to develop an index that captures the subject in depth. First, Nyaruwata and Leibbrandt (2009) provide a descriptive overview of the NIDS data on personal debt and access. The study only used the wave 1 data to examine personal debt and access to finance with a specific focus on race. They found that 90% of white-headed households had access to a bank account whilst this proportion was 43% for African-headed households. A greater proportion of white households had private pensions (29%) and investments (11%) compared to African households (3% and 1% respectively). Also, 26% white households

reported they had a bond compared to 4% of African respondents. Ocran (2015) used the same data to conduct a logistic model focusing specifically on the likelihood of holding risky financial assets (which included direct ownership of unit trust and shares) and found that this probability was significantly higher for married high-income earners with at least Matric.

Orthofer (2016) used the wave 2 NIDS data together with a novel sample of almost 1.2 million personal income tax records in the 2010-2011 fiscal year to specifically assess the South African wealth distribution. The author found that the wealth share for the top 10% of the population was about 95%. The study also derived total wealth by considering individual assets on pension/life (private pension, life insurance), other financial items (cash on hand, bank account, trusts, stocks, shares) and non-mortgage liabilities (personal loan, study loan, vehicle finance, hire purchase, credit card, store card, Mashonisa loan, micro loan), as well as household-level wealth (real estates, livestock, mortgages). Wealth was found to be more unequally distributed compared to income distribution. While the author conducted a fairly good assessment of wealth, however, the study did not comprehensively investigate the extent of financial inclusion and profile of people who were financially excluded.

The deeper impact of the effects of financial services on the livelihood of the less privileged was observed by Ntsalaze and Ikhide (2016). The authors also used the NIDS data to study financial inclusion by looking at the effects of household indebtedness threshold on multidimensional poverty in South Africa. They found that a debt threshold below 42.5 percent of income was important for improving the welfare of households. Hence the authors argued that appropriate levels of debt should be encouraged as it smoothens consumption and improves the quality of life of many households. The study also showed that government grants were not an effective tool to eradicate multidimensional inequality in South Africa.

Empirical literature also shows that, while it may be, as indicated by Ntsalaze et al. (2016), that while access to credit plays an important role in eradicating poverty and empowering disadvantaged groups, the control of the distribution of such a service is even more important, as it can lead to over-indebting and exploitation of the impoverished group (Bateman, 2019). The 2019 Bateman study conducted a post-apartheid microcredit experiment in South Africa, to examine the effect of the microcredit institutes in the betterment of the previously disadvantage population, particularly the black South African community. The study revealed that the microcredit channels that were apparently directed at improving the lives of the poor

post-apartheid era were rather impoverishing them. It is particularly because these channels were set to deliberately benefit the tiny financial elites who operated these institutions, which has led to the indebtedness and worsened conditions for black South Africans. The study further expressed that this has also dispossessed the black community of their scarce financial resources, opportunities and livelihoods.

Bateman (2019), also emphasises that, while the micro lending model may have seemed to initially make policy sense, it has in recent years proven to, in practice, have zero impact on poverty reduction. In fact, the only people who, in practice, benefit from microcredit is mainly the elite who are in finance and business supplying microcredit to the poor, and the political elites, who implement neoliberal policies in favour of microcredit.

Financial development in South Africa has many advocates, but so are its critics. The country has one of the most sophisticated financial sectors in the world, hence it is no surprise that there have been several financial inclusion initiatives adopted over the recent years. However, such initiatives, in particularly Shoprite and Pick'n Pay money transfer as well as the Mobile banking platforms (M-Pesa, FNB e-wallet, Standard Bank and Capitec money transfer, etc.) are mostly providing services as payment platforms, and do not offer other important financial services such as saving and accessing credit (Abrahams, 2017), which also make it appear as if most people are financially included on the surface, while these products are mainly used only for cash transfer purposes. Wentzel et al. (2016) argue that the difference in geographies and socioeconomic conditions is the reason why the impact of financial inclusion on the livelihood of the poor often varies.

The effect of spatial externalities on financial development is observed by Bara et al. (2017). The study analyses the effect of spatial externalities on the Southern African development community (SADC) region's financial development and the results show that, in South Africa, the financial development is spatiality responsive. However, the responsiveness differs according to the particular aspect of financial development. It indicates that monetary measures, particularly, Liquid Liabilities and Broad Money are highly responsive to proximity and elicit positive spatial economies of scale. The Finscope survey has dedicated itself in making financial inclusion data available in Africa, while the Global Findex has done so on a global scale. For this reason, the majority of the empirical work done on financial inclusion internationally used the Global Findex data and the Finscope has been fairly used locally as

well around the African continent. In terms of local studies, Makina et al. (2015) used the Finscope Small Business Survey to analyse the effect of access to credit on firm size. The study discovered that access to formal credit by small- and medium-sized enterprises (SMEs) constituted as sole proprietorship had a positive relation with firm size. It was also found that informal credit access had no significant effect on the size of SMEs. A general observation was that access to credit, whether formal or informal, had a local dimension. Access to formal credit was more prominent in the SMEs in the more urbanised provinces, while those in rural provinces relied more on informal credit. The authors argued a fairly clear narrative of firms' access to credit. However, being a firm-level study, it did not really investigate the extent of financial inclusion and the characteristics of financially excluded individuals.

Ardington et al. (2004) reviewed the extent of financial inclusion in three broad areas, namely savings, insurance and debt. The review essentially summarised literature that was available in South Africa over the post-apartheid period and prior to 2004. The review indicated that the formal matrix of savings, lending and insurance institution did not cater for poorer households and the situation worsened over time, especially in rural areas. Moreover, households with access to at least one form of savings institutions were able to access other additional forms of savings, borrowing and insurance institutions; in contrast, those households without access to at least one form of financial institution tended not to have access to any form at all. Ardington et al. (2004) support the findings by Bateman, (2019), that the poor households were left worse off by the financial inclusion channels initiated post the apartheid period. This dynamic entrenches inequality which, in turn, weakens financial development (Gwama, 2014).

The Ardington et al. (2004) study further shows that informal traditional options of saving and borrowing (such as stokvels) were accessed mainly by Africans who resided primarily in rural areas. The literature, however, indicated that access to stokvel was significantly low across all income deciles; it was mainly accessible to households in the middle of income distribution and those in the bottom decile were excluded. Households in bottom deciles were the largest group that purchased funeral insurances and mainly through membership of burial societies as opposed to formal funeral insurance policies. One shortcoming of the Ardington et al. study is that, while it provides detailed review on access to basic financial inclusion services, it is somewhat outdated and did not thoroughly investigate the usage of basic financial services. Comparable studies in Africa are rare, although ethnographic studies that are similarly spirited can be found elsewhere in Africa (see, Kotir, and Obeng-Odoom, 2009)

At the international level, financial inclusion is mostly observed in comparison with other countries. Honohan and King (2009), for instance, used the Finscope survey to explore the potential of the data on a cross-country analysis and review the nature of evidence that has been assembled. The study revealed an overall low penetration percentage, with an average of 29% banked across the aggregate sample (it was 15% in Rwanda and 62% in South Africa). There was evidence of a positive correlation between mean income and penetration, and the proximity of households to financial services played a crucial role in the usage of these services. The study further regressed several demographic variables against the probability of being unbanked; it was found that highly educated middle-aged individuals with mobile phones enjoyed a significantly greater likelihood of being banked. The empirical findings also indicate that trust in banks, financial sector knowledge and broader economic infrastructure increased the likelihood of being banked.

Demirgüç-Kunt et al. (2017) conducted an overview of financial inclusion globally and review of recent empirical evidence on how usage of financial products may contribute to inclusive growth and economic development. The evidence suggests that financial inclusion allows individuals to efficiently and safely conduct their daily transactions and broadens their investment and options of financial risk management through the use of formal financial system. In addition, use of certain financial products such as digital payment and inexpensive savings account was more effective in reaching development goals (e.g. reducing poverty and inequality), as compared to other financial products.

Other international empirical research conducted either across countries or in comparison with other countries, generally found financial inclusion to play a major role in economic development and growth. Usage of financial products from the formal financial system in particular was found to have a positive and significant effect on eradicating poverty, reducing inequality gaps and improving people's standard of living. Fungáčová and Weill (2015) analysed China's financial inclusion in comparison to other BRICS countries, using the World Bank's Global Findex (2011) database. The study found that there was greater financial inclusion resulting from the use of formal savings and formal account in China than other BRICS countries and the financially included were able to invest in education and launch their own businesses, thereby leading to poverty reduction and economic growth. Furthermore, the more educated, older males and high-income earners were significantly associated with greater

usage of formal accounts and credit in China, whilst use of alternative channels of borrowing was highly influenced by education and income.

The findings of Fungáčová et al. (2015) were confirmed by Zins and Weill (2016) who used the same data source to investigate the determinants of financial inclusion in thirty-seven countries in Africa. They found that older and more educated male high-income earners were significantly more likely to be financially included. There was also a difference between determinants of informal finance and formal finance, and that mobile and traditional banking were driven by similar determinants. The study emphasised the need for the design of policies aimed at fostering financial inclusion in Africa and that there was a high use of informal financial services in the continent, whereas informal finance was found not to be a substitute of formal finance in all financial inclusion aspects in Africa.

Another general observation from empirical literature that seek to study or compare financial inclusion across countries is that, financial inclusion was mostly found to be low in underdeveloped economies, as compared to advanced economies. This is also shown by Sarma and Pais (2011), who derived a financial inclusion index (FII) at country level for 49 countries and compared it to the Human Development Indices (HDIs). The study found that countries with high and medium FIIs belonged to the group that was classified as countries with high human development (HDI > 0.7). Sarma (2012) derived the same FII as proposed by Sarma and Pais (2011) for 94 countries in 2004-2010. A general improvement in the level of financial inclusion took place during the period, as average FII increased from 0.373 to 0.478. While low-income and lower middle-income countries dominated the low FII countries, the medium and high FII countries were dominated by upper middle- and high-income countries. Hence, financial inclusion and income levels in general moved in the same direction.

Park and Mercado (2015) adopted a similar approach to derive the FIIs for 37 Asian countries, to study the link between financial Inclusion, poverty and inequality at country level. Higher per capita income, sound rule of law, large population size, low dependency ratios, good governance and high institutional quality had significant positive impact on financial inclusion. Also, financial inclusion significantly reduced poverty and there was some evidence on the role of financial inclusion to reduce income inequality. Finally, Kim, Yu and Hassan (2018) provided evidence on mutual causal relationship between financial inclusion and economic growth, in filthy five countries affiliated with the Organization of Islamic Cooperation (OIC).

Hlophe (2018) investigates whether financial development translates into financial inclusion in the Kingdom of Eswatini right next to South Africa. The study reveals that in Eswatini financial development translates to considerably increasing financial inclusion. It also stresses the importance of the innovation of digital financial services in expanding channels for increased financial inclusion. The study however looks at financial inclusion as the ability to receive and make payment or simply circulate funds and does not look at the access to other key financial inclusion services that can lead to human development and reduction of poverty. It is important to consider multiple important variables that will positively contribute the livelihood of people, when studying financial inclusion.

While it may seem as if there is a consensus that financial inclusion in greatly associated with economic development, there is an existence of literature that proves otherwise. De Haan and Sturm (2017) for instance, looks at the relationship between financial development and income inequality in 121 countries. The study shows that, increased level of financial development, financial liberalization as well as banking crises all lead to increased income inequality. These findings are evidently in contrast with vast existing literature that associates financial development to economic development in general. Taylor (2012), argues that the political economy is a key factor in determining how financial inclusion interventions impacts the lives of the poor.

To summarize the general observation of empirical literature available on financial inclusion is that it is somewhat "superficial", in particular the local studies. This is because in most cases, only few finance variables are selectively examined, whereas the more comprehensive studies have become somewhat outdated and, hence, incapable of providing insights about new forms of finance and credit. There is also lack of studies that provide a long-term trend on the extent of the usage of financial products and the profile of individuals who are completely financially excluded, especial at country level. In our study we observe a wide range of financial inclusion variables, which will provide a more detailed examination of the usage of these products in South Africa. This study, therefore, helps to address the remaining gaps in the literature, especially in the local context.

2.3 Data and methodology

2.3.1 Data

The first four waves of the NIDS data (wave 1: 2008; wave 2: 2010/2011: wave 3: 2012; wave 4: 2014/2015) are used for this study. NIDS is South Africa's first national panel data study and is conducted biannually by the Southern Africa Labour and Development Research Unit (SALDRU), based at the University of Cape Town.

Traditionally, data aimed at examining financial inclusion can be provided through two channels: demand-side data and supply-side data. The former provides information concerning financial services users, while the latter is usually gathered through household and firms surveys. Through the demand-side data, one can measure financial service users' socio-economic, demographics and problems encountered when seeking formal financial services. Supply-side data provides information on regulated financial services providers. Such information helps us understand the geographical accessibility, pricing, penetration and usage of financial products and services. Supply-side data is usually gathered as a set of broad indicators of formal and regulated financial service providers (World Bank, 2014).

The existence of these two channels in which financial inclusion data is presented as well as the manner in which financial inclusion should be measured has become a topic of concern amongst most researchers and policy makers. Most researchers have approached the measurement of financial inclusion mainly by using supply-side data to look at the usage and access to formal financial services (see Sarma, 2012; Chakravarty and Pal, 2010). There has also been some work done using demand-side data, in most cases these studies relied on individual level demand side data, with a focus on indicators related to usage and barriers individually (see Demirgüç-Kunt and Klapper, 2013).

As mentioned earlier, the Finscope survey has dedicated itself in making data on financial inclusion available around Africa. It is, therefore, no surprise that the Finscope survey is commonly used by scholars who seek to analyse financial inclusion in Africa. This has, as a result, created the need for alternative views using different data source. The NIDS survey, on the other hand, provides quite detailed data on the household usage of financial inclusion.

The NIDS data primarily provide information on demand-side indicators, since the survey is conducted on households who demand and consume financial services and products. The questions on finance focus on ownership, value of payment and outstanding balance. Our study focuses on ownership, as the questions were asked as "do you personally have …?" Only households with at least one adult member are included for the analysis, and the number of households observed in each wave is as follows: 7 274 in wave 1, 6 749 in wave 2, 8 023 in wave 3 and 9 597 in wave 4. Households are divided into deciles with per capita income in December 2016 prices, using consumption price index data (Statistics South Africa, 2017).

Additional to the primary objective of the study, which is to measure the extent of household financial inclusion, we further examine the relationship between financial inclusion, labour market outcomes and poverty. For poverty analysis, we make use of the Statistics South Africa (2015) lower bound poverty line of R501 per capita per month in 2011 February prices, equivalent to R689 in 2016 December prices. This poverty line is derived using the consumption basket from the 2010/2011 Income and Expenditure Survey (IES) data. All the empirical results are weighted using the post stratified weights.

2.3.2 Methodology

In this study, the PCA method is used to derive a financial inclusion index, which is derived by considering the 14 finance assets questions in the NIDS adult questionnaire. The PCA is a data reduction method to re-express a large number of variables into fewer dimensions. The PCA approach aims to change the dataset in such a way that, a multitude of variables can be combined into relatively fewer components that capture the best possible variation from the original variables. The PCA is also useful when identifying similar or related patterns across variables (Vyas & Kumaranayake, 2006). Each of the components that the PCA decomposes the variance of the set of variables into is a weighted summation of the individual variables. PCA is conducted in such a way that the weighting of every single variable is proportional to the share of total variance that it represents.

In equation terms, it means $P_1 = \sum_{i=1}^{n} a_{1i} X_{1i}$, (2.1)

where $a_{ki} = \frac{\sum_{i=1}^{n} r_{x_1 x_i}}{\sum_{i=1}^{n} \sum_{j=1}^{n} r_{x_j x_i}}$. (2.2)

In the above equation, $P_1 = \sum_{i=1}^{n} a_{1i} X_{1i}$ is the principal component, while $\frac{\sum_{i=1}^{n} r_{x_1 x_i}}{\sum_{i=1}^{n}\sum_{j=1}^{n} r_{x_j x_i}}$ represents its sample variance given by the variance of linear combinations of the indicators which takes the sample variances of the indicators and the sample covariance's across indicators into account. Originally, the components are calculated in turn, where the previous component captures the elimination of successive variation. The second principal component is calculated in such a way that it is based on a matrix with elements equal to $r_{x_i x_j} - a_{1i} a_{ij}$. To identify the number of variables included in the index, the eigenvalue ratios are used. These ratios show the proportion of all the variance that is explained by each principal component (Van der Berg et al., 2003).

Other methods to derive a composite index include, amongst others, Factor Analysis (FA) and Multiple Correspondence Analysis (MCA). There is no definite answer on which statistical approach is the best; nonetheless, the PCA was designed essentially for continuous variables whereas the MCA is more suitable for categorical variables. Blasius and Greenacre (2006) assert that one important difference between PCA and MCA is that the MCA imposes fewer constraints on the data. Booysen, Van Der Berg et al. (2007) observed both methods and noted that the two methods arrived at similar weighting of index components.

The final set of analyses that we undertake is to fit a series of multivariate regression models to our data. The study first conducts the Ordinary Least Squares (OLS) analysis by regressing the financial inclusion index on the demographic characteristics (such as gender, race, age, education, geographical type, province, household size, employment status and level of income) of the household heads. This is followed by the probit regressions to examine the impact of these explanatory variables on the likelihood of the household being completely financially excluded. In other words, the dependent variable is a binary variable, which is equal to one when the household is completely financially excluded (i.e. the answer is "no" to all 14 financial asset questions) but zero otherwise.

2.3.3 Limitations

There are some limitations that come with using the NIDS data to measure financial inclusion, in particular the fact that NIDS did not ask questions on barriers, access and affordability. Hence, we cannot conduct the two-stage PCA approach as done by a few past empirical studies as reviewed earlier. Moreover, the stokvel indicator is excluded from the analysis as it was only captured by the NIDS survey in waves 3 and 4. Another limitation is that, it is not possible to distinguish between voluntary and involuntary financial exclusion.[2] Lastly, for this study, we do not examine the changes (if any) of the extent of financial inclusion of each household across the four waves. To do this, we need to only include the balanced panel component of the date (i.e., households taking part in all four waves). This would require a separate, more in-depth study of its own.

[2] It is unfortunate that the NIDS did not ask questions to clearly distinguish voluntarily from involuntarily financially excluded individuals, and it is not possible for us as authors to make any assumptions or impose criteria to assume certain individuals belong to a particular group. Nonetheless, the empirical findings in Tables 1 and 2 as well as Figure 1 suggest an increasing proportion of households are banked (having a bank account). This may imply the likelihood of involuntary financial exclusion has been decreasing over time.

2.4 Empirical Findings

2.4.1 Descriptive Statistics

Table 2.1 presents the proportion of households with at least one adult member having some form of the observed financial services. The results indicate that there has been an increase in the usage of most financial services between waves 1 and 4. The proportion of households having at least one member with a bank account increased from almost 57% in wave 1 to over 78% by wave 4, while those with a personal loan from a bank nearly doubled (8.63% to 16.41%) between the first and last waves.

Table 2.1: Proportion of Households (%) With at Least One Member Having Each Source of Finance (wave 1 – wave 4)

Item	Wave 1	Wave 2	Wave 3	Wave 4
Home loan or bond	8.57	7.13	7.25	5.68
Personal loan from a bank	8.63	6.77	10.78	16.41
Personal loan from a micro-lender	0.93	0.95	0.65	1.73
Loan with a Mashonisa	1.69	1.82	2.05	2.97
Study loan with a bank	0.99	0.70	0.47	0.86
Study loan with an institution other than a bank	0.62	0.56	0.48	0.69
Vehicle finance (car payment)	7.34	4.88	3.99	6.29
Credit card	12.50	8.06	9.76	9.74
Store card	22.07	15.84	21.37	31.30
Hire purchase agreement	5.40	3.98	4.90	6.52
Loan from a family member or friend or employer	2.85	3.44	2.24	8.76
Bank account	56.89	60.48	68.13	78.50
Pension or retirement annuity	8.36	10.14	4.46	13.12
Unit trusts, stocks and shares	2.71	2.35	1.11	2.76

Source: Authors' own calculations using the NIDS waves 1 to 4 data.

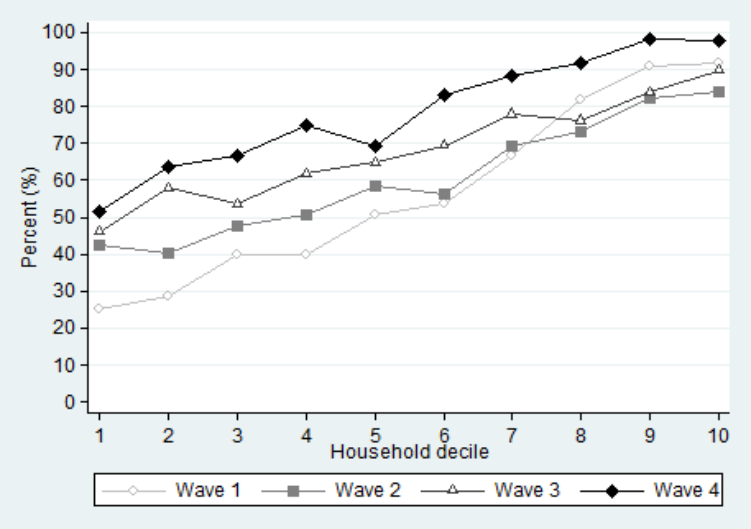
We also considered variables from informal financial sources, such as loans from Mashonisa (loan sharks) which have increased from 1.69% in wave 1 to 2.97% in wave 4, and loans from a family member, friend of employer which increased from less than 2.85% to 8.76%. The usage of other important services, such as hire purchase agreements, store cards and pension or retirement annuity also increased across the four waves. Furthermore, there is a decrease in the use of some of the major financial services. For example, households where at least one member reported to have home loans or bonds were at 8.63% in wave 1 and it gradually

declined over the years ending up at 5.68% by wave 4. There was also a slight decline with regard to the study loans with a bank and vehicle finance variables.

One finance source that particularly stands out is the use of credit cards, which decreased from 12.50% (wave 1) to 9.74% (wave 4). Even though this output is meant to indicate the change or trends of use of financial services, the changes over the four waves may have come about as a result of change of attitude, behaviour or interest of the recipients towards the service, as opposed to the accessibility of those services, since factors such as services fees negatively affect the attitude towards services such as credit cards (Kessler et al. 2017).

Figure 2.2 shows the proportion of households with at least one member having a bank account by decile. In all four waves there was a substantial increase in the share of members with bank accounts, especially for the poorest seven deciles. Between waves 1 and 4, there was an increase in the percentage of households with at least one member having a bank account in all deciles, and this proportion in general increased across the richer deciles in all waves.

Figure 2.2: Proportion of Households (%) With at Least One Member Having a Bank Account, by Decile (wave 1 – wave 4)



Source: Authors' own calculations using the NIDS waves 1 to 4 data.

Table 2.2: Proportion of Households (%) With at Least One Member Having Each Source of Finance, by Poverty Status, (Wave 1-Wave 4)

Item	Wave 1		Wave 2		Wave 3		Wave 4	
	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
Home loan or bond	0.1	11.8	0.2	9.6	0.3	8.8	0.2	6.7
Personal loan from a bank	1.4	11.4	2.0	8.5	1.9	12.8	6.5	18.3
Personal loan from a micro-lender	0.8	1.0	0.1	1.2	0.1	0.8	3.0	1.5
Loan with a Mashonisa	1.0	1.9	3.1	1.4	2.3	2.0	5.1	2.6
Study loan with a bank	0.3	1.3	0.3	0.8	0.0	0.6	0.0	1.0
Study loan with an institution other than a bank	0.3	0.7	0.2	0.7	0.1	0.6	0.8	0.7
Vehicle finance (car payment)	0.1	10.1	0.1	6.6	0.0	4.9	0.3	7.4
Credit card	1.0	16.9	0.6	10.7	0.5	11.8	1.3	11.3
Store card	6.9	27.9	7.3	18.9	8.2	24.3	17.5	33.9
Hire purchase agreement	2.5	6.5	2.0	4.7	3.0	5.3	6.1	6.6
Loan from a family member or friend or employer	3.1	2.8	4.5	3.0	3.2	2.0	12.2	8.1
Bank account	30.5	67.0	42.3	67.0	50.8	72.0	56.4	82.7
Pension or retirement annuity	0.4	11.4	0.6	13.5	0.8	5.3	0.9	15.4
Unit trusts, stocks and shares	0.0	3.7	0.1	3.1	0.1	1.3	0.4	3.2

Source: Authors' own calculations using the NIDS waves 1 to 4 data.

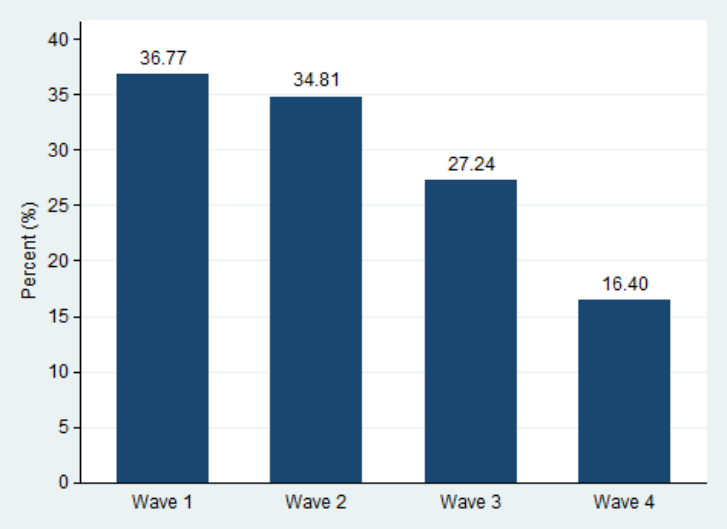
Table 2.2 shows the proportion of households with at least one member having some form of the observed financial services by poverty status. The general findings in the table suggest that poverty is associated with financial exclusion; in all four waves, households who were regarded as poor had relatively lower rates of usage of each source of finance. These findings are in line with the earlier reviewed past empirical studies that associates poverty with financial exclusion (e.g., Fungáčová and Weill, 2015; Sarma and Pais, 2011).

The results in Table 2.2 confirm the findings derived by recent empirical literature (Ocran, 2015; Orthofer, 2016), as high-income (or non-poor) household enjoy greater usage of financial services as opposed to poor households. The analyses show that the proportion of poor households who had members with bank accounts was 30.5% in wave 1 but increased continuously to 56.4% in wave 4. For the non-poor households, this share increased from

67.0% to 82.7%. Other strong indicators of financial inclusion such as having a home loan, personal loan from a bank, credit card, vehicle finances and store cards are also seen in very high proportions in the households which are not poor as opposed to the poor households, once again implying that poverty is associated with financial exclusion.

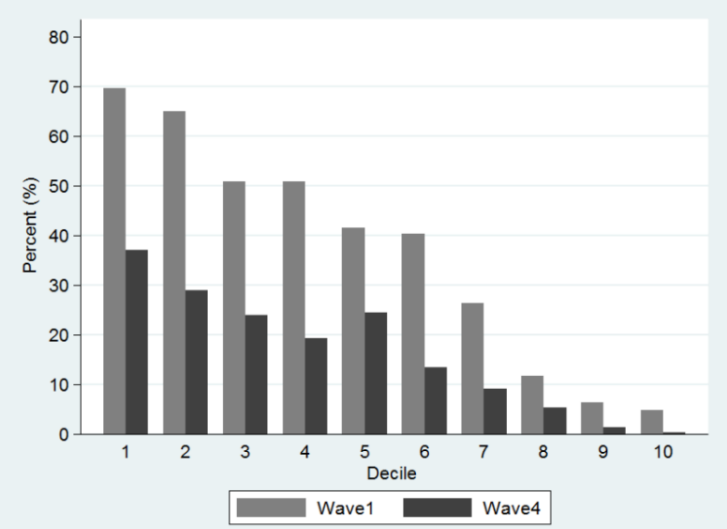
Figure 2.3 shows the proportion of households that were completely financially excluded (i.e. not having any of the 14 sources of finance), and it can be seen that it more than halved between the first (36.77%) and fourth (16.40%) waves. In addition, Figure 2.4 and Table 2.3 provide a more detailed breakdown of the extent of complete financial exclusion by household decile (using the real per capita income variable); as expected, the proportion of households that were completely financially excluded was higher in the poorer deciles, but this share declined across all deciles between waves 1 and 4. Table 2.3 also presents information on the decile share of the financially excluded households, and the results suggest that the shares of the poorest three deciles increased between waves 1 and 4.

Figure 2.3: Proportion of Households (%) Completely Financially Excluded (Waves 1-4)



Source: Authors' own calculations using the NIDS waves 1 to 4 data.

Figure 2.4: Proportion of Households (%) Completely Financially Excluded in Waves 1 and 4, By Decile



Source: Authors' own calculations using the NIDS waves 1 and 4 data.

Table 2.3: Financial Exclusion by Household Decile (Wave 1-Wave 4)

Decile	% of households that are financially excluded in each decile		Decile share of the financially excluded households	
	Wave 1	Wave 4	Wave 1	Wave 4
1	69.68	37.09	18.95	22.68
2	65.05	29.09	17.71	17.79
3	50.91	24.07	13.87	14.59
4	50.84	19.33	13.79	11.89
5	41.63	24.58	11.36	14.89
6	40.31	13.52	10.93	8.24
7	26.40	9.17	7.17	5.60
8	11.74	5.37	3.20	3.26
9	6.34	1.33	1.72	0.81
10	4.78	0.40	1.30	0.24
All	36.77	16.40	100.00	100.00

Source: Authors' own calculations using the NIDS waves 1 and 4 data.

Table 2.4 shows the list of components used to generate the financial inclusion index. The principal component includes 14 variables across the four waves. This is done in such a way that the principal components have a mean of zero. The standard deviation for the components is given and it is the sequence of the eigenvalue. What we are interested in is which variables are strongly correlated with the component.

We do this by pointing out the number that is large in magnitude, such that, the farthest the number is from zero in either direction the stronger is the variable correlated to the component. We deem a correlation above 0.4 as important and the first principal component is the biggest (above 0.4) for variables such as home loan/bond, pension or retirement annuity and credit card.

Table 2.4: First Principal Components for Deriving the Financial Inclusion Index in Each Wave

Item	Wave 1	Wave 2	Wave 3	Wave 4
Home loan / Bond	0.3681	0.3960	0.3723	0.4000
Personal loan from a bank	0.3018	0.2179	0.2803	0.3179
.Personal loan from a micro-lender	0.0545	0.0787	0.0961	0.0383
Loan with a Mashonisa	-0.0206	-0.0240	-0.0045	-0.0460
Study loan with a bank	0.0850	0.1147	0.1860	0.1489
Study loan with an institution other than a bank	0.1092	0.0431	0.0198	0.0348
Vehicle finance (car payment)	0.3602	0.3790	0.3686	0.3868
Credit card	0.4391	0.4276	0.4535	0.3977
Store card	0.3280	0.3337	0.3364	0.2862
Hire purchase agreement	0.1181	0.0796	0.1012	0.0282
Loan from a family member or friend or employer	0.0363	0.0453	0.0390	-0.0280
Bank account	0.3225	0.3056	0.2919	0.2840
Pension or retirement annuity	0.3665	0.4047	0.3466	0.4234
Unit trusts, stocks and shares	0.2591	0.2656	0.2585	0.2463
Proportion (%) of variation explained by the first principal components	20.92	18.76	17.19	17.73

Source: Authors' own calculations using the NIDS waves 1 to 4 data.

2.4.2 Econometric Analysis

Table 2.5 presents the findings of the OLS regressions, regressing the financial inclusion index (derived by the PCA method as discussed earlier) on numerous demographics, education and labour market characteristics. Table 2.6, on the other hand, presents the corresponding estimates of the probit regressions to test for the likelihood of a household being completely financially excluded.

Note that in both regressions, only households with real per capita income of less than R1 million per annum (or R83 333 per month) are included, to prevent the inclusion of 'outliers' (or households with excessively higher income) from affecting the robustness of the econometric findings.

Table 2.5: OLS Regressions on Financial Inclusion Index

	Wave 1	Wave 2	Wave 3	Wave 4
Gender of household head: Male	0.0109	0.0608	-0.0622	0.0504
	[0.0538]	[0.0643]	[0.0606]	[0.0529]
Race of household head: African	-0.2927**	-0.6239***	-0.2047	-0.2383
	[0.1474]	[0.2039]	[0.1872]	[0.1944]
Race of household head: Coloured	-0.1022	-0.1426	-0.1863	-0.0888
	[0.1536]	[0.3024]	[0.2364]	[0.2046]
Race of household head: Indian	-0.3811	-0.0669	0.3808	0.1943
	[0.3207]	[0.4231]	[0.3314]	[0.3746]
Age of household head	0.0622***	0.0656***	0.0280***	0.0542***
	[0.0080]	[0.0093]	[0.0082]	[0.0078]
Age squared of household head	-0.0006***	-0.0007***	-0.0002***	-0.0005***
	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Years of education of household head	-0.0518**	-0.0651***	-0.0409*	-0.1015***
	[0.0254]	[0.0258]	[0.0248]	[0.0222]
Years of education squared of household head	0.0104***	0.0085***	0.0071***	0.0134***
	[0.0021]	[0.0022]	[0.0020]	[0.0017]
Geo type: Urban	0.3472***	0.2254	0.0920*	0.1478***
	[0.0621]	[0.0603]	[0.0558]	[0.0494]
Province: Eastern Cape	-0.1072	0.2785	-0.1615	0.0724
	[0.1110]	[0.2247]	[0.1615]	[0.1162]
Province: Northern Cape	0.0021	0.0861	-0.1259	-0.0223
	[0.1129]	[0.1842]	[0.1566]	[0.1047]
Province: Free State	-0.1638	0.1373	-0.0636	-0.0590
	[0.2127]	[0.2255]	[0.1460]	[0.1822]
Province: KwaZulu-Natal	-0.0641	0.1248	-0.4135***	-0.1506
	[0.1291]	[0.2132]	[0.1596]	[0.1138]
Province: North West	0.0946	-0.0210	-0.2799	0.0546
	[0.1740]	[0.2327]	[0.1802]	[0.1602]
Province: Gauteng	-0.3118	0.3057	-0.1433	0.1149
	[0.1123]	[0.2170]	[0.1465]	[0.1268]
Province: Mpumalanga	-0.0761	0.4304*	-0.1686	-0.0165
	[0.1197]	[0.2256]	[0.1738]	[0.1212]
Province: Limpopo	0.0696	0.2915	-0.2005	0.1027

	[0.1295]	[0.2248]	[0.1596]	[0.1316]
Household size	0.1117***	0.1073***	0.1013***	0.1201***
	[0.0120]	[0.0123]	[0.0115]	[0.0106]
Number of employed	0.2926***	0.3012***	0.3891***	0.3283***
	[0.0393]	[0.0503]	[0.0431]	[0.0389]
Log real per capita income	0.5159***	0.4059***	0.4191***	0.4548***
	[0.0400]	[0.0357]	[0.0377]	[0.0363]
Constant	-6.3187***	-5.2592***	-4.6643***	-5.9735***
	[0.4441]	[0.4326]	[0.4414]	[0.4060]
Sample size	7 228	6 734	8 012	9 577
R-squared	0.4730	0.3884	0.3493	0.4423
Prob. > F	0.0000	0.0000	0.0000	0.0000

Source: Authors' own calculations using the NIDS waves 1 to 4 data.

Standard errors in parentheses

*** Significant at 1% ** Significant at 5% * Significant at 10%

Reference categories: gender: female; race: whites; geotype: rural; province: Western Cape

The two tables show some interesting and, in some instances, expected findings. For example, the OLS regressions indicate that both the household head age (positive sign) and household head age-squared (negative sign) variables are significant in all four waves, meaning households headed by middle-aged people are associated with higher financial inclusion index. In contrast, these two explanatory variables have exactly the opposite sign in the probit regressions (with the exception of wave 3), meaning a convex relationship between age and financial exclusion likelihood. This implies that households headed by middle-aged people are associated with significantly lower likelihood to be financially excluded. Our findings are consistent with a number of previous findings that also associate older individuals with greater financial inclusion (Honohan and King, 2009; Fungáčová and Weill, 2015; Zins and Weill, 2016).

For the other explanatory variables, the male coefficients are almost always positive, yet insignificant in all regressions in both tables. With regard to race, only the African dummy is statistically significant with a negative sign in waves 1 and 2 of Table 2.5, meaning Africans are associated with significantly lower financial inclusion index. Both African and Coloured dummies are significant with positive marginal effects in wave 1, meaning households headed by these two races are significantly more likely to be completely financially excluded, compared to their white counterpart.

In contrast, the Indian dummy is significant with negative marginal effects in wave 3. These results are consistent with other findings about the South African financial inclusion across race groups (Nyaruwata and Leibbrandt, 2009).

Table 2.6: Probit Regressions on Complete Financial Exclusion

	Marginal effects			
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**
Gender of household head: Male	0.0109	0.0007	0.0130	-0.0048
	[0.0187]	[0.0213]	[0.0178]	[0.0083]
Race of household head: African	0.1534***	-0.0011	0.0386	-0.0086
	[0.0539]	[0.0598]	[0.0451]	[0.0339]
Race of household head: Coloured	0.1857***	-0.0250	0.0754	0.0703
	[0.0763]	[0.0603]	[0.0647]	[0.0574]
Race of household head: Indian	0.2416	0.0907	-0.1764***	-0.0285
	[0.1621]	[0.1332]	[0.0354]	[0.0359]
Age of household head	-0.0144***	-0.0113***	0.0004	-0.0057***
	[0.0032]	[0.0034]	[0.0026]	[0.0012]
Age squared of household head	0.0001***	0.0001***	0.0001	0.0001***
	[0.0000]	[0.0000]	[0.0000]	[0.0001]
Years of education of household head	0.0033	-0.0175**	-0.0150**	0.0055*
	[0.0070]	[0.0089]	[0.0077]	[0.0034]
Years of education squared of household head	-0.0025***	0.0001	-0.0005	-0.0015***
	[0.0006]	[0.0007]	[0.0006]	[0.0003]
Geo type: Urban	-0.1305***	-0.0690***	-0.0467**	-0.0317***
	[0.0215]	[0.0237]	[0.0201]	[0.0106]
Province: Eastern Cape	0.2073***	0.1286***	0.1057***	0.0736***
	[0.0448]	[0.0422]	[0.0282]	[0.0309]
Province: Northern Cape	-0.0155	-0.1339	-0.0904	0.0235
	[0.0341]	[0.0353]	[0.0273]	[0.0247]
Province: Free State	-0.0308	-0.1656	-0.1149	0.0208
	[0.0421]	[0.0389]	[0.0278]	[0.0278]
Province: KwaZulu-Natal	0.0294	0.0822*	0.0673*	0.0684***
	[0.0407]	[0.0432]	[0.0341]	[0.0294]
Province: North West	-0.0376	-0.1171	-0.0108	0.0308
	[0.0424]	[0.0469]	[0.0505]	[0.0290]
Province: Gauteng	0.0088	-0.2273***	-0.1532***	0.0168
	[0.0399]	[0.0388]	[0.0307]	[0.0244]
Province: Mpumalanga	-0.0356	-0.2262	-0.0924	-0.0154
	[0.0424]	[0.0299]	[0.0331]	[0.0215]

Province: Limpopo	-0.0057	0.1452***	0.1160***	0.0017
	[0.0445]	[0.0427]	[0.0323]	[0.0240]
Household size	-0.0349***	-0.0418***	-0.0315***	-0.0229***
	[0.0043]	[0.0047]	[0.0041]	[0.0026]
Number of employed	-0.0993***	-0.0889***	-0.1239***	-0.0561***
	[0.0121]	[0.0173]	[0.0145]	[0.0077]
Log real per capita income	-0.1355***	-0.1076***	-0.0617***	-0.0611***
	[0.0112]	[0.0139]	[0.0114]	[0.0068]
Sample size	7 228	6 734	8 012	9 577
Observed probability	0.3664	0.3485	0.2730	0.1642
Predicted probability	0.2880	0.3151	0.2234	0.0778
Pseudo R-squared	0.2937	0.1670	0.1745	0.2791
Prob. > Chi-square	0.0000	0.0000	0.0000	0.0000

Source: Authors' own calculations using the NIDS waves 1 to 4 data.

Standard errors in parentheses

*** Significant at 1% ** Significant at 5% * Significant at 10%

Reference categories: gender: female; race: whites; geotype: rural; province: Western Cape

The results in Table 2.5 in general show a convex relationship between years of education and financial inclusion index, implying that the index increases at a non-linear, increasing rate as the household head becomes more educated. The relationship between education and probability of complete financial exclusion is somewhat mixed in Table 2.6; years of education is significant with negative marginal effects in waves 2 and 3, while years of education squared is significant (also with negative marginal effects) only in waves 1 and 4. The positive relationship between financial inclusion and education is not surprising, as it is consistent with the literature (Fungáčová and Weill, 2015; Zins and Weill, 2016; Honohan and King, 2009).

As far as the impact of the geographical type and province variables are concerned, households residing in urban areas enjoy significantly higher financial inclusion index and significantly lower likelihood of being completely financially excluded. This outcome, however, is not simply a case of 'urban rich, rural poor'. As recent research shows (Obeng-Odoom, 2020), there is an uneven socio-economic relationship between the urban propertied classes and rural tenants in South Africa. The provincial dummy variables in general are statistically insignificant in Table 2.5.

In contrast, the results in Table 2.6 suggest that, comparted with Western Cape (reference category), households from Gauteng are associated with a significantly lower probability of complete financially exclusion but this likelihood is significantly higher for Eastern Cape, KwaZulu-Natal and Limpopo residents, in some waves.

Finally, bigger household size, the presence of more employed household members and higher log real per capita income are associated with significantly higher financial inclusion index but lower odds of complete financial exclusion. These findings imply financial exclusion is associated with higher poverty likelihood (or lower real income). While there is empirical evidence that indicates that financial inclusion does not always lead to the betterment of the poor, the association of poverty with financial exclusion is consistent with majority of the existing empirical literature both locally and internationally (Ardington, et al. 2004; Demirguc-Kunt et al. 2017; Fungáčová and Weill, 2015; Park and Mercado 2015; Ntsalaze et al. 2016).

2.5 Summary

This is the first local study using the first four waves of data from the NIDS, which comprehensively captures information on financial asset ownership, to examine the levels and trends on the usage of financial products and services in South Africa. The empirical analysis showed that there was a general increase in the use of financial goods and services across the waves in 2008-2015. There was, however, strong indication that financial inclusion was mostly associated with households with higher income. The likelihood of complete financial exclusion was more prevalent in poor rural households living in Eastern Cape, KwaZulu-Natal and Limpopo provinces. Almost invariably, these households were made up of black people. The study also found that households with low real per capita income and fewer employed members were associated with greater likelihood of financial exclusion. Furthermore, households bigger in size and headed by middle-aged persons were associated with significantly higher financial inclusion index and lower likelihood of complete financial exclusion.

The key policy implication is that more financial services targeted at low-income households should be prioritised as there is generally a high rate of exclusion among the poor. There is evidence in the empirical literature that affordability limits poor households from accessing formal financial services, which avails a need for affordable financial services that can service particularly the low-income households. Supporting alternative, black finance models is one possibility. This may range from low-cost bank accounts and products to advanced technologies that deliver financial services to the excluded in a swift, affordable and efficient manner. Other countries can be used as a case study. For instance, in India, the government and private providers have worked together to grow access to financial products such as insurances at a lower cost. The Indian government founded a social security fund that finances insurance companies to subsidise insurance premium policies offered to the poorer households. This initiative has provided over two million poor Indians access to insurance policies (International Labour Office, 2001). While in the United States the creation and expansion of the freedman's bank in the nineteenth century, thereby creating bank accounts for the predominantly freed black slaves, resulted to the increase in their real estate wealth, schooling, labour participation, literacy rate and income (Stein and Yannelis, 2019).

There is also a clear indication that, financial inclusion initiatives directed at the poor should be closely monitored, as empirical literature has shown that financial inclusion does not always positively impact the poor (Bateman, 2019).

The promotion of money pools is also another option to be considered. A study conducted from five Caribbean Countries shows that, money pools, where poor people pool their money and create collective banks, where found to actually enrich people in ways that the mainstream banking system will never be able to (Hossein, 2016). While in Cameroon, the practice of lending and serving through kinship and financial networks was found to be more trusted than the mainstream. As a result, such practices keep increasing despite the existence and availability of formal financial channels (Ojog and Obeng-Odoom, 2017). This clearly, calls for a proactive financial system that promotes such channels and one that the trusted by the general public, especially low-income earners.

Finally, more thorough empirical analysis is required to examine the financial inclusion further, in particular using the balanced panel component of the data to examine whether the financial inclusion or exclusion of the households is chronic or transitory over time, but this requires a separate study of its own.

CHAPTER THREE: THE RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND MACROECONOMIC STABILITY[3]

3.1 Introduction

The world economy has in the recent years increasingly prioritised the agenda of financial inclusiveness and financial development. This has been greatly influenced by the growing body of empirical evidence indicating a relationship between financial inclusions levels and economic growth, as well as other measures of economic development such as poverty.

With financial inclusion receiving such a great deal of attention over the past decade, globally, over 60 nations have since set financial inclusion as a formal development goal (Sahay et al., 2015). While financial inclusion remains a global developmental challenge, significant progress has been made over the years. According to the World Bank (2018), bank account holders have increased by 1.2 billion worldwide, between 2011 and 2017. As a result, 69% of the world adult population now have a bank account, recording an increase of almost 20% from 2011. Despite this progress, almost two billion adults still remain unbanked, and this cohort is largely inclusive of the poor, young and those who have lower levels of education.

South Africa has also not lagged behind in the race for a financially inclusive economy. In 2012, the South African government scheduled in its National Development Plan to have 90% of the population financially included by 2030. The country has since seen considerable progress with 91% of the adult population having been included in the financial system, of which about 81% were considered as being banked by 2019, while 78% make use of other non-bank channels and 61% still using the informal financial channels (Finscope, 2019). There is also evidence, however, that while there is a clear increase in indicators of financial inclusion, a large portion of consumer transactions remain cash based (Delloit, 2019).

The South African economy is seen as one that is more favourable to take the financial inclusion agenda forward, compared to its counterparts' economies. This is due to the country's advanced and well-regulated financial sector, which boast with a variety of financial services and products that are well supported and availed through a wide range of access service points

[3] At the time of writing, an article has been extracted from Chapter Three and accepted for publication on the DHET-accredited International Journal of Economics and Financial Issues.

(Ardington et al, 2004). Moreover, the South African government has developed and strengthened regulatory structures aimed at advancing the efficiency, safety, and stability of the country's financial sector, so it meets global standards and better financial inclusion in the country (National Treasury, 2020).

A closely related, yet distinct, phenomenon to financial inclusion is that of financial development, which has a direct link to Macroeconomic indicators, such as the Gross Domestic Product (GDP), domestic credit as well as stock market size. Moreover, the levels of financial inclusion and financial development are directly impacted by the country's macroeconomic stability (VO et al., 2019; Park and Mercado, 2015).

Macroeconomic stability has seen considerable changes over the years from time of the dominance of the Keynesian school of thought, where macroeconomic stability meant a mixture of external and internal forces with the latter implying full employment and economic growth stability coupled with low inflation, to a period when fiscal balance and price stability took the spotlight and thereby ousting the Keynesian thinking on real economic activity. Overtime, however, it has since been recognised that macroeconomic stability is multidimensional in its nature, with indicators ranging from price stability and efficient fiscal policy to a functional real economy, sustainable debt rates as well as a healthy domestic financial system and private sector (Ocampo, 2008). While financial inclusion fundamentally implies the provision of equal opportunities to access financial products and services by all participants of the economy, high inclusivity levels in the financial system greatly translate to an increased overall economic participation. Existing evidence indicate that people experience financial problems due to the unavailability of financial services in economies with low financial inclusiveness (GPFI, 2011).

The relationship between financial inclusion and macroeconomic stability is in greatly under researched both from a global and local perspective. Existing empirical literature has shown quite differing sentiments, with some scholars suggesting that vast access to finance may potentially bring about market instability to the economy. For instance, Garcia (2016) raises the concern that the results of financial inclusion, such as rapid growth in credit and an unregulated financial system, may inherently bring about even greater risks in the financial markets. Opposing arguments, however, present evidence that financial inclusion hardly leads to systemic risks, this is because low-income economic participants are less likely to change

their financial behaviour, even in the event of financial crashes, that is, savers are likely to keep their deposits and borrowers are likely to keep paying their loans (Hannig and Jansen, 2010).

In the South African context, there is no study that explores how financial inclusion relates to macroeconomic factors. This study aims to fill up that gap and contribute to the body of empirical literature on the subject, by analysing the relationship between financial inclusion and macroeconomic stability in South Africa. Understanding the macroeconomic effects of financial inclusion is crucial, as existing literature from developed economies shows that, financial inclusion increases economic growth and improves the standard of living of individuals (Sahay et al., 2014; Sarma and Pais, 2011; Demirgüç-Kunt et al., 2017).

The remainder of the study will be structured as follows: Section 3.2 provides a literature review pertaining the relevant theoretical and empirical studies on the subject. Section 3.3 describes the data and research methodology to be utilised in the study. In Section 3.4, the descriptive analysis will be conducted, and the empirical results will be presented, while Section 3.5 will be the conclusion of the study.

3.1.1 Research Question

This chapter intends to address one key question on the connection between financial inclusion on macroeconomic stability in South Africa, mainly: How does financial inclusion relate to macroeconomic stability in South Africa?

3.1.2 Objectives of the Study

The general objective of the study is to employ quantitative tools to investigate the impact of financial inclusion on macroeconomics stability in South Africa using supply side data from the Financial Access survey (FAS) and the South African Reserve Bank (SARB). Specifically, the study seeks to:

- Investigate the impact of financial inclusion on macroeconomic stability in South Africa.
- Examine the causal direction between financial inclusion and macroeconomic stability and
- Determine the response of macroeconomic stability to shocks in financial inclusion.

3.2 Literature Review

3.2.1 Conceptual framework

3.2.1.1 Financial Inclusion

Despite financial inclusion being a multidimensional concept, there has been quite good progress in defining it. Hannig and Jansen (2010) define financial inclusion as the attempt to include the population that is regarded as unbanked into the formal financial system, so that they have access to existing financial services. The World Bank (2008) defines financial inclusion as the ability for every person, entities, and other economic participants to have access to affordable formal financial services that cater for their needs. While according to Demirgüç-Kunt (2008) financial inclusion takes place when financial services are used in the absence price and non-price barriers. Gardeva and Rhyme (2011) further suggest that the following factors are important for any country to attain full financial inclusion: Everyone should have access to financial services; good quality financial services should be provided (that is, financial inclusion should be affordable, convenient, product-fit, safe, dignified, and protective of the clients); financial inclusion must provide fill suit of basic financial services, such as, payment transfers, savings, insurance etc.

The varying definitions of financial inclusion stems from the reason that financial inclusion is a multidimensional concept in its nature, with several nuanced factors used differently based on the specific research subject matter or country agenda. The Alliance for Financial Inclusion (2010) outlines four key dimensions of financial inclusion, namely: Access, Quality, Usage and Welfare. These dimensions are presented in Figure 3.1 below.

Figure 3.1: Financial Inclusion Dimensions

Source: Alliance for Financial Inclusion (2010).

Access - the access dimension deals with the usability of existing financial services and products from the formal financial sector. Insight and analysis of possible barriers to open and use a bank account may therefore be required to understand levels of access. These include barriers such as cost and physical distance to bank point of service, such as ATMs or bank branches. Information on the access dimension is usually obtained from the supply side data, which is provided by financial service providers (AFI, 2010).

Quality - this dimension deals with how the financial services or products are best fitting the lifestyle needs of the customer. This includes the experiences of the end-user, which is demonstrated in the attitudes and views about those services available to them. This dimension can help gauge the relationship end-users have with the service provider and the services available to them (AFI, 2010).

Usage - the usage dimension looks beyond the basic adoption of the financial product, it is more concerned about impact of the product, in particular its permanence and depth. It basically looks at how regular, frequent, and how long the financial service in being used. Over and above, usage also measures the combinations of financial services used by a consumer. This type of information is obtained from the demand side data (AFI, 2010).

Welfare - the welfare dimension focuses on the financial product's impact on the lives of its users. This includes possible changes in the use of service, business activity and client wellness. This component is the most difficult to measure, due to reasons, such as difficulty to differentiate the role of the financial product on the consumer's life, without confusing it for the effects of coexisting factor, for instance, change in income. This may, as a result, require a special research design. Information for the welfare dimension is obtained from the demand side data (AFI, 2010).

3.2.1.2 Macroeconomic Stability

The concept of macroeconomic stability has undergone substantial changes over the years. During the 1940's, while dominated by the Keynesian economics, the idea of macroeconomic stability entailed a mixture of full employment, a stable economic growth and inflation stability (Ocampo, 2008). In the years after, the focus moved to fiscal balance and price stability. This shift replaced the Keynesian thinking, thereby completely suppressing the macroeconomic policy's counter-cyclical role, while exposing developing economies to a more pro-cyclical macroeconomic policy, characterized by risky financial assets (Stiglitz, 2003). Recent evidence, however, shows that pro-cyclical macroeconomic policies have discouraged growth and, in some cases, caused growth volatility in developing countries (Prasad et al. 2005). This brief background is clear evidence that macroeconomic stability involves multiple dimensions. As such, like financial inclusion, there is no single straight forward definition of macroeconomic stability.

Fischer (1992) states that a macroeconomic framework that is regarded to be stable is one that is associated with inflation rates that are low and predictable, interest rate that are appropriate, a sustainable and stable fiscal policy, a real exchange rate competitive and predictable, as well as a perceived balance of payments situation. On the other hand, Serven and Montiel (2004) argue that macroeconomic stability is a phenomenon that causes a country's macroeconomic structure more unpredictable. In this study, output growth and inflation will be used as indicators of macroeconomic stability.

3.2.2 Theoretical literature

There are a number of theoretical literatures related to the effects of financial inclusion that have been developed in the past. In this chapter we cover two on which this section of the study is underpinned.

3.2.2.1 Classical Theory

Adam Smith, with the Classical 1776 Wealth of Nation, brought about the introduction to the concepts of free market economy discussions. Smith outlined the concepts of the invisible hand where he advocates that the economy is such that, if left alone, can achieve an equilibrium state through the interaction of the demand and supply forces. The classical economic theory stems from the idea that free market requires little or no interference by the government, which is a concept of a laissez-faire economic market. Through this concept, individuals can make economic decisions to serve their own interest, such that, resources are distributed according to what individuals and businesses desire in the marketplace.

According to Schumpeter (1912), the services that financial institutions provide, such as savings mobilization, risk management, facilitating transactions and evaluation projects, play a crucial role in technological progress and economic development. Similar findings are expressed by king and Levine (1993), showing that financial development measures and real GDP per capita growth are strongly associated. The authors also find that components of financial development lead to increased physical capital accumulation rate and the efficiency of employing that physical capital.

3.2.2.2 Theory of Information Asymmetry

Another theory that best fit this subject matter in the theory of asymmetric information was developed by Stiglitz (1981) to plausibly explain market failures. The theory states that, information asymmetry occurs in a scenario whereby one participant possesses more information about a product, service, or transaction than the other party. This then leads to markets becoming inefficient, because the participants lack the appropriate information needed in making decisions. Inclusive financial institutions or an inclusive financial sector is more likely to contribute to growth by reducing asymmetric information that would potentially distract financial service providers from intermediating resources efficiently.

3.2.3 Empirical Literature Review

There is too little existing literature on the link between macroeconomic stability and financial inclusion globally and it does not exist locally. The lack of macroeconomic evidence links to financial inclusion is largely due to the, until very recent, shortage of consistence financial inclusion data on macroeconomic level. The existing body of empirical work that studies the macroeconomic link with financial inclusion is mainly conducted at an international level and it is mostly observed in comparison with other countries and there is no study that looks at the subject from a South African point of view.

Sahay et al. (2015) investigated whether financial inclusion can meet multiple macroeconomic goals using a cross country survey for two years (2011 and 2014), a long-time series across five countries and firm-based data on access to finance. The study found financial inclusion to increase economic growth up to a certain point. They indicated that firms and household greater access to a variety of banking services, and an increasing use of these services by women, tends to lead to higher economic growth. Furthermore, countries with higher levels of financial inclusion tend to have their external finance dependent sectors grow more rapid. However, the results also show decreasing marginal returns on growth, as financial inclusion and depth increases.

In a more related study, Vo, Van & McAleer (2019) examined the linkage between financial inclusion and macroeconomic stability for twenty-two developing and frontier economies. The study focused on a potential optimal level for these countries during the 2008-2015 period, using the panel threshold estimation technique. They measure financial inclusion as an approximate of the growth rate in the number of bank branches over 100 000 account holders and they find it to positively impact on financial stability under a certain threshold. The authors also find that financial inclusion enhances the maintenance of stable inflation and growth.

While a recent study by Nizam et al. (2020) examined financial inclusiveness affects economic growth, with a focus on sixty-three developing and developed economies, from 2014 to 2017. The study shows that, the connection between financial inclusion and growth has a threshold

effect, which suggests that financial inclusion display a non-monotonic positive relationship with economic growth. According to the study, raising financial inclusion to a higher level than low, stimulates sustainable economic growth. Cumming et al. (2014) provides a compelling supportive narrative for the impact of financial inclusion, highlighting that access to finance is important in encouraging entrepreneurs to take risk, invest more and subsequently contribute positively on economic growth.

Nobla-Norris et al. (2015) came up with general equilibrium that is micro-founded with heterogeneous agents to examine the relevant constraint to financial inclusion. The study used firm-level data extracted from the World Bank Enterprise Survey and it looked specifically at six countries of different economic prospects. The study shows that a country's specific characteristics play a key role in defining the relationship and trade-offs between financial inclusion, economic growth, inequality and how gains and losses are distributed. The authors further find that lowering monitoring costs, relaxing collateral requirements and subsequently increasing the access to credit for firm increases economic growth.

Some existing empirical literature bring differing finding to this relation, for instance Mehrotra and Yetman (2015), indicated that too much credit access could negatively impact the quality of the credit and result to an increase in unregulated credit growth. While Khan (2011) brings a differing view, indicating that financial inclusion brings about a broader spectrum of economics agents, through their great asset diversity and also provides better economic resilience for financial service providers.

Neaime and Gaysset (2018), makes an empirical assessment of how financial inclusion impacts financial stability, income inequality, and poverty, and the study also found that mixed conclusions can be drawn from the existing empirical literature on the subject. It shows that, while financial inclusion leads to decreased income inequality, it has no significant relationship with poverty. These findings are contrary to the vast existing empirical literature that associated financial inclusion with reduced levels or poverty (Honohan, 2008; Imai & Annim, 2010; Jabir, 2015; Levine, 2001).

Demirgüç-Kunt et al. (2017) investigates financial inclusion from an overview point globally and conducts a review of recent empirical literature on how usage of financial services may contribute to economic development and inclusive growth. The evidence suggests that financial

inclusion allows individuals to efficiently and safely conduct their daily transactions and broadens their investment and options of financial risk management through the use of formal financial system.

In addition, use of certain financial products such as digital payment and inexpensive savings account was more effective in reaching development goals (e.g., reducing poverty and inequality), as compared to other financial products. The importance of digitalization and technology is emphasized by Andrianaivo and Kpodar (2012), who investigate whether mobile phones impact economic growth through better financial inclusion in a sample of African countries, between 1988 and 2007. The results of the study reveal that indeed greater financial inclusion creates a conducive environment for the development mobile phone to impact economic growth positively.

The general observation of empirical literature is that there is too little existing body of work done on the macroeconomic correlates with financial inclusion; moreover, no existence of such knowledge from a South African point of view. Furthermore, the existing literature on the subject is getting somewhat outdated. This study addresses the shortage of research on the link of financial inclusion and macroeconomic stability in South Africa.

3.3 Methodology and Data

The study makes use of quantitative tools to investigate the relationship between Macroeconomics and financial inclusion. In this section, details of these tools are provided.

3.3.1 Model Specification and Analytical Framework

The following regression models, partially adopted from the study by Sahay et al (2015), are proposed to explore the relationship between financial inclusion and macroeconomic stability. The study uses the vector autoregressive (VAR) model to analyse the relationship between financial inclusion and macroeconomic stability in South Africa.:

$$Y_t = \beta_0 + \beta_1 FI_t + \beta_2 X_t + \varepsilon_t \qquad (3.1)$$

Where Y_t represents the dependent variable, Macroeconomic stability. The Proxies that we use to measure macroeconomic stability are, Output and Inflation.

FI_t represent the first independent variable Financial inclusion, which is measured using the growth rate of the number of bank branches with account holders over 100 000.

X_t represents the control variables, which includes exchange rate volatility, real GDP, per capita GDP growth, exchange rate regime, private credit to GDP or broad financial development index, liquid assets to GDP and financial openness.

ε_t = random error term
t = Time period
β = Parameter estimates

As one of the highly flexible, user friendly and most successful models for analysing multivariate time series data, the VAR model will be used to examine the possible complexity of the interrelationship between our observed endogenous variables. The following VAR model is specified for this study:

$$Y_{1,t} = \alpha + \sum_{i=1}^{k} \theta_i Y_{1,t-i} + \varepsilon_{1t} \quad (3.2)$$

α represents the constant vector, θ_i represent the matrices and $Y_{1,t}$ is the vector of the endogenous variables. The vector of residual is represented by ε_{1t}.

3.3.2 Estimation Techniques

3.3.2.1 Unit Root Test

The issue sometime encountered when using time series data is that, the results may at times depict the explanatory variables to be more significant than the true reality. This usually happens in a model where these variables happen to have underlying trends similar to those of the dependent variable. As such, it is requirement that all variables estimated in the model actually meet the stationarity condition, so as to ensure that a spurious relationship is avoided and a meaningful one is formed. For a series to be considered as stationery, its mean and variance should not show changes over time.

To put this is more formal manner, a time series variable, say for example a random variable (Y_t), is considered to be stationery in a case where the mean of Y_t is constant over a certain period, the variance of Y_t is, over the period, constant as well. While at the same time, the simple correlation between Y_t and Y_{t-k} is dependent on how long the lag (k) is, but not on any

other variable (for all values of K) (Studenmund, 2006). Should a case arise, where a single or more of these requirements is not achieved, then it can be concluded that then Y_t is not stationary.

For the purpose of this study the unit root properties of the time series data are investigate by subjecting the variables to the unit root tests using the Augmented Dicky-Fuller and the Phillips-Perron techniques. Details on these two tests are provided below.

Augmented Dickey-Fuller (ADF) tests

The stationarity test is a very important component of time series analyses, precisely because it helps provide assurance that the equations being estimated are indeed not spurious. Once it is confirmed that the estimated variables are indeed stationary, then the possibility of a spurious regression would not be something to worry about. The Dickey-Fuller (DF) test and the Augmented Dickey-Fuller (ADF) are the standard procedures used to test for stationarity. These methods function under the hypothesis that the variable of interest has a unit root. The Dickey-Fuller test for stationarity runs three regression in its approach, and they are as follows; The first regression is without a drift, which is also frequently referred to as random walk. While The second estimation is said to have a drift, and the third test has a drift as well as a trend.

The random walk, or rather the regression without a drift, is known for its non-stationery properties, because it has the ability to move up and down or fluctuates without being characterized by an equilibrium and without moving towards any the mean. Let reflect the following equation:

$$X_t = \alpha X_{t-1} + \mu_t \qquad (3.3)$$

Because of the criterion of the unit root, if in terms of probability $\alpha = 1$, then it can be concluded that this a random walk. In this event the expect value of X_t does not converge on any value, and as such, considered to be nonstationary. The situation where $\alpha = 1$ is called a unit root. The above equation (3.3) hold in all conditions where a unit root is found to exist in a variable, and this essentially suggests that the said variables follow a random walk, and as such, are considered to be nonstationary. In a case where $\alpha < 1$, it would suggest that the expected value of X_t will, as the sample size increases, eventually start to approach zero and consequently become stationery.

Contrary to the above, in case $\alpha > 1$, it would suggest that X_t is not stationary, and as a result it would tend to grow at a rather speedy rate.

In order to achieve the simplest form of the test, we must first subtract $X_t - 1$ in both sides of the equation:

$$X_t = \alpha X_{t-1} + \mu_t$$

$$X_t - X_{t-1} = (\alpha - 1)X_{t-1} + \mu_t$$

$$\therefore \Delta X_t = \beta_1 X_{t-1} + \mu_t \qquad (3.4)$$

In a case where a one-sided t- test is conducted from the above equation, under the hypothesis that, $\beta_1=0$;

the null hypothesis would be H_0: $\beta_0 = 0$ while the alternative hypothesis would be H_1: $\beta_1 < 0$

The null hypothesis states that a unit root exist in X_t, whereas the alternative hypothesis is that stationarity exist in X_t.

If X_t contains a unit root, it means that $\alpha = 1$ and $\beta_0 =0$. While, If X_t is said to be stationary then $\alpha < 1$ and $\beta_1 < 0$.

From equation shown above, a constant can be included to develop an extended equation that has a drift:

$$\Delta X_t = \beta_0 + \beta_1 X_{t-1} + \mu_t \qquad (3.5)$$

Similarly, it can be assumed that X_t has a trend, that is, in this event, (t). In the event that (t) is added to the equation as a variable, it means that it should have a coefficient (Studenmund, 2006). Therefore, an equation should exist expressed as follows:

$$\Delta X_t = \beta_0 + \beta_1 X_{t-1} + \beta_{2^t} + \mu_t \qquad (3.6)$$

Phillips Perron (PP) tests

There are several unit root testing techniques that were developed by Phillips and Perron (1988) and they have all gained vast popularity in field of financial time series analysis. The Philips Perron (PP) test has some characteristics unique from the ADF test, particularly when it comes to how it deals with serial correlation and heteroskedasticity in the errors. While the ADF test utilises a parametric autoregression to estimate the Autoregressive Moving-Average (ARMA) structure of the errors in the test regression, with the PP test any serial correlation in the test regression is ignored.

The PP test extends from the Dickey–Fuller test when it come to the null hypothesis in Δ, where Δ is the first difference operator. Similar to the ADF test, the PP technique addresses the issue that the process of data generating, may have a higher order of autocorrelation than it is indicated in the test equation, making it endogenous and as a result causing the Dickey–Fuller t-test to be invalid (Gujarati, 2004). The difference between the ADF and PP tests in addressing this issue is that, the ADF introduces lags of Δ as regressors in the test equation, while the PP test makes a non-parametric correction to the t-test statistic. The test is concluded to be robust with respect to unspecified autocorrelation and heteroskedasticity in the disturbance process of the test equation.

The regression test for the PP technique is as follows:

$$\Delta Y_t = \beta_0 X_t + \alpha Y_{t-1} + \mu_t \quad (3.7)$$

Where μ_t is I (0) and may be found to be heteroskedastic. The PP technique has the ability to correct for any serial correlation and heteroskedasticity in the errors μ_t of the test regression, and it does this by directly modifying the test statistics $t\pi = 0$ and $T\hat{\pi}$. These modified statistics, denoted Z_t and Z_π, are given by;

$$Z_t = \left[\frac{\hat{\sigma}^2}{\hat{\lambda}^2}\right]^{\frac{1}{2}} . t\pi = 0 - \frac{1}{2}\left[\frac{\lambda^2 - \hat{\sigma}^2}{\hat{\lambda}^2}\right] . \left[\frac{T.SE - (\hat{\pi})}{\hat{\sigma}^2}\right] \quad (3.8)$$

$$Z_\pi = . T\hat{\pi} - \frac{1}{2}\frac{T^2 . SE(\hat{\pi})}{\hat{\sigma}^2}(\hat{\lambda} - \hat{\sigma}^2) \quad (3.9)$$

The terms $\hat{\sigma}^2$ and $\hat{\lambda}^2$ are consistent estimates of the variance parameters.

$$\sigma^2 = \lim_{1-\infty} T^{-1} \sum_{T=1}^{T} E\,[\mu_t^2] \quad (3.10)$$

$$\lambda^2 = \lim_{T-\infty} \sum_{T=1}^{T} E\,[T^{-1} S_T^2] \quad (3.11)$$

Where $S_T = \sum_{T=1}^{T} \mu_t$. The sample variance of the least squares' residual $\hat{\mu}_t$ is a consistent estimate σ^2, and the Newey-West long-run variance estimate of μ_t using $\hat{\mu}_t$ is a consistent estimate of λ^2. The PP Zt and Z1 statistics have asymptotic distributions similar to the ADF t-statistic and normalized bias statistics, as long as it is under the null hypothesis that $\pi = 0$. The PP technique has an advantage over the ADF test in that, its tests are robust to general forms of heteroskedasticity in the error term μ_t. An additional advantage of the PP tests over the ADF tests is that, with the PP technique, there is no need for the user to specify a lag length for the test regression (Hendry and Wallis, 1999).

3.3.2.2 Diagnostic and Stability Testing

Also known as the test for misspecification, the Diagnostic and stability tests are used to are used in time series data analyse to establish if whether the model being estimated is specified correctly. To test for stochastic characteristics in the estimated model, the Diagnostic test is the instrument of choice. These includes testing for autocorrelation in the residuals, testing for normality and testing for heteroskedasticity, to name a few (Takaendesa, 2004). In this study, the White Heteroskedasticity to tests technique is used to test for Heteroskedasticity.

Heteroskedasticity tests

Heteroskedasticity is said to exist in the event that different error terms do not show similar variances, such that there is differing in the diagonal elements used in the covariance matrix. While the variance of 1_1 may differ or vary over the observations, the error terms are not mutually correlated. Gujarati (2003), brings it forward that, using the usual testing techniques despite the existence of heteroskedasticity, may result to the consequences that the conclusions made from the results or the inferences we make may be rather vastly misleading. The heteroskedasticity test null hypothesis states that, there is no heteroskedasticity and in cases where the p-values are less than 5 percent (in some case 10 percent) level of significance ($p < 0.05$), the null hypothesis is rejected.

From the supplementary regression, $Y_1 = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \mu_i$ the test statistic is based, and can be depicted as follows:

$$e_t^2 = \beta_0 + \beta_2 X_t + \beta_2 Z_t + \beta_3 X_t^2 + \beta_4 Z_t^2 + \gamma_t \quad (3.12)$$

Should the null hypothesis be true, then the ρ is greater or equal to that of the sample statics.

Normality Tests

Another important practice when conducting time series analysis is testing for normality distribution within the residuals. The multivariate extension of Jarque-Bera (JB) (1987) is one testing instrument frequently used for the normality test and this technique is proposed for the same purpose in this study. The JB test functions under the concept that, normal distribution has a characteristic set of moments. Its mechanism functions in such a way that, the sample versions of the coefficient of excess skewness and the coefficient of kurtosis are compared. The equation that depicts the JB technique is as follows:

$$JB = n\left[\frac{S^2}{\sigma} + \frac{(k-3)^2}{24}\right] \quad (3.13)$$

where S represents the skewness, while k depicts the kurtosis and the sample size is represented by n. For a sample large in size, JB follows a chi-square distribution χ^2. The null hypothesis H_0 states that; the residuals are normally distributed. To decide if whether the residuals are indeed normally distributed we check if the value of the JB is significant. If it is indeed significant, then the cannot null hypothesis can be rejected and as such, the conclusion that the residuals are normally distributed can be made. (Asteriou & Hall, 2007)

3.3.2.3 VAR Stability

Stability is one of the most crucial characteristics of a VAR (p)-process (Pfaff, 2008). This suggest that, given sufficient starting values, stationary time series is generated with time invariant means, variances and covariance structure. This can be checked by evaluating the characteristic polynomial:

$$det(I_K - A1z - \ldots - A_p z^p) \neq 0 \ for\ |z| \leq 1\,. \quad (3.14)$$

The characteristic polynomial is defined as:

$$\Pi(z) = (I_n - A_1 z - A_2 Z^2 - \cdots) \quad (3.15)$$

In a case were the outcome of the above formulae is such that it root for z=1, I would mean that either some of all variables in the VAR (p)-process are integrated of order 1, that is I(1). There may be a possibility that, there is cointegration between the variables.

For a set of n time series variables $y_t = (y_{1t}, y_{2t,}\ldots, y_{nt})'$, a VAR model of order p (VAR(p)) can be expressed as:(1) $y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t$ such that, the A_i's are (nxn) coefficient matrices and $u_t = (u_{1t}, u_{2t}, \ldots, u_{nt})'$ is an unobservable i.i.d. zero mean error term. The sufficient condition necessary for the stability states that, all characteristic roots should stay outside the unit circle. Then it can be concluded that Π is of full rank and none of variables are not stationary.

3.3.2.4 Lag length Criteria

Among the crucial practices of conducting empirical analysis using the VAR models is determining the lag order of the autoregressive lag polynomial, and this is due to the correct model specification being the determinant for all inferences in the VAR model. The model selection criteria may be used to determine the lag length for the VAR (p) model. This is done by fitting VAR (p) models with orders p = 0, pmax and choose the value pf p which minimizes some model selection criteria. The Model selection criteria for VAR(p) models take the structure $IC(p) = ln|\tilde{\Sigma}(p)| + cT \cdot \phi(n,p)$, such that $\tilde{\Sigma}(p) = T - 1\ PT\ t = 1\ \hat{}\varepsilon t\hat{}\varepsilon 0$ is the residual covariance matrix without a degrees of freedom correction from a VAR(p) model, while cT is a sequence indexed by the sample size T, and ϕ(n, p) is a penalty function which penalizes large VAR(p) models (Fossati:2004).

3.3.2.5 Cointegration Tests

The test for Cointegration is one of the most crucial practices of time series analyses, it is an analytic technique performed in order to test if whether there are common trends in the multivariate time serie. It is also for modelling short-run and long-run relationship between the variables observed in the model. With a time series model, for cointegration to exist between two or more predictive variables, it should be such that, those variables share a common stochastic drift. Moreover, these variables' linear combination should further produce a stationary time series to be considered cointegrated (Gujarati, 2004).

The two methods most frequently used to test for cointegration are the The Engle-Granger and Johansen cointegration techniques. These two techniques may be used for the same purpose, but they differ in that, Engel-Granger cointegration technique is suitable for testing individual cointegrating relationships and estimates their parameters, while the Johansen method cointegration technique is more suitable when testing for multiple cointegrating relationships. Moreover, with the Johansen cointegration method the parameters are estimate in the corresponding vector error-correction models (VECM). In addition, Johansen cointegration test also estimates linear restrictions on both the space of cointegrating vectors and error-correction speeds, and estimate restricted model parameters (Studenmund, 2006). In this study the relationship between multiple variables is investigated, therefore, the Johansen Cointegration is the most suitable technique to estimate.

The Johansen Cointegration testing method is mainly utilized for cointegration testing in several I (1) time series and as already stated, it allows the testing for several cointegration relationships (Gujarati, 2004). The methodology for the Johansen test starts from the VAR of order p; this can be presented as follows:

$$Y_t = \mu + A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + Et \quad (3.16)$$

Yt represents the n × 1 vector variables integrated of the order one, I (1) while □*t* depicts the n×1 vector of innovations. Thus, the VAR can be illustrated as:

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta Y_{t-1} + \varepsilon_t \quad (3.17)$$

$$\text{Where } \Pi = \sum_{i=1}^{p} A_{i-1} \text{ and } \Gamma_i = \sum_{i=i+1}^{p} Aj$$

In the event that the coefficient matrix's (Π) rank has, for some reason, been reduced, then an $n \times r$ matrices α and β exist. $\Pi = \alpha\beta^I$ and $\alpha\beta^I Y_t$ are stationary, r represents the total number of cointegration relationship, α represents the adjustment parameters that the vector error correction model has and each column of β represent the cointegrating vector. The Johansen Cointegration test depicts that, there are two different likelihood ratio tests of the significance of these canonical corrections and because of this, the reduced rank of the Π matrix (Johansen and Juselius, 1990)

There are two categories for the Johansen cointegration test, and that is, the trace and the maximum eigenvalue, but, there is little difference in the inference (Gujarati, 2004). The two types of the Johansen cointegration testing technique (trace and maximum eigenvalue) are illustrated as follows:

$$J_{trace} = -T \sum_{i=r+1}^{n} In(1 - \overline{\lambda_\iota}) \quad (3.18)$$

$$J_{\max Eigen} = -TIn(1 - \overline{\lambda_\iota}) \quad (3.19)$$

Where the sample size is depicted by *T* and i^{th} largest canonical correlation is depicted by $\overline{\lambda_\iota}$.

The null hypothesis of the trace test is; H_0: r cointegrating vectors and the alternative hypothesis is; H_1: n cointegrating vectors. The null hypothesis of r cointegrating vectors is considered by the maximum eigenvalue test while the alternative hypothesis is *r + 1* cointegrating vectors.

Other cointegrating relationships hypotheses are tested by the Johansen and Juselius's (1990) method under the following assumptions:

- The regression is spurious. That is, cointegrating relationships do not exist.
- There is, at most, only one cointegrating relationship.
- There are, at most, two cointegrating relationships and so on.

hypotheses tested is the instrument that depicts the total number of cointegrating variables. Should it happen that, none of the available hypothesis are rejected, it can therefore be concluded that the regression or model is spurious. In a case were only the first hypothesis is rejected, it can then be easily assumed that there exist a single cointegrating relationship, only. Should it happen that, the first and second hypotheses are the only ones rejected, then the conclusion is that two cointegrating relationships exist. While if this is taken a step further and all hypotheses are rejected, it is the assumed that none of the variables contain stochastic trends. This is done this way because, it is the only way for multiple cointegrating relationships to exist as variables (Studenmund, 2006).

Cointegrated variables have a tendency of reverting to common stochastic trends, and this can be expressed in terms of error-correction. In a case where y_t is an n-dimensional time series and β is a cointegrating vector, then the combination $\bar{\beta} y_{t-1}$ measures the "error" in the data (the deviation from the stationary mean) at time $t - 1$. The rate of correction for series from disequilibrium is represented by a vector α of adjustment speeds, and this is provided for in the VAR model at time t through a multiplicative error-correction term $\alpha\bar{\beta} y_{t-1}$ (Greenslade and Henry, 2002).

It is not a requirement that the error correction model (ECM) detect the relationships of the equilibrium. The pair-wise cointegration relationships can exist between pairs of variables, however, it does not necessary mean that these relationships will last forever because they might find disequilibrium in the short-term. Sargan (1964) was the first to propose the equilibrium error term, and it is mainly known as 'error correction mechanism'. The idea behind the error correction mechanism was then amplified by Davidson and Hendry (1978) and later Engle et al (1987) combined it with cointegration theorem.

3.3.2.6 Impulse Response Analysis

The impulse response analysis is a technique used in econometric analysis to how long the shocks effects last for, over a period of time on the variable's value in the future. Brooks (2008) indicates that, the impulse response analysis instrument is utilised for tracing how the dependent variables response to shocks on each of the independent variables in the VAR. As such, the persistence and magnitude of both the nominal and real shocks are shown to the real growth in this study. According to Brooks (2008), the impulse response analysis provides the information about whether there is stability in the system, the shocks should steadily disappear, and the VECM is the model through which this process is done. This impulse response analysis technique will be utilised to trace out the effects of a shock from the dependent variable on the independent variables.

3.3.2.7 Variance Decomposition

Once the VAR model has been fitted, the Variance decomposition will be used to help the interpretation. The variance decomposition in mainly used to investigate how important of each individual shock are over all other variables (Enders, 2004). The variance decomposition technique is also used to determine the normalisation of the VAR Model. A variable that is normalised should explain its own variation by less than 50%. In case the normalisation condition is not satisfied, then the variable is exogenous and normalisation is inappropriate.

3.3.2.8 Causality Test

The possibility that two variables (X and Y) are cointegrated implies that the any of the following three relationships may exist: (1) Y affects X, (2) X affects Y, and (3) the two affect each other. There is also a possibility of the two variables being independent, where the two variables are not cointegrated, and the one does not affect the other. To examine this relationship, the Granger causality test is proposed Granger (1969). One variable is said to Granger Cause the other in a case where its past values can be used to predict the values of the other. The following Granger causality model is specified:

$$\Delta Y_t = \sum_{i=1}^{n} \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{n} \beta_j \Delta FI_{t-j} + \mu_{1t} \quad (3.20)$$

$$\Delta X_t = \sum_{i=1}^{n} \lambda_i \Delta X_{t-i} + \sum_{j=1}^{n} \delta_j \Delta Y_{t-j} + \mu_{2t} \quad (3.21)$$

3.3.3 Data

Due to the limited macroeconomic data on financial inclusion, the study employs quarterly time series data from 2000 to 2020 to analyse the impact of financial inclusion on macroeconomic stability and financial stability, respectively.

For the financial inclusion indicator, the study makes use of the Financial Access survey (FAS). The FAS launched in 2009, is a financial inclusion survey conducted by the International Monetary Fund (IMF), which provides supply-side data on the access to and use of financial services aimed at supporting policymakers to measure and monitor financial inclusion and benchmark progress against peers. The FAS dataset consist of 189 economies covered over 10 years with 121 time-series variables on access, usage, and gender disaggregated data on basic financial services. The survey also provides 64 variables normalised relative to the adult population size, land area and GDP.

The below nine FAS indicators have been endorsed as the G20 Financial Inclusion indicators, as shown in Table 3.1. Moreover, for the Macroeconomic Stability indicators, Output, Inflation, and Exchange rate, the study makes use of data from the South African Reserve Bank (SARB) will be used. The SARB provides high-quality economic and financial data based on international best practice. The SARB compiles rich data on the instruments of macroeconomic for the South African economy.

Table 3.1: G20 Financial Inclusion Indicators

1.	Number of ATMs per 100,000 adults
2.	Number of commercial bank branches per 100,000 adults
3.	Number of mobile money transactions per 100,000 adults
4.	Number of deposit accounts at commercial banks per 1,000 adults
5.	A. Number of life insurance policy holders per 1,000 adults
	B. Number of non-life insurance policy holders per 1,000 adults
6.	Deposit accounts of SMEs at commercial bank (as % of non-financial corporations)
7.	Loan accounts of SMEs at commercial banks (as % of non-financial corporations)
8.	Number of registered mobile money agent outlets per 100,000 adults
9.	Number of loan accounts with commercial banks per 1,000 adults

3.3.4 Limitations

There are some limitations that come with the use of existing data on macroeconomic correlates with financial inclusion, in particular the fact that, until very recent, there has been a large shortage of financial inclusion data on macroeconomic level, especially time series data. Hence, the study cannot be conducted covering years prior to 2000.

3.4 Empirical Findings

3.4.1 Introduction

In section 3.3 above the analytical framework were proposed and the model and techniques that the study employs were introduced. In this section, the main empirical results on the quarterly data from 2000 to 2020 are presented. The model regresses the relationship between financial inclusion and macroeconomic stability. Four factors of macroeconomic stability are used in this study, these are Output, Inflation and Exchange rate, and Commercial bank branches per 100,000 adults (CBB) is used as a measure of financial inclusion. The data used in this study is measured in percentages except for CBB and Output, as such, these two variables are converted into natural logarithm. LNOUT and CPI represent output and Inflation in variables in the natural logarithm and they are the selected two representatives for macroeconomic stability as per literature, amongst other many variables. In this section, the main objective of this chapter is achieved, which is to examine the relationship between financial and macroeconomic stability in South Africa.

3.4.2 Unit Root Test

To kick-off the statistical properties of the series in this study, the unit root is conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The unit root test is necessary as it help test whether correct inferences can be provided by the series and, from a standard economic theory, this will ascertain that the estimations of regression are consistent. The ADF and PP tests results are presented in terms of level, first difference and second difference in Tables 3.2 and 3.3 respectively.

Table 3.2: Unit root tests: ADF in levels, first and second difference

Variable	ADF Test							
	Intercept				Trend and intercept			
	Level	First Diff	Second Diff	Order of Integration	Level	First Diff	Second Diff	Order of Integration
LNOUT	-2.45	-1.89	-8.51***	I (2)	-1.02	-2.91	-8.48***	I (2)
CBB	-1.98	-1.78	-7.01***	I (2)	-0.63	-2.45	-7.05***	I (2)
CPI	-3.99***	-3.20**	-5.56***	I (0)	-3.97**	-3.18*	-5.47***	I (0)
EXC	-0.83	-2.88*	-8.49***	I (1)	-2.51	-3.03	-8.46***	I (2)

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

The ADF test shows that the LNOUT and CBB variables are only stationary at second difference for both Intercept and, trend and intercept. As such, the null hypothesis that, there is a present of unit root for LNOUT and CBB, is rejected after testing the ADF at second difference.

The ADF test reject the null hypothesis that there is unit root for CPI after conducting the test at level for both intercept and, trend and Intercept, since the variable is stationary at level I(0). The EXC variable, on the other hand, is only stationary after taking first difference for intercept I(1), while under trend and intercept, we can only reject the null hypothesis after conducting the ADF test on second difference as the variable is integrated of order I(2).

Table 3.3: Unit root tests: PP in levels, first and second difference

Variable	PP Test							
	Intercept				Trend and intercept			
	Level	First Diff	Second Diff	Order of Integration	Level	First Diff	Second Diff	Order of Integration
LNOUT	-3.28**	-1.99	-8.51***	I (0)	-0.03	-3.05	-8.48***	I (2)
CBB	-1.35	-3.45**	-8.49***	I (1)	-0.82	-3.51**	-8.44***	I (1)
CPI	-2.43	-3.50	-8.49***	I (2)	-2.42	-3.48**	-8.43***	I (1)
EXC	-0.31	-3.05**	-8.49***	I (1)	-1.42	-3.16*	-8.46***	I (1)

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

The PP tests shows that only the LNOUT variable is stationary at level form under trend since it is integrated at order 1. while under trend and intercept the variable is integrated of order 2 and stationery after conducting the test at second difference form. The rest of the variables (CBB, CPI and EXC) are all stationary after testing at first difference for both trend and, trend and intercept, with an exception of CPI under intercept which is stationary only at second difference and integrated of order 2.

3.4.3 Cointegration Test Results

The cointegration test is significant for testing if there is a long run relationship between the variables or put differently, to test the linear combination of two or more time series. In a case where are more than one series, these will link to form a long run relationship, one that is also possible even if they individually have a stochastic trend. This is because, overtime, the variables are predicted to have the same stable trend and be stationery (Granger,1990). The Johansen test, based on trace and maximum Eigen values of the stochastic matrix, is employed to test for cointegration in this study and the results are presented in Tables 3.4 and 3.5 below.

Table 3.4 Cointegration Rank Test Results (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.3067	54.8527	47.8561	0.0096
At most 1	0.1895	27.7498	29.7970	0.0846
At most 2	0.1256	12.1985	15.4947	0.1477
At most 3	0.0302	2.2686	3.8415	0.1320
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level ** MacKinnon-Haug-Michelis (1999) p-values				

The results from the trace test above indicates that there is one (1) cointegrating equations existing at 5% level of significance. The null hypothesis here states that there is no cointegration. This test is such that the rejection of the null hypothesis suggests that the calculated value of the t-statistics is greater than the critical value. The null hypothesis of no cointegrating vector is rejected at none since the trace statistic of 54.8527 is greater that the critical value of 47.8561. As a result, the study concludes that, there is cointegration between the variables.

Table 3.5 Cointegration Rank Test Results (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.3067	27.1029	27.5843	0.0575
At most 1	0.1895	15.5513	21.1316	0.2522
At most 2	0.1256	9.9299	14.2646	0.2166
At most 3	0.0302	2.2687	3.8415	0.1320

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** MacKinnon-Haug-Michelis (1999) p-values

The Maximum Eigen Value test results indicate that none of the calculated values of the tests statistics are greater than the critical values at 5% level of significance. As such, the null hypothesis of no cointegration cannot be rejected and the conclusion that there is not cointegration is made for the maximum Eigen values. This means, by implication, that should shocks exist in the system, the model is not likely to converge in the log-run.

Ideally, the nonexistence of cointegration implies that only the short run (In this case the VAR) and not the long run (VEC) Model should be estimated. However, since the trace test results shows that there is cointegration, and Trace statistics is considered to be more powerful that the Max Eigen Value test statistic, the VECM is estimated in this study.

3.4.4 Vector Error Correction Model (VECM)

Now that the cointegration relationship has been found, the VECM is applied to detect the short run and the long run relationship. The VECM technique makes use of the Error Correction Term (ECT) as the instrument to estimate possible movement from the long run equilibrium. The adjustment speed of any equilibrium towards a long run state of equilibrium is estimated by the ECT. The larger the size of the ECT the quicker the adjustment speed back to the state of equilibrium. However, before, generating the ECT results, the restricted VAR tests first information on lag length and how stable is the model. Table 3.6 below, shows the information on lag.

Table 3.6: VAR Lag Order Selection Criteria

LNOUT = f (CBB, CPI, EXC)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
1	283.6942	NA	5.61e-09	-7.6484	-7.1345	-7.4443
2	392.3784	192.5262	3.98e-10	-10.2965	**-9.2686***	**-9.8882***
3	397.1243	7.8646	5.55e-10	-9.9750	-8.4331	-9.3626
4	404.1279	10.8055	7.31e-10	-9.7179	-7.6622	-8.9014
5	420.7780	23.7859	7.41e-10	-9.7365	-7.1668	-8.7158
6	466.4164	**59.9820***	**3.34e-10***	**-10.5833***	-7.4997	-9.3585
7	473.3453	8.3146	4.66e-10	-10.3241	-6.7266	-8.8951
CPI = f (CBB, LNOUT, EXC)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-329.4664	NA	0.1614	9.5276	9.6561	9.5787
1	291.6499	1153.5020	5.01e-09	-7.7614	-7.1190	-7.5063
2	401.6824	191.7709	3.43e-10	-10.4481	**-9.2917***	**-9.9888***
3	406.2353	7.4146	4.81e-10	-10.1210	-8.4507	-9.4575
4	413.4329	10.8992	6.32e-10	-9.8695	-7.6853	-9.0019
5	430.8055	24.3217	6.31e-10	-9.9087	-7.2105	-8.8370
6	476.8963	**59.2595***	**2.82e-10***	**-10.7684***	-7.5563	-9.4926
7	483.8495	8.1452	3.96e-10	-10.5099	-6.7839	-9.0299

Where:
** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

In Table 3.6, the level of lags is presented for both estimated models and the points of convergence for the models is known as the optimal lag length. The lag length structure and the convergence lag length suggested the most is six, this is suggested by the lag length criterions LR, FPE and AIC. While, two lags were selected by SC and HQ. The stability conditions are presented in Table 3.7 below.

Table 3.7: VAR Stability (Roots of Characteristic Polynomial)

LNOUT = f (CBB, CPI, EXC)	
Root	**Modulus**
0.973224	0.973224
0.879594 - 0.266040i	0.918946
0.879594 + 0.266040i	0.918946
0.901601 - 0.036681i	0.902346
0.901601 + 0.036681i	0.902346
0.782814 - 0.251592i	0.822251
0.782814 + 0.251592i	0.822251
0.586271	0.586271
CPI = f (CBB, LNOUT, EXC)	
Root	**Modulus**
0.973224	0.973224
0.879594 - 0.266040i	0.918946
0.879594 + 0.266040i	0.918946
0.901601 - 0.036681i	0.902346
0.901601 + 0.036681i	0.902346
0.782814 - 0.251592i	0.822251
0.782814 + 0.251592i	0.822251
0.586271	0.586271
No root lies outside the unit circle. *VAR satisfies the stability condition.*	

The stability conditions to be fulfilled states that, all modulus must be less that one and all roots should lie within the unit circle. Table 3.7 above confirms that the VAR fulfils the stability condition for both models, as all of the modulus is less than one, and this means that all roots are expected to lie within the unit circle.

Table 3.8 show results for the relations between Output (LNOUT), Commercial bank branches (per 100,000 adults) (CBB), Inflation (CPI) and Exchange Rate (EXC), where Output is the dependent variable, while in Table 3.9 Inflation is the dependent variable.

The long run relation results are represented in the first part of Table 3.8, while the short-run results are represented on second part in the lower section on the table. According to the long-run results, Commercial bank branches are associated with an increase in economic output. An increase, by 1%, of Commercial bank branches per 100,000 adults causes output to increase by 0.04%. This positive relationship between Commercial bank branches, as a measure of financial inclusion, and economic output is in line with most existing empirical literature, also reviewed in this study (Sahay et al., 2015; Vo et al., 2009; Nizam et al., 2020; Demirgüç-Kunt et al., 2017).

Table 3.8: Long-run and Short-run VECM Results for Model LNOUT = f (CBB, CPI, EXC)

Vector Error Correction Estimates
Dependent Variable: DLNOUT
Sample (adjusted): 2000Q4 2019Q1
Included observations: 74 after adjustments

Cointegrating Equation:	**Cointegrating Equation1**			
LNOUT(-1)	1.0000			
CBB(-1)	-0.0418 (0.0118) [-3.53253]			
CPI(-1)	0.0669 (0.0141) [4.7459]			
EXC(-1)	0.0346 (0.0130) [2.6637]			
C	-28.9460			
Error Correction:	**D(LNOUT)**	**D(CBB)**	**D(CPI)**	**D(EXC)**
CointEq1	-0.0095 (0.0022) [-4.2595]	0.1135 (0.1679) [0.6763]	-1.3684 (0.4828) [-2.8346]	-0.4362 (0.2302) [-1.8946]

The long-run results further show that increases in inflation and exchange rate are associated with a decrease in output. A 1% increase in inflation causes output to decrease by 0.06%, while a 1% increase in exchange rate negatively impact output by 0.03%. These findings concur with key Economic theories on these relations. The Philips curve indicates the negative relationship between inflation and output, and an increase in exchange rate, especially when unexpected, will impact the goods market making exports more expensive and imports less expensive. This will result to a decrease in demand for domestic products by competition from foreign markets and eventually to a fall in domestic output.

The second part of Table 3.8 depicts the estimated loading matrices or α coefficients. The independent variable coefficient tells us whether the particular variable participates in bringing the dependent variable to equilibrium. A variable will be regarded as not participating in bringing the dependent variable to equilibrium in a case were its adjusted coefficient is 0. Since the loading matrices relates to issues of weak exogeneity, a variable that doesn't take part in bringing the normalised variable to equilibrium is regarded as weakly exogenous.

The results from Table 3.8 above, show that log output, which is the coefficient of the error correct model, is negative and statistically and statistically significant. As such, output plays a role in bringing itself to equilibrium, with an adjustment speed of 0.95%. That is, should there be a shift from equilibrium, only 0.95 % is corrected in each quarter as equilibrium becomes restored. Inflation and exchange rate both also play a role in bring output to equilibrium, while commercial bank branches variable is the only one that moves output away from equilibrium.

Table 3.9 shows the long- and short-run results after modelling inflation against commercial bank branches, output and exchange rate. The long-run results show that increase in the measure of financial inclusion (commercial bank branches per 100,000 adults) is associated with an increase in inflation. A 1% increase in commercial bank branches per 100,000 adults causes inflation to increase by 0.63%. The positive relationship between financial inclusion and inflation is consistent with the findings of other scholars, such as Vo et al. (2009).

Table 3.9: Long-run and Short-run VECM Results for Model CPI = f (CBB, LNOUT, EXC)

Vector Error Correction Estimates
Dependent Variable: DCPI
Sample (adjusted): 2000Q4 2019Q1
Included observations: 74 after adjustments

Cointegrating Equation:	**Cointegrating Equation1**			
CPI(-1)	1.0000			
CBB(-1)	-0.6256 (0.4686) [-1.3351]			
LNOUT(-1)	14.9584 (7.4240) [2.0149]			
EXC(-1)	0.5173 (0.1936) [2.6719]			
C	-432.9836			
Error Correction:	**D(CPI)**	**D(CBB)**	**D(LNOUT)**	**D(EXC)**
CointEq1	-0.0915 (0.0323) [-2.8346]	0.0076 (0.0112) [0.6763]	-0.0006 (0.0002) [-4.2595]	-0.0292 (0.0154) [-1.8946]

The long-run results further show that increases in economic output and exchange rate are associated with a decrease in inflation. An increase in output, by 1%, will cause inflation to fall by 14.96%. This negative relationship between inflation and output is expected, as supported by economic theory. A 1% increase in exchange rate cause inflation to decline by 0.52%. This relationship is in contrast to economic literature on the subject, which depicts a positive relationship between inflation and exchange rate (Agenor & Montiel, 1996; Dornbusch, 1976; Monfared & Akın, 2017).

The results from the second part of Table 3.9 shows that the coefficient of the error correction model (CPI) is negative and statistically significant. This suggests that inflation plays a role in bring itself to equilibrium. Since the coefficient is -0.091, in the event that there is a shift from equilibrium, only 9.1% is corrected in each quarter as equilibrium becomes restored. The commercial bank branches coefficient is positive and almost exogenous. This tells us that, even though commercial bank branches move output away from equilibrium, its impact is very weak. The results further indicate that, exchange rate volatility plays a role in bringing inflation to equilibrium. Output, on the other hand, appears to be weakly exogenous, and as such does not play a role in bringing inflation to equilibrium.

3.4.5 Granger Causality Test Results

The Causality test is used to establish exactly which variable causes the other to move, in case where it known that two variables are related without knowing the direction of that relationship. Granger Causality test is used in order to determine if whether the current and lagged values of one variable have an effect on the other.

The Granger causality tests for the possible causal direction between variables, or whether two variables predict each other. A variable Granger causes another if the past and current values of the first one can contribute to predicting the second one (Granger, 1969). In a case where the probability value is less than 5%, then we conclude that there is causality and in effect reject the null hypothesis.

Table 3.10: Pairwise Granger Causality Tests

Model: LNOUT = f (CBB, CPI, EXC)				
Null Hypothesis:	**Observation**	**F-Statistic**	**Prob.**	**Outcome.**
CBB does not Granger Cause LNOUT LNOUT does not Granger Cause CBB	75	1.1284 3.9506	0.3294 0.0237	No causality **Causality**
CPI does not Granger Cause LNOUT LNOUT does not Granger Cause CPI	75	6.2198 0.2731	0.0033 0.7618	**Causality** No causality
EXC does not Granger Cause LNOUT LNOUT does not Granger Cause EXC	75	1.3659 2.3045	0.2619 0.1073	No causality No causality
CPI does not Granger Cause CBB CBB does not Granger Cause CPI	75	0.1466 0.4758	0.8639 0.6234	No causality No causality
EXC does not Granger Cause CBB CBB does not Granger Cause EXC	75	0.1078 2.5009	0.8980 0.0893	No causality No causality
EXC does not Granger Cause CPI CPI does not Granger Cause EXC	75	1.0086 2.8223	0.3700 0.0663	No causality No causality
Model: CPI = f (CBB, LNOUT, EXC)				
Null Hypothesis:	**Observation**	**F-Statistic**	**Prob.**	**Outcome.**
CBB does not Granger Cause CPI CPI does not Granger Cause CBB	75	0.4758 0.1466	0.6234 0.8639	No causality No causality
LNOUT does not Granger Cause CPI CPI does not Granger Cause LNOUT	75	0.2731 6.2198	0.7618 0.0033	No causality **Causality**
EXC does not Granger Cause CPI CPI does not Granger Cause EXC	75	1.0086 2.8223	0.3700 0.0663	No causality No causality
LNOUT does not Granger Cause CBB CBB does not Granger Cause LNOUT	75	3.9506 1.1284	0.0237 0.3294	**Causality** No causality
EXC does not Granger Cause CBB CBB does not Granger Cause EXC	75	0.1078 2.5009	0.8980 0.0893	No causality No causality
EXC does not Granger Cause LNOUT LNOUT does not Granger Cause EXC	75	1.3659 2.3045	0.2619 0.1073	No causality No causality

In the top part of Table 3.10, the causality test is mainly aimed at output (LOUT) and financial inclusion (CBB). The results show that, there is a unidirectional causality running from output to financial inclusion because the p-value of 0.0237 which is less than 0.05 level of significance, therefore can only reject the null hypothesis that output does not granger cause financial inclusion and cannot reject the opposite.

Additionally, the causal relation between output and inflation is only on one direction, from inflation to output since, inflation does Granger-cause output. With regards to the relation with the rest of the variables, the results show that there are no further causal relationships.

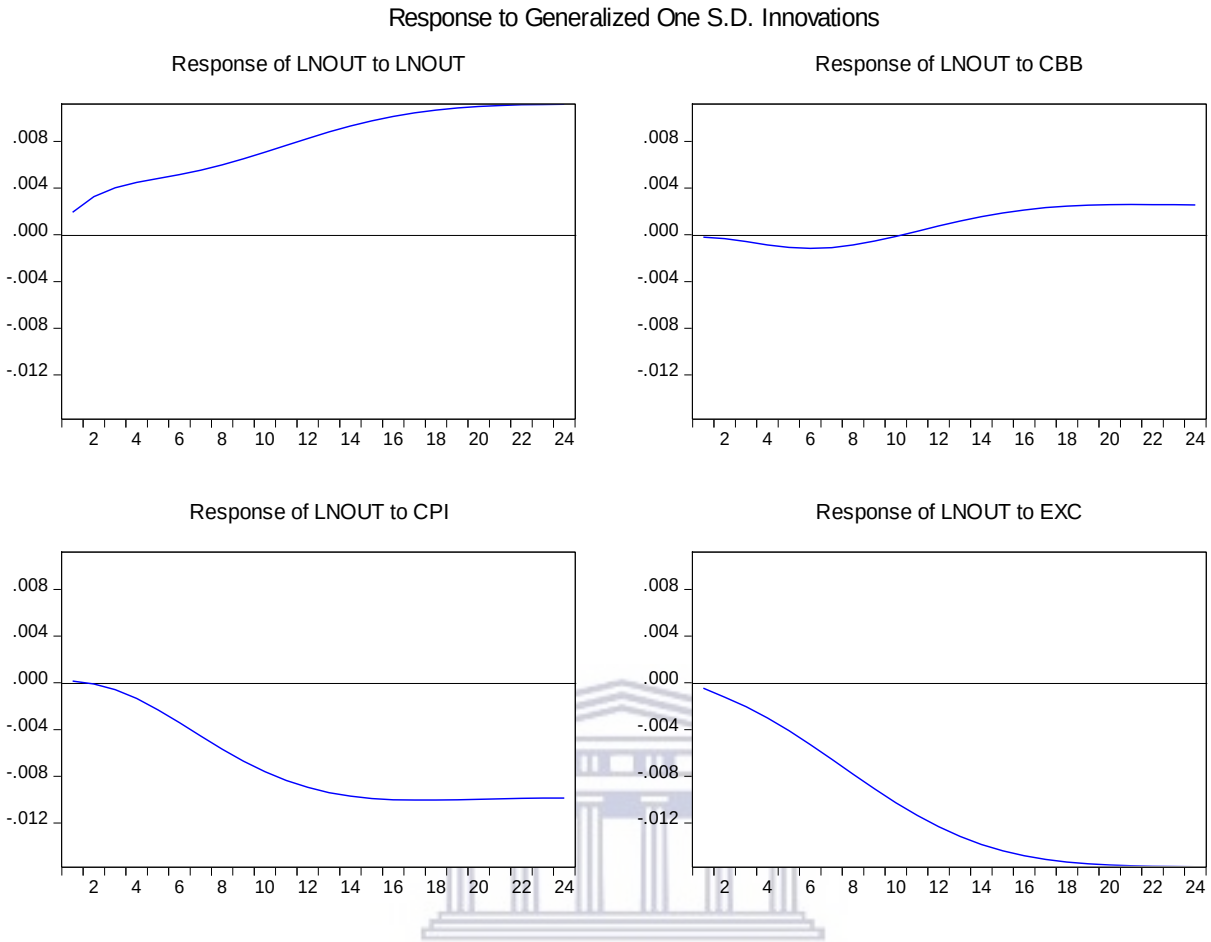
With the second part of the table, the main interest is on the causality between inflation rate (CPI) and the other variables. The results show that there is a unidirectional causality running from inflation to output as shown by the probability 0.0033 which is less than 0.05 level of significance. Additionally, there is also a unidirectional causality running from output to financial inclusion, while there is not causal relationship between inflation and financial inclusion seen in the results.

3.4.6 Impulse Response Functions

The Impulse Response function is used to trace the dependent variable's responsiveness to shocks from the other variables. Figure 3.2A below shows the how output reacts to exogenous shocks in financial inclusion, inflation and exchange rate. While Figure 3.2B shows how inflation responds to the shocks from the other variables. Figure 3.2A indicates that output has a positive yet diminishing response to itself. It shows a gradient that increase continuously at a decreasing rate until around the 20th term, then it starts to show a rather constant horizontal trend throughout the remaining period.

The response of output (LNOUT) to financial inclusion (CBB) proves to be transitory in nature, as the effect die out over time. It starts with a decreasing negative behaviour for the first 6 periods, then it starts increasing until it reaches the steady state around the 10^{th} period. From there onwards the response increases at a decreasing rate above the steady state until it reaches a stand still just before the 20^{th} period, where it continues constantly at uniform horizontal trend until the end of the observed period. This suggest that, in the long run, financial inclusion will impact output positively for some time until it reaches a certain point, then the output growth rate will fall down to zero, indicated by the horizontal trend.

Figure 3.2A: Impulse Response Function Results - LNOUT = f (CBB, CPI, EXC)



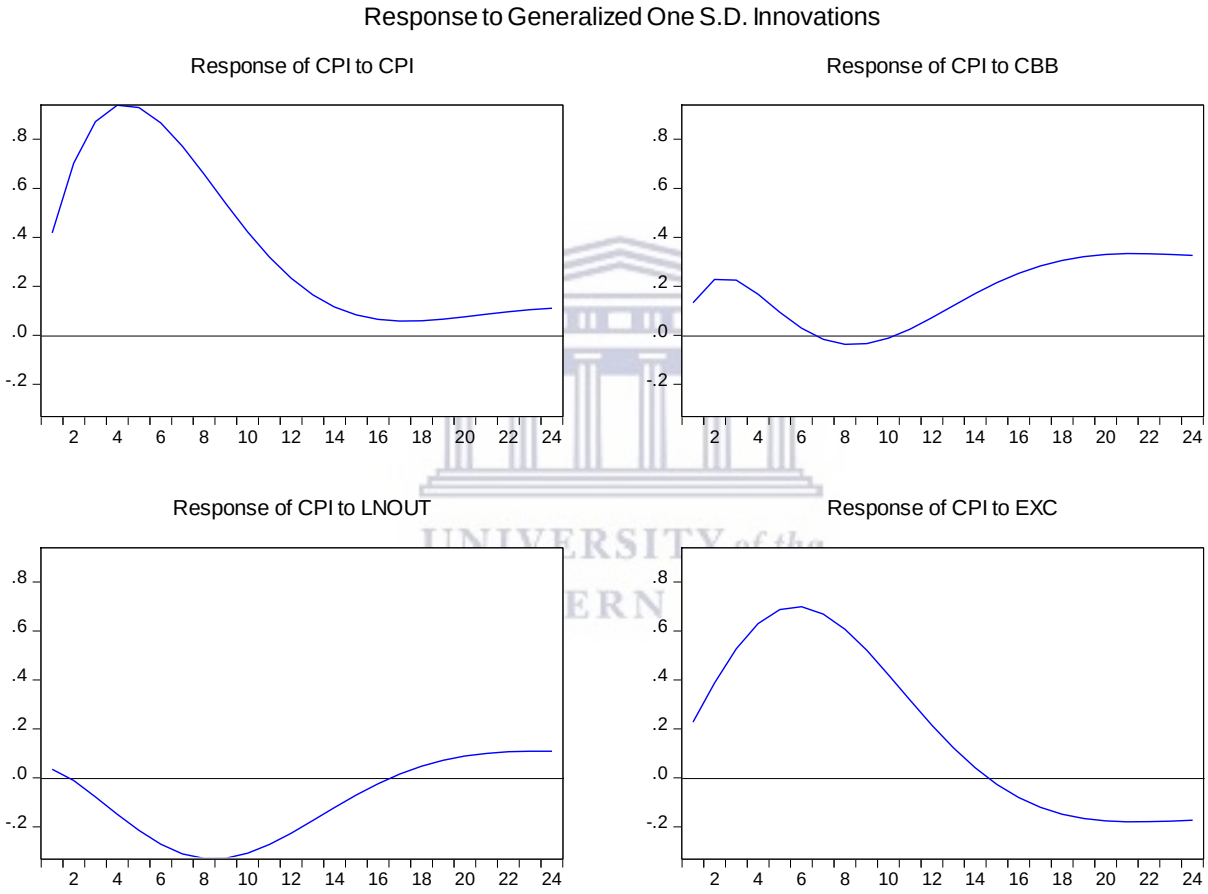
The shocks in inflation and exchange rate both show a transitory decreasing effect on output below the state for the whole duration of the observed time period. The effect of the shock in exchange rate on output seems to wear out earlier than that of the shock in inflation. While the response to inflation shock curve tends to reach a constant horizontal trend earlier than that of exchange rate, the shock in exchange rate only has an impact on output for the first 20 terms of the observed period. The negative impact of both inflation and exchange rate comes expect, as indicted by economic theory.

In figure 3.2B the response of inflation to shocks in inflation starts off a decreasing rate above the steady state for the first 6 periods of the term, in which it drastically falls until around the 17th period, however still remaining above the steady state. From that point, it shows a gradual increasing trend for the remainder of the period.

The impact of shocks in financial inclusion on inflation shows a rather fluctuating behaviour for most of the early parts of the observed term. For the first two terms, the trend shows an

increasing behaviour, until it starts falling just around the 4th term. The negative behaviour continues until the curve reaches a point below the steady state at around the 8th term. From that point onwards, the response line starts increase until it reaches a constant horizontal trend above the steady state and the point where it began at around the 20th term, in which it continues for the remainder of the period. This effect is permanent, and tells us that, while there is a negative relationship between the two variables in the short run, financial inclusion will have a positive impact on inflation in the long run.

Figure 3.2B: Impulse Response Function Results - CPI = f (CBB, LNOUT, EXC)



The shocks to output also show a permanent effect on inflations, indicated by the fluctuating behaviour. A shock in output leads to a sharp decrease in inflation above the steady state equilibrium for the first 3 terms. The fall continues gradually below the steady state equilibrium until 8th term, where the relationship disappears and appears again in term 10, from which it starts increase reaching the steady state equilibrium at a round the 17th term. From that point, the increase continues above the steady state equilibrium until it takes a flat trend from around the 22nd period.

The overall observation from this relation is that, output has a negative impact on inflation in the short run and a positive impact in the long run. This is in line with macrocosmic theory/ models, depicted by the AS-AD model.

The response to shocks in exchange rate shows that, in the short run, exchange rate has a positive impact on inflation, hence the response starts off with and increasing trend above the steady state period for the first six terms of the observe period, from which it starts falling reaching the steady state equilibrium around the 15th term. The fall continues bellow the steady state equilibrium up until it reaches a point where it maintains a horizontal trend from the 20th period. The shocks in exchange rate shows to have a permanent impact on inflation. The behaviour is such that in the medium term, exchange rate proves to have a negative impact on inflation, and in the long run the relationship disappears.

3.4.7 Forecast Error Variance Decomposition

The forecast error decomposition (FEVD) is employed in this study to test how each of the observed variables is important in random innovation using the VAR model. The FEVD essentially decomposes the variance of the forecast error into the contributions from specific exogenous shocks. Table 3.11 below presents the FEVD result for specifically the dependent variables, output and Inflation, regressed in the two models.

Table 3.11: The forecast error Variance decomposition (FEVD) Results

LNOUT = f (CBB, CPI, EXC)					
Period	**S.E.**	**LNOUT**	**CBB**	**CPI**	**EXC**
1	0.001940	100.0000	0.000000	0.000000	0.000000
2	0.003827	98.43318	0.000145	1.101875	0.464798
3	0.005673	95.01219	0.098259	3.148432	1.741122
4	0.007530	89.24544	0.365163	6.755646	3.633748
5	0.009512	81.55122	0.626884	12.13541	5.686483
6	0.011725	72.97275	0.718035	18.81380	7.495412
7	0.014235	64.63983	0.629170	25.86594	8.865060
8	0.017061	57.33422	0.463750	32.40844	9.793592
9	0.020183	51.38019	0.334366	37.90675	10.37869
10	0.023552	46.76624	0.305490	42.19238	10.73588
11	0.027104	43.31356	0.390496	45.33680	10.95914
12	0.030771	40.79532	0.571077	47.52113	11.11247
13	0.034487	38.99707	0.816502	48.95164	11.23478
14	0.038195	37.73872	1.095743	49.81808	11.34746

15	0.041847	36.87751	1.383173	50.27844	11.46087
16	0.045407	36.30371	1.660241	50.45719	11.57886
17	0.048851	35.93442	1.915113	50.44882	11.70164
18	0.052165	35.70774	2.141470	50.32314	11.82765
19	0.055341	35.57794	2.337117	50.13040	11.95455
20	0.058381	35.51164	2.502692	49.90577	12.07990
21	0.061289	35.48486	2.640598	49.67308	12.20147
22	0.064073	35.48074	2.754175	49.44765	12.31744
23	0.066745	35.48779	2.847111	49.23865	12.42645
24	0.069315	35.49850	2.923044	49.05084	12.52762
CPI = f (CBB, LNOUT, EXC)					
Period	S.E.	CPI	CBB	LNOUT	EXC
1	0.418118	100.0000	0.000000	0.000000	0.000000
2	0.820436	99.19940	0.003843	0.726956	0.069806
3	1.209229	97.64079	0.214229	2.105176	0.039808
4	1.557290	95.20349	0.920520	3.834319	0.041673
5	1.855713	92.13431	1.960689	5.788623	0.116377
6	2.101793	88.84769	3.065272	7.850044	0.236996
7	2.295913	85.73270	4.013682	9.888834	0.364779
8	2.441124	83.06662	4.680982	11.78022	0.472178
9	2.543051	80.99576	5.037692	13.42093	0.545615
10	2.609394	79.54469	5.132978	14.73938	0.582957
11	2.649026	78.63540	5.072067	15.70135	0.591184
12	2.670916	78.11367	4.989353	16.31242	0.584554
13	2.683119	77.78464	5.017739	16.61545	0.582172
14	2.692037	77.45568	5.258758	16.68118	0.604380
15	2.702065	76.97706	5.761842	16.59259	0.668504
16	2.715632	76.26740	6.519824	16.42743	0.785351
17	2.733551	75.31623	7.481036	16.24500	0.957732
18	2.755522	74.16686	8.570940	16.08093	1.181271
19	2.780640	72.89007	9.713693	15.94949	1.446754
20	2.807806	71.55991	10.84694	15.85028	1.742868
21	2.835991	70.23788	11.92813	15.77554	2.058450
22	2.864373	68.96618	12.93423	15.71569	2.383893
23	2.892384	67.76781	13.85781	15.66262	2.711756
24	2.919686	66.65026	14.70210	15.61083	3.036811

Looking at the variance decomposition of inflation from Table 3.11 above, the results depict that, while the variance error for inflation decreases throughout the 24 terms included here, inflation remains substantially strongly endogenous in every term. By term 24, inflation accounts for over 66 percent variance forecast error variance in itself, from 100 percent in the first term and 78 percent in term 12.

In the last term, the second largest contributor to inflation variance is output and CBB with 15.6 and 14.7 percent, respectively. Exchange rate remains weekly influential to inflation throughout the period, only contributing 3 percent forecast error variance to the variation in inflation by term 24.

The results from Table 3.11 shows that in the first term, 100 percent of forecast error variance in output (LNOUT) is explained by itself, hence the other observed variables do not have an influence on output, during this term. While CBB, CPI and EXC continue to exhibit strong exogeneity for most of half the observed term, their influence in predicting output increases substantially as the terms progress, with inflation having the most influence, followed by exchange rate and CBB being the least influential. In fact, by term 10 inflation and exchange rate, together, have over 50 percent influence on output, with inflation being the strongest predictor by 42 percent, and exchange rate contributing 10 percent forecast error variance. CBB still remains insignificant with an influence of less than one percent. Moving further into the future, the forecast error variance of output on itself keeps decreasing and inflation continues to account for most of the forecast error variance in output, surpassing output as early as term 11. By term 24, inflation accounts for 49 percent forecast error variance in output, proving to be the strongest contributor output volatility, followed by output itself with over 35 percent and then exchange rate by over 12 percent. CBB remains strongly exogenous throughout the observed period, contributing only 2.9 percent by the last term.

3.5 Summary

This study set out to examine the relationship between financial Inclusion and macroeconomic stability in South Africa, using quarterly time series data from year 2000 to 2019. The relation of financial inclusion with macroeconomic factors is greatly under researched globally. In fact, from a local point of view, this is the first study that investigates the relationship between financial inclusion and macroeconomic stability, with a specific focus on South Africa. As such, this study will play a great role in contributing to the lacking body of literature on the subject.

To measure macroeconomic stability, the study used two macroeconomic factors, namely output and inflation, and commercial bank branches per 100,000 adults (CBB) was used as a measure of financial inclusion. Two VEC models were observed in this study, one with output

as the dependent variable and CBB, inflation and exchange rate as the explanatory variables, and in the other model inflation was the dependent variable, and financial inclusion (CBB), output and exchange rate were used as the independent variables. Among other analysis, the study investigated the long and short run relationship between the variables and determined their causal relationship thereof. In doing so, the Johansen cointegration approach and the VEC model were employed to establish the long and short run relationship.

The Johansen cointegration test results confirmed that a long run relationship exists among the variables. The VECM results indicated a positive relationship between financial inclusion and output in the long run, while inflation and exchange rate were found to negatively impact output. In the short run, the results found that inflation and exchange play a role in bring output to equilibrium, while CBB moves output away from equilibrium. After regressing the model with inflation as the dependent variable, the results found financial inclusion to have a positive impact on inflation in the long run, and output and exchange rate are found to have a negative long run impact on inflation. The positive relationship between financial inclusion and the macroeconomic stability measure used is this study, is consistent with findings of related empirical work done on this relation in both developed and emerging economies (Vo et al., 2018; Nizam et al., 2020; Cumming et al., 2014). For instance, Vo et al. (2018) submits that financial inclusion, as approximated by the growth in the number of bank branches over 100,000 account holders, plays an important role in restricting inflation and output growth stability. While Cumming et al. (2014), indicates that financial inclusion promotes to economic growth through encouraging entrepreneurs to take more risk and invest more. Furthermore, the relationship negative relationship between output and inflation is aligns with economic theory, as stated in the Philips Curve.

Important policy implications from this study points to the importance of financial inclusion in impacting output and inflation. As such, Macroeconomic policy maker can use financial inclusion as a tool to retain macroeconomic stability. Policymakers should find a balance between financial inclusion and inflation control. They should also be mindful of the relationship between financial inclusion and output, and identify innovative measures to efficiently deliver financial services to the great population, in the pursuit of increase economic output. Apart from having a great benefit in retaining macroeconomic stability, the impact of financial inclusion could be extended to other aspects of the economy and development. These

include boosting economic growth, increasing the standard of living of individuals and eradicating poverty (Ozili, 2020; Kim et al., 2018, World Bank, 2008).

The study identifies a number of opportunities for future financial inclusion research, particularly in South Africa. There is a large vacuum on research done on Financial Inclusion in South Africa, particularly from a macroeconomic point of view. Part of the problem stems from macroeconomic data on financial inclusion being available only recently. Future research should look at the relationship between financial inclusion on financial stability in South Africa. There is a general concern that financial inclusion has potential risks to financial system stability. No research has been done on this relation in South Africa so far. There is also a need for research that uses other measures of financial inclusion to test for its impact on macroeconomic factors, this is important since financial inclusion is generally a multidirectional phenomenon. Lastly, some key economic crises facing South Africa are inequality and poverty, it would be impactful to also conduct research investigating channels of financial inclusion that could efficiently promote the eradicating of income inequality and poverty.

CHAPTER FOUR: THE RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND FINANCIAL STABILITY IN SOUTH AFRICA.

4.1 Introduction

The efficient functioning of any market economy is determined by the stability of key economic sectors and systems. Monetary and financial stability are of central importance to this phenomenon. Financial stability is not an end to itself but, as the case with concepts such as price stability, it is widely regarded as an essential precondition for sustainable economic growth, development and the creation of employment opportunities. A stable financial system also provides certainties to economic participants that aids efficient allocation of resources and increase the confidence and willingness to enter into intertemporal contracts. It also provides a conducive environment for individuals, firms and governments to make rational decisions about the allocation of real resources and subsequently improve the bases for savings, investment and making use of other key financial inclusion services, (World Bank, 2018).

According to Mishkin (1999), a stable financial system is one with financial markets that conducts the key function of channelling financial services to the participants (individuals, firms and government entities) that see productive investment opportunities. The failure for a financial system to appropriately execute this essential role could have negative impacts to the efficient operation of the economy and could hamper economic growth. Part of the responsibilities that come with performing this role includes, among other factors, tackling issues of information asymmetric, which advocates for the assurance that all parties should have equal or enough accurate information about the financial contract (Mishkin, 1999).

South Africa's financial system is known to be amongst the most developed financial systems in the world. The system boasts with a highly sophisticated financial sector, which is backed by a sound regulatory and legal framework, and comprising of both domestic and global institutions that caters the public with dozens of advanced series of services. These range from insurance and investment, to lending, mortgages, merchant banking, commercial, borrowing and retail, among other financial products. This range of financial services options can be used by customers to enhance their daily consumption activities and also manage their risk (International Monetary Fund, 2022).

Just like many developed financial sectors, the South African financial sector is widely criticised for being mostly tailored for the advanced segment of the economy (Schoombee, 2004). This critic raises from the reality that, all members of the society must benefit from the financial sector. The financial system should expand products to meet the needs of the whole population particularly individuals and small and medium sized enterprises (SMEs) that make little use of it, in order to achieve the global concern of financial inclusiveness. (World Bank, 2018).

The financial inclusion agenda has become an issue of global concern in the recent years. Particularly because growing empirical evidence indicates that lack of financial inclusion results to negative consequences for a country's economic growth, harms the development of SMEs, slows transformation and affects the ability of the poor to take part in the formal financial sector (Demirguc-Kunt & Klapper, 2012). Recently, however, there has also been a growing concern from organisations responsible for financial stability, that links between financial stability and inclusion might be more complex than one can imagine. They suggest that, the growing promotion of financial inclusion interventions could pose a threat to the financial stability of developing economies (FSB, IMF and WB 2011).

Due to scarcity and relative newness of macroeconomic data on financial inclusion, there is very few studies conducted on its macroeconomic impact, including the relationship between financial stability and financial inclusion. This lack of literature is even worse from a South African point of view. Existing empirical literature suggest contradicting results on how financial inclusion could affect financial stability. García (2006) indicates that, new financial inclusion institutions and instruments, as well as poorly regulated players of the financial system, that causes rapid credit growth could cause risk of financial stability. However, broader access to financial inclusion services that diversifies the base of deposits, could significantly improve the strength of the overall financial system and subsequently, financial stability. While Morgan and Pontines (2014), also advocates for a positive relationship between financial inclusion and financial stability. They indicate that, increasing lending to SMEs improves stability, particularly through the reducing of non-performing loans (NPLs) and the probability of default by financial institutions.

This study examines this relationship between financial inclusion and financial stability in the South African economy. According to our knowledge, there has not yet been a South Africa

study that examine relationship. Findings from the study will contribute to the wanting local literature on this subject.

The rest of the chapter is organised as follows. Section 4.2 presents analytical literature review pertaining the relevant theories between financial inclusion and financial stability and covers evidence from existing empirical literature. Section 4.3 describes the available data on financial stability and financial inclusion, and outlines the research methodology to be employed in the study. Section 4.4 presents the empirical results and writeup. Finally, the study concludes in section 4.5.

4.1.1 Research Questions

This chapter intends to examine two key questions on the relationship between financial inclusion and financial stability in South Africa, mainly:

I. How does financial inclusion impact financial stability in South Africa?
II. How does financial inclusion relate to financial stability in South Africa?

4.1.2 Objectives of the Study

The general objective of the study is to investigate the relationship between financial inclusion and financial stability in South Africa. The study seeks to:

- To study how financial inclusion impact financial stability in South Africa.
- Determine the causal direction between financial inclusion and macroeconomic stability and

The corresponding hypotheses are as follows:

- H_0: Financial inclusion impacts financial Stability in South Africa.
- H_1: Financial inclusion does not impact financial Stability in South Africa.

4.2 Literature Review

4.2.1 Conceptual framework

4.2.1.1 Financial Stability

Due to its complex nature, there is no universally accepted agreement on how financial stability should be defined. As such, scholars have proposed different definitions of financial stability. For instance, Crockett (1996), Davis (2003) and Mishkin (1999) propose that financial stability be defined in terms of what it is not. They define it as a situation in which financial instability impairs the real economy, especially in a case where the problems of information deprive the financial system from effectively allocating funds to productive opportunities of investments. De Bandt and Hartmann (2000) use a similar approach, with a focus on systematic risk, and define financial stability in terms of financial problems resulting from the link between institutes of finance or financial markets, particularly those that have the potential of largely impacting the real economy negatively. Houben, Kakes, and Schinasi (2004), on the other hand, take a more positive approach and define financial stability as a state in which the financial system has the ability to efficiently allocate resources between activities and across time, assess and manage financial risks and lastly, absorb shocks.

While there are evidently multiple definitions of financial stability, the common factor most of these definitions have is that they all view financial stability as a financial system that is resilience to stress. It is also about the unavailability of system-wide episodes in which the financial system has crises. Thus, the best definition of financial stability, and one that is used in this study, is a system of finance that has the ability to allocate resources efficiently, assess and manage financial risks, maintain healthy levels of employment and one that has the capability to eliminate factor that have potential harm to monetary stability and levels of employment.

4.2.1.2 Financial Inclusion

Financial inclusion is also a multidimensional concept. However, its definition and identification has become more straightforward over the years. The World Bank (2018) defines financial inclusion as individuals and firms having access to financial products and services that are useful and affordable, meet their transactional, payments, savings, credit and insurance needs, and are delivered in as sustainable and responsible manner. Khan (2011), regard financial inclusion as the process of making sure that the vulnerable groups such as the weak and low-income segments of the society have access to affordable financial services and timely and adequate credit where needed. This is primarily the access to bank accounts, affordable credit and the payments system.

Hannig and Jansen (2010) define financial inclusion as the aim to draw the segments of the population that are regarded as "unbanked" into the formal financial system, to allow them the opportunity to have access to financial services such as savings, payments, and transfers to credit and insurance. While, Zins and Weill (2016) simply suggests that financial inclusion is when an individual owns an account at a formal financial institution and though this account is able to formally save and borrow money, contract insurance and/ or use payment services.

The definition of financial exclusion is also warranted in the process of enhancing the understanding of the financial inclusion concept, for that reason, some scholars have resorted to using the definition of financial exclusion to clarify what financial inclusion is. As such, Warsame (2009) proposes a narrow and broad sense of defining financial exclusion. He suggests that, a case where participants are excluded from certain sources of credit and other financial services, such as bill payments, insurance and access to appropriate deposit accounts, is regarded as a narrow sense. While a wider sense is when particular factors are put in place to effectively exclude the less fortunate members of the society from having access to the formal financial system.

From a macroeconomic point of view, the limitation of financial institutions and bank branches, fewer automatic teller machines (ATMs), the high cost of small deposit and loan services, lack of appropriate personal identification documents, and limited collateral assets and credit information has widely been recognised by lower-income countries as reasons for majority of their population and firms to not have access to formal financial services. As such, variables

such as, number of Commercial bank branches adults and number of ATMs that services a certain potion of the population are mostly used as measures of financial inclusion by some scholars. (Vo et al., 2009; Morgan & Pontines, 2014).

4.2.2 Theoretical literature

Keynes (1930), while taking up the ideas of Wicksell in his treatise on money, advocates for the important role played by the banking sector in economic growth. He argues that the bank credit provides conducive grounds for production and bankers have a duty to insure such a relation takes its full impact on the economy. The Keynesian theory is also famous for emphasizing the role of government spending on the nation's economic growth during slow economic productivity. According to this theory, expansion of government spending leads to financial inclusion and deepening. By increasing government spending, money is injected into the economy, thereby increasing productivity, income and demand for money.

Economic theories that are influenced by the Keynesian narrative are often immediate result oriented, as such, policies that stem from this discipline usually focus on the short-term needs and how they can provide instant solutions to the economy. In times of economic meltdowns, recessions or depressions, people and firms often do not have the sufficient resources for consumption and investment, and the government, through the fiscal and monetary policies, is regarded as the main participant to increase demand and restore stability to the economy.

The Keynesian theory achieves financial deepening or inclusion through government spending expansion. Government intervention, through regulations, is also crucial in the efficient and equitable allocation of credit, particularly in developing economies. Financial institutions and markets that function property and are well regulated, provides all economic participants with investment opportunities by channelling funds to their best use, and thereby boosting the economy, stabilizing the financial system, and improve the efficient distribution of income. Stabilizing the financial system and improving financial accessibility speeds up economic growth and alleviate poverty and income inequality.

Ozili (2020) outlines the Systems theory of financial inclusion. This theory essentially proposes that financial inclusion relies on existing sub-systems, such as economic, social and financial systems, and these systems can be used to achieve financial inclusion. Subsequently, greater

financial inclusivity will also passively impact the sub-systems it relies on. A significant change in a sub-system can have significant impact on the financial inclusion outcome expectation. For example, imposing regulation on financial sector agents can align their interests with those of the consumers of basic financial services, and further force financial services providers to offer formal financial services that are affordable and equitable to the consumers, and provide rules to project those users from price discrimination and exploitation.

The theory further indicates that, a substantial change at the level of a full system, such as the replacement of the prevailing national financial inclusion plan with a new one, does not necessarily result to a change in the existing sub-system. This is because, changes in a sub-system has to be done at sub-system level. Some key factors emphasised by the theory are that:

- The success or of national financial inclusion agenda depends on the effectiveness and efficiency of the sub-systems.
- Under the systems theory, Sub-systems that exist within a country are the ultimate beneficiaries of financial inclusion

Key merits to draw from the systems theory of financial inclusion are firstly, it is clear recognition that economic, financial and social systems or structures that exist within a country, play an important role in promoting financial inclusion. Secondly, unlike most theories of financial inclusion theories, this theory provides a macro perspective on the subject. Lastly, the systems theory of financial inclusion is considerate of how interrelationship among the sub-systems that financial inclusion relies on affect the outcomes of financial inclusion.

4.2.3 Review of past empirical studies

While there has been a growth in empirical work done on the relationship between financial stability and financial inclusion from a global perspective in the past few years, it is still quite limited. In South Africa, there is no existing research conducted to examine this relationship specifically. There is, however, some evidence of work done for the BRICS countries and The Southern African Development Community (SADC) region. For instance, Arora (2018) examines the links between financial inclusion and financial stability in the BRICS countries. The study showed that there is considerable emphasis on the increasing financial inclusion in this group of countries, yet there is evidence that financial sector reforms together with regulatory reforms have also taken place. The study also finds that the BRICS countries were

resilient and did not experience any direct losses during the recent global financial system. The study further observed that, shadow banking has significantly grown within the BRICS group over the recent years, which has been found to have a positive impact on financial inclusion and growth, it has however remained much lower compared to the global average especially the US, UK and Europe. The final emphasis made by the study is that, there should not be any complacency in this region, there is a need to keep a vigilant eye for the potential risks likely to surface in case of macroeconomic vulnerabilities.

Hlophe (2018) examined whether financial development causes an increase in financial inclusion in the small country of Eswatini right next to South Africa. The study reveals that, there is a long run relationship between financial inclusion and financial development. The causal direction discovered by that study, is that of financial development towards financial inclusion, indicating that financial development causes financial inclusion in Eswatini. Another African study is conducted by Aduda and Kalundam (2012), examines the relationship between financial inclusion and financial stability in Kenya. The study essentially explores existing literature on financial inclusion both in Kenya and globally, without conducting any empirical analyses. According to the authors, the theoretical and empirical literature indicates that majority of world's population is financially excluded, and that, while there is a need for interventions to increase financial inclusion in Kenya, there is even a greater need for care to be taken when doing so, so as to avoid creating financial instability.

In Nigeria, Mbutor and Uba (2013) investigated the impact of financial inclusion on monetary policy in the country, between 1980 and 2012. The study found that financial inclusion is an impactful strategy for improving the effectiveness of the monetary policy in Nigeria. Particularly, the study indicates that, the increase in credit accessibility in the system would boost investment and dampen inflation. Increasing rural customers overall exposure to bank branches, is also found to have a positive influence on monetary policy. The positive impact of financial inclusion on monetary policy is also realised by Khan (2011), who investigates whether financial inclusion and financial stability are two sides of the same coin. He indicates that, financial inclusion has the ability to improve financial status and living standards of the poor segment of the society, especially when being viewed from the overall economic inclusion context. He adds that, there is a greater need for financial inclusion and financial stability to co-exist. This is because, it may be difficult to achieve financial inclusion without a stable

financial system and also, it is difficult to achieve and maintain a financial stability when and increasing potion of the socio-economic systems is kept financially excluded.

Khan's (2011) findings further emphasized the impact of financial inclusion on financial stability, indicating that financial inclusion can make the intermediation process between savings and investment even more efficient, while also facilitating change in the composition of the financial system with regards to transaction process, service users/ clients, the new risk created, and in some cases the institutions that partake in the new or expanded financial markets. He adds that, financial inclusion brings about a more stable retail base of deposits for financial institutions, particularly banks. While the author shows sufficient evidence of how financial inclusion improves financial stability, he also indicated that, there are potential risks to financial stability emanating from greater financial inclusion. He indicates that, there is a need to understand well, the risks for financial institutions rendering service to less developed and low-income markets.

Neaime and Gaysset (2018) also found financial inclusion to contribute positively to financial stability. The authors use Generalized Methods of Moments and Generalized Least Squared models to empirically investigate the impact of financial inclusion on financial stability, as well as on other macroeconomics factors, particularly income inequality and poverty, in eight countries in the Middle East and North Africa (MENA) region, from 2002 to 2015. On financial stability the study indicated that, while financial integration is found to contribute to financial instability in MENA, financial inclusion has a positive impact on financial stability. Just as indicated by Khan (2011), this study also shows that, greater access to financial services positively contributes to the resilience of the banks depositing funding base.

While most of the existing literature indicates a positive link between financial stability and financial inclusion, mixed results are also observed. For instance, Morgan and Pontines (2018) estimates a dynamic-panel equation and investigate the effects of various financial inclusion measures on measures of financial stability, such as bank Z-scores and bank non-performing loans, in Asia from 2005 to 2011. The study shows a twofold result. On one hand, financial inclusion measures, such as increased share of lending to small and medium-sized enterprises, were found to improve financial stability, while on the other, the study indicates that financial inclusion expands the range for borrowers, lowers lending standards and thereby raising financial and economic risk. The study also found higher per capita GDP to enhance financial

stability, while on the other hand financial stability is found to be decreased by a higher ratio of private bank credit to GDP.

Garcia (2016) conducted a review of studies that investigate the relationship between financial inclusion and stability, the study found that mixed conclusions can be drawn from the existing empirical literature on the subject. Firstly, it is shown that, rapid credit growth that comes as a result of new financial inclusion initiatives and unregulated financial channels may result to the rise in risk. However, access to deposits at a broader scale, that lead to a diversified base of deposits, may result to a significantly improved resilience of the overall financial system and subsequently financial stability.

Hannig and Jansen (2010) take a rather direct link to this relationship, and examine the policy issues of the relationship between financial inclusion and financial stability. The authors argue that increased financial inclusion presents opportunities for financial stability to be enhanced. They express that, while some risks may be posed by financial inclusion, there are only at institutional level and hardly systematic in nature. They discovered that, during the financial crisis savers and borrowers from the lower end of the income bracket, kept a consistent solid financial behaviour throughout the crises period, ensuring that their deposits are kept in a safe place and their loans are paid back. They add that, although profiling clients at the lower end of the financial market may raise some concerns about the reputation risks for the central bank and consumer protection, since such institutional risk profiles are characterized by a large group of vulnerable clients whose balances are limited and only transact small volumes, but as far as financial instability is concerned, the potential risk brought by inclusive policies is negligible. Furthermore, with known prudential instruments and better effective client protection, the risks prevalent at the institutional level are largely manageable. They also emphasize that the financial inclusion potential risks are compensated for curial dynamic advantage that boost financial stability over time through a more diversified and deeper financial system.

From a general point of view, there is fairly an increase in the empirical work done on financial inclusion, however, there is too little done on its relationship with financial stability, on a global perspective. Moreover, most of the existing results are somewhat outdated, especially when one considers the reality that macroeconomic financial inclusion data has only recently became

available. While from a local perspective, there is no evidence of research done to investigate such a direct link, with South Africa as a case study. This study fills up the gap and contribute to addressing the shortage of empirical literature on the relationship between financial inclusion and financial stability, while also providing evidence with up to date data.

4.3 Methodology and Data

This section of the chapter presents the data and quantitative tools employed to conduct an empirical investigation of the relationship between financial inclusion and financial stability in South Africa.

4.3.1 Model Specification and Analytical Framework

The study makes use of the Engle-Granger (Residual Based) Error Correction (1987) modelling approach to explore the link between financial inclusion and financial stability in South Africa. The model is specified as follows:

$$Z_t = \alpha + \beta_1 FI_t + \beta_2 X_t + \varepsilon_t \qquad (4.1)$$

Where, Z_t represent Bank Z-score, which is used as a measure of financial stability. In simple term, the Z-score measures the standardized return of a country's banking system.

FI_t represent financial inclusion. While X_t stands for the control variables, which comprises of Gross Domestic Production (GDP), Private credit by deposit money banks and other financial institutions to GDP (%) (PCGDP), and Liquid assets to deposits and short-term funding (%) (LIQ). The coefficient α captures the impact of financial inclusion on financial stability. ε_t refers to the random error term, while t = Time period. β means the set of nuisance Parameters.

To examine how financial stability is affected by the financial inclusion in both long run and short run, a regression analysis based on the co-integration and Error Correction Model (ECM) of Engle and Granger will be utilised. While there are other techniques that can be used to test for cointegration, such as the Johansen cointegration test, The EC model, is unique in the sense that it is an ordinary least square based approach that can be used in cases where the time series data is integration order. That is, it does not necessarily require the variables to be integrated of a specific order, but order would suffice as long as all the variables are integrated of that order.

4.3.2 Estimation Techniques

4.3.2.1 Unit Root Test

Prior to estimating the EC model, it is important to first test for stationarity. In fact, this test is crucial when studying any different time series data. Ensuring that the variables are stationery, eliminates the possibility of the estimated equation being spurious. A stationery series is one with a mean and variance that does not change over time. While there are numerous techniques used to test for stationarity, namely the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981), the Philips Peron (PP) (1988) test and the Kwiatkowski, Phillips, Schmidt and Shin (1992), this study makes use of the ADF and PP unit root tests to test for stationarity.

The ADF test, as in the case of the PP test, tests for a null hypothesis of the presence of a unit root, while the alternative hypothesis is that there is no unit root. Should the value of the calculate statistic be greater than the value of the critical statistic at a certain significance level, between the standard significance levels 1%, 5% or 10%, then the null hypothesis is rejected. An advantage that the PP test has over the ADF test is its ability to capture time series properties even when there are possible structural changes. This is because, it does not need lag length specification to estimate the regression (Enders, 2004). The PP test also holds the advantage of the user not having the need to specify a lag length for the test regression (Hendry and Wallis, 1999).

The PP unit toot test is also different from the ADF test in how it deals with serial correlation and heteroskedasticity in the errors. That is, instead of using a parametric autoregression to approximate the Autoregressive Moving-Average (ARMA) structure of the errors in the test regression as the ADF does, the PP unit root test ignores any serial correlation in the test regression.

For the Error Correction Model (ECM) to be estimated, it is required that the all the variables are integrated of the same order either one or two.

4.3.2.2 Cointegration Tests

The cointegration analytic technique is used to test for common trends time series and to model short-run and long-run dynamics. In this chapter, Error Correction cointegration technique is used to make an empirical analysis of the long-run relationships and short run dynamic interactions between financial inclusion and financial stability. Engle et al (1987) developed a means of reconciling the short run behavior of an economics variable with its long run behavior. ECM combines long-run information with a short-run adjustment mechanism. ECM specifications are to estimate the relationship between financial stability and financial inclusion. The ECM overcomes the problems of spurious regression through the use of appropriate differenced variables in order to determine the short-term adjustment in the model. According to Engle et al (1987), if two nonstationary variables are cointegrated, an error correction term should then include in the model testing the time series in their first differences. The danger of spurious regression can be eliminated by the analysis of the cointegration relationship, and the error correction models can used to present the causality between the pairs of variables.

The model consists of following equations;

$$\Delta Y_t = \alpha_0 \Delta X_t + \Phi \mathrm{ecm}_{t-1} + \mu_t \quad (4.2)$$

$$\mathrm{ecm}_{t-1} = Y_{t-1} - \beta_t X_{t-1} \quad (4.3)$$

Where ΔY_t represents the data-series derived from the first difference of the time series Y_t and ΔX_t denotes the data series X_t at the first difference level, $t = 1,2.3,\ldots,n$ and n is dimension of the vector variable. The time series of Y_t and X_t are both integrated at the first difference level, I (1). α_0 represents the short-term elasticity and the symbol φ stands for the rapidity of adjustment back to equilibrium status and μ_t is the residual value of the ECM. ecm_{t-1} represents the error correction term, and in the expression of $\Phi \mathrm{ecm}_{t-1}, \beta_0$ denotes the constant item and β_1 is the long-term elasticity. The calculation of ecm_{t-1} is derived as the residual value of the cointegration regression equation.

4.3.2.3 Error Correction Model

As already stated, the study employs the Error Correction Model (ECM) to examine the relationship between financial inclusion and financial stability in South Africa. The ECM was first developed by Sargan (1964) but later improved and popularised by Engle and Granger (1987). The ECM is mainly utilised to correct the disequilibrium for testing the causality in the cointegrated variable for both the short-run and long-run.

$$\Delta LZ = \delta_0 + \sum_{i=1}^{p} \lambda_i \Delta LZ_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta LFI_{t-i} + \varphi_1 ECT_{t-1} + e_{1t} \quad (4.3)$$

$$\Delta LFI = \delta_0 + \sum_{i=1}^{p} \lambda_i \Delta LFI_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta LZ_{t-i} + \varphi_1 ECT_{t-1} + e_{2t} \quad (4.4)$$

ECT_{t-1} in the equations above, represents the lagged error correction term, as well as the first difference to capture the disturbance in the short-run. The error term that should be the white noise and serially uncorrelated is represent by e_{1t} and e_{2t}. The ECM makes a difference between the short and long-run Granger causality. To test for statistical significance of the short run, the individual coefficients of the lagged terms are used, while the long-run causality is indicated by coefficient of the ECT_{t-1} being statistically significant. The value of the ECT should lie between zero and one, and be negative to indicate the system convergence back to equilibrium. To check for joint significance, the joint causation of both long-run and short-run can be tested.

Other diagnostic and model stability tests are conducted to examine the weather the estimation of the EC model is reliable and valid. The diagnostic test is performed to check for serial correlation and heteroscedasticity. The CUSUM test developed by Brown *et al.* (1975), is used to examine the structural stability of the model.

4.3.3 Data

The study makes use of secondary data to examine the relationship between financial inclusion and financial stability. The dependent variable is financial stability which is measured by the bank Z-score indicator. The Z-score measures the distance to distress for bank, explicitly comparing buffers with risk to measure solvency risks for banks. The Z-score essentially reflect the buffers against earnings shocks or rather a country's banking system probability of default, and is defined as:

$$Z \equiv \frac{(k+\mu)}{\sigma} \tag{4.5}$$

Where k represents the equity capital as percent of assets, μ denotes returns as a percentage of assets, and lastly σ represents the return on assets' standard deviation as proxy return volatility. The bank Z-score data used in this study is secondary data harvested from the Global Financial Development database.

Financial inclusion is the explanatory variable and two financial inclusion indicators are used in chapter, namely, number of ATMs per 100,000 adults and the number of commercial bank branches per 100,000 adults. This data is from Financial Access survey (FAS), a financial inclusion survey that has been conducted by the International Monetary Fund (IMF) since 2009. The survey compiles supply-side data with information about access to and usage of financial services. This dataset is aimed at giving policymakers support in measuring and analysing financial inclusion as well as to monitor progress across countries. Until recent there has been a huge shortage of macroeconomic data on financial, and due to this reason, the study makes use of quarterly time series data from 2010 to 2020.

Gross Domestic Production (GDP), Private credit by deposit money banks and other financial institutions to GDP (%) (PCGDP), and Liquid assets to deposits and short-term funding (%) (LIQ).

4.3.4 Limitations

The general problem that faces most, if not all, studies that seek to examine financial inclusion from a macroeconomic point of view is the scarce and relatively new macroeconomic time series data on financial inclusion. As such, this is the main limitation facing this study. For this reason, the study only explores data from the year 2004 onwards. However, this limitation does not affect the results of the study, especially since the data is observed on quarterly bases.

4.4 Empirical Findings

4.4.1 Introduction

In this section, the empirical analysis and results of the study are presented in line with the model specification and analytical tools presented in section 4.3 above. The main purpose of the model observed here is to examine the relationship between financial inclusion and financial stability. For financial inclusion the study uses two different variables, namely Commercial bank branches per 100,000 adults (CBB) and number of ATMs per 100 000 adults (ATMs), which will be regressed separately against Bank Z-Score (BZS) used as measure of financial stability. The explanatory variables included in the analyses are Gross Domestic Production (GDP), Private credit by deposit money banks and other financial institutions to GDP (%) (PCGDP), and Liquid assets to deposits and short-term funding (%) (LIQ). GDP is the only variable not measured in percentages, as such it is converted into natural logarithm.

4.4.2 Stationarity (Unit Root Tests)

The prerequisite for conduction an Engle-Granger (Residual Based) Error Correction Model is that all the variables are integrated of the same order either 1 or 2, as such, the first investigation of statistical properties of the series of the study is through the unit root test. Determining the stationery properties of the data is also necessary to avoid running spurious regression, particularly since times series data is used in this study and time series data is regarded to be stochastic and non-stationary. The unit roots test methods applied in this study are the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, and the results are presented in Tables 4.1 and 4.2 respectively.

Table 4.1: Unit root tests: ADF in levels, first and second difference

Variable	ADF Test							
	Intercept				Trend and intercept			
	Level	First Diff	Second Diff	Order of Integration	Level	First Diff	Second Diff	Order of Integration
BZS	-2.25	-1.81	-7.79***	I (2)	-2.95	-1.91	-7.82***	I (2)
LGDP	-1.68	-0.59	-7.86***	I (2)	0.25	-1.79	-7.91***	I (2)
CBB	-3.15**	-0.88	-8.30***	I (0)	-1.13	-3.01	-8.27***	I (2)
ATMs	-2.73*	-1.57	-7.75***	I (0)	-0.99	-2.49	-8.04***	I (2)
PcGDP	-2.17	-3.59***	-7.77***	I (1)	-3.67**	-4.04**	-7.71***	I (0)
LIQ	-1.66	-2.44	-6.67***	I (2)	-1.79	-2.34	-6.61***	I (2)

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

The ADF test in Table 4.1 shows results at intercept and, trend and intercept. According to the results, the BZS, LGDP and LIQ variables are only stationary after running the test at second difference for both Intercept and, trend and intercept, while CBB and ATMs are stationery at level under intercept and stationery at second difference under trend and intercept. As such, the after running the ADF test at second difference in both intercept and, trend and intercept, the null hypothesis that, there is a present of unit root for BZS, LGDP and LIQ, is rejected. While for CBB and ATMs, the null hypothesis is rejected at level under intercept, and at second difference under trend and intercept.

Table 4.2: Unit root tests: PP in levels, first and second difference

Variable	PP Test							
	Intercept				Trend and intercept			
	Level	First Diff	Second Diff	Order of Integration	Level	First Diff	Second Diff	Order of Integration
BZS	-1.45	-2.02	-7.79***	I (2)	-1.81	-2.10	-7.82***	I (2)
LGDP	-3.94***	-0.61	-7.86***	I (0)	0.07	-1.96	-7.91***	I (2)
CBB	-2.99**	-3.15**	-7.79***	I (0)	-1.55	-3.35*	-7.76***	I (1)
ATMs	-1.54	-1.65	-7.75***	I (2)	0.26	-2.48	-8.04***	I (2)
PcGDP	-1.75	-2.98**	-7.77***	I (1)	-2.94	-3.30*	-7.71***	I (1)
LIQ	-2.10	-3.36**	-7.77***	I (1)	-2.52	-3.17	-7.85***	I (2)

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

The test further rejects the null hypothesis that there is unit root for PCGDP after conducting the test at first difference for intercept, hence the variable is stationary at level I (1). While, for trend and Intercept, the variable is stationery at level.

The overall picture is that, all the variables are stationery at second difference for both trend and trend and intercept, suggesting that they are all integrated of order 2 and thus satisfy the prerequisite for conduction an Engle-Granger (Residual Based) Error Correction Model.

The PP tests shows that LGDP and CBB are the only variable stationery at level under intercept, and under trend and intercept the LGDP are stationery at second difference and CBB at second difference. PCGDP is stationery at first difference for both intercepts, and trend and intercept. The PP test reject the null hypothesis that there is unit root for BZS after conducting the test at second difference for both intercept and, trend and Intercept, while LIQ is stationery at first difference under intercept and second difference under trend and intercept.

4.4.3 Cointegration Test

Now that the variables' order of integration has been established, the practice is that the test for cointegration among the variables should be conducted. To do this, the long-run model has to be estimated, from which the residual is derived, and that residual is then tested for unit root. For cointegration to exist, the unit root should be stationery in levels. The results of the residual based test for cointegration, for both tests CBB and ATMs as a measure of financial inclusion, are respectively shown in Table 4.3 below.

Table 4.3: The Engle-Granger residual based test for cointegration

BZS f (CBB, LGDP, LIQ, PcGDP)		**t-Statistic**	**Prob.***
Augmented Dickey-Fuller test statistic		-3.325803	0.0178
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	
BZS f (ATMs, LGDP, LIQ, PcGDP)		**t-Statistic**	**Prob.***
Augmented Dickey-Fuller test statistic		-3.290378	0.0198
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

According to the ADF test results shown in Table 4.3, the calculated t-statistic is greater than the critical value at 5% and 10% level of significance, suggesting that the residual is stationary at least at 5% level of significance and a conclusion can be made that cointegration exist. The existence of cointegration is a prerequisite to then estimate an error correction model. This is also the case after estimating the ADF test with ATMs as a measure of financial Inclusion, the t-statistic is also greater than the critical value at least 5% level of significance, also indicated in Table 4.3 above.

4.4.4 Error Correction Model

In the previous section, the ADF unit root test was conducted to establish whether there is an existence of cointegration between the variables. Now that this is confirmed, the error correction model is estimated to understand the short run relationship between the financial inclusion and financial stability, as well as the other observed variables. The results of the error correction model are presented in Table 4.4 below. For the error correction model to be valid, the error correction term (EC) must be negative and statistically significant, and according to the results in Table 4.4 bellow, it is so. The EC (-1) is negative and statistically significant at 5% level of significance, confirming that the model is indeed valid.

Table 4.4 Error Correction Model Results [BZS f (CBB, LGDP, LIQ, PcGDP)]

Dependent Variable: D(BZS,2)				
Method: Least Squares				
Sample (adjusted): 2004Q3 2020Q1				
Included observations: 63 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.007102	0.015738	-0.451242	0.6535
D(CBB,2)	0.023270	0.119779	0.194276	0.8467
D(LGDP,2)	5.743593	5.225346	1.099180	0.2763
D(LIQ,2)	-0.137213	0.041668	-3.293020	0.0017
D(PCGDP)	0.013677	0.008950	1.528159	0.1320
EC(-1)	-0.104376	0.024847	-4.200776	0.0001
R-squared	0.402658	Mean dependent var		-0.010791
Adjusted R-squared	0.350260	S.D. dependent var		0.151164
S.E. of regression	0.121848	Akaike info criterion		-1.281692
Sum squared resid	0.846275	Schwarz criterion		-1.077584
Log likelihood	46.37330	Hannan-Quinn criter.		-1.201415
F-statistic	7.684551	Durbin-Watson stat		2.263491
Prob(F-statistic)	0.000014			

The short-run error correction model results show that the coefficient of the commercial bank branches (CBB) is positive, suggesting that financial inclusion positively affects financial stability. These findings confirm those of Morgan and Pontines (2018), Neaime and Gaysset (2018), and Khan (2011), however, the results in this study shows that the coefficient is statistically insignificant. This indicates that, while there is a positive relationship between financial inclusion and financial stability, the significance of the relationship depends on the variable used to measure financial inclusion. After estimating the regression with ATMs as a measure of financial inclusion, the results depict contradicting results. As shown in table 4.5, the ATMs coefficient is negative, but also insignificant. These findings are consistent with the discoveries by Rwechungura et al., (2020), who develops an Index of financial inclusion with a few measures of financial inclusion, including number of ATMs per 100 000 people and regress it against bank score to assess the relationship between financial inclusion and financial stability. The study also finds financial inclusion to negatively impact financial stability.

However, these findings are not in line with the findings of other scholars. Pham and Doan (2020), for instance, discovered that ATMs have a positive and significant relationship with financial stability in Asia. The differing views are, however, not surprising as they have been noted in empirical literature before, for instance, Ghosh (2008) expresses it clearly that, depending on the services used by the individuals, an increase in demographic penetration of banking services is linked to either a decrease or an increase in financial stability. These findings open up the debate about the relationship between financial inclusion and financial stability even further. This is an indication that, the type of financial inclusion instrument determines the impact it has on financial stability.

The log GDP coefficient is positive in both regression panels, but only statistically significant when financial inclusion is measured using the ATMs variable. This positive relationship indicates that a 1% increase in LGDP, increases the probability of financial stability by 6%, when financial stability is measured by CBB, while after replacing CBB with ATMs, the results show that a 1% increase in LGDP, increases the probability of financial stability by over 9%. These findings are in line with existing empirical literature and theoretical framework that study this relationship in detail (Manu et al., 2011; Levine and Zervos, 1998; King and Levine, 1993; Morgan and Pontines, 2014). The theoretical framework that advocates for this relation indicate that, a stable financial market can impact growth positively during the transition to an economy's steady-state growth path only, as suggested in the traditional growth theories. While

the new theories of endogenous growth, argues that, a stable financial market permanently elevate the economy to a higher growth path (Deabes, 2004).

The results in both regressions also show that, contrary to the findings by Han and Melecky (2013), and Morgan and Pontines (2014), higher liquidity by banks (LIQ) has a negative impact on financial stability. While greater private sector credit relative to GDP (PCGDP), on the other hand, is found to have a positive relationship with both CBB and ATMs, implying that, greater private sector credit relative to GDP leads to a higher likelihood of financial instability. These findings follow on from what is found by other empirical studies (Gourinchas and Obstfeld, 2012; Morgan and Pontines, 2014; Drehmann et al., 2011). The lagged error correction terms in the two regression outputs both have a coefficient of -0.10, which essentially implies that, on average, about 10% of the deviations from the EC models would adjust towards its long-run equilibrium. Showing a convergence or speed of adjustment to equilibrium rate that is rather moderate. The results further show that, in both regressions, the Durbin Watson statistic values are just above two, indicating that both models passed the test for autocorrelation. The adjusted R-squared from the two regression results are 0.35 and 0.37 respectively, which indicates that the models respectively explain 35% and 37% of the variation in the response variable around its means. Finally, the F-statistics from the two models are both around 8%, which is greater than the Prob(F-statistic), from this it can be concluded that in both regressions there is a linear relationship between financial stability and the set of predictor variables fitted.

Table 4.5 Error Correction Model Results [BZS f (ATMs, LGDP, LIQ, PcGDP)]

Dependent Variable: D(BZS,2)				
Method: Least Squares				
Sample (adjusted): 2004Q3 2020Q1				
Included observations: 63 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006414	0.015430	-0.415709	0.6792
D(ATMS,2)	-0.045553	0.030520	-1.492598	0.1411
D(LGDP,2)	8.913945	5.093156	1.750181	0.0855
D(LIQ,2)	-0.135686	0.040906	-3.317028	0.0016
D(PCGDP)	0.012107	0.008654	1.399085	0.1672
EC2(-1)	-0.100664	0.026591	-3.785598	0.0004
R-squared	0.420923	Mean dependent var		-0.010791
Adjusted R-squared	0.370127	S.D. dependent var		0.151164
S.E. of regression	0.119971	Akaike info criterion		-1.312746
Sum squared resid	0.820399	Schwarz criterion		-1.108638
Log likelihood	47.35149	Hannan-Quinn criter.		-1.232469
F-statistic	8.286500	Durbin-Watson stat		2.216961
Prob(F-statistic)	0.000006			

4.4.4.1 Serial Correlation

To test for Serial Correlation, the study makes use of the Breusch-Godfrey Serial Correlation LM Test. The test is essentially conducted so as to ascertain if whether the variables are serially correlated. The results for both models are presented in Table 4.6 below.

Table 4.6: Breusch-Godfrey Serial Correlation LM Test:

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags **BZS f (CBB, LGDP, LIQ, PcGDP)**			
F-statistic	0.621955	**Prob. F(2,56)**	0.5406
Obs*R-squared	1.393331	**Prob. Chi-Square(2)**	0.4982
BZS f (ATMs, LGDP, LIQ, PcGDP)			
F-statistic	0.396538	**Prob. F(2,56)**	0.6746
Obs*R-squared	0.895519	**Prob. Chi-Square(2)**	0.6391

Based on the results in Table 4.6, the Breusch Godfrey serial correlation LM tests indicate no existence of serial correlation problems in both models. This is conclusion is made because the models p-values are both greater that 5%. The P value must be greater than 5%, otherwise there is a problem of serial correlation. In this case there is no autocorrelation problem.

4.4.4.2 Heteroskedasticity Test

Heteroskedasticity refers to a situation when the variances of error terms are not constant from one observation to another. The problem of heteroskedasticity will exist when the probability value is less than 0.05 (5%). The results from the heteroskedasticity test in Table 4.7 above shows that the probability of the Chi square, in both estimations, is greater than 5%, implying that there is no problem of heteroskedasticity between the variables, for both models. As such, the null hypothesis of Homoskedasticity, cannot be rejected.

Table 4.7: Heteroskedasticity Test Results

Heteroskedasticity Test: Harvey Null hypothesis: Homoskedasticity **BZS f (CBB, LGDP, LIQ, PcGDP)**			
F-statistic	1.195681	**Prob. F(5,58)**	0.3229
Obs*R-squared	5.980454	**Prob. Chi-Square(5)**	0.3081
Scaled explained SS	6.249584	**Prob. Chi-Square(5)**	0.2827
BZS f (ATMs, LGDP, LIQ, PcGDP)			
F-statistic	1.927241	**Prob. F(5,58)**	0.1039
Obs*R-squared	9.110376	**Prob. Chi-Square(5)**	0.1047

Scaled explained SS	12.33267	**Prob. Chi-Square(5)**	0.0305

4.4.4.3 Stability Test

To test for whether the model is stable or not, the study makes use of the cumulative sum (CUSUM) of recursive residuals and the CUSUM of square (CUSUM square) (Pesaran & Pesaran, 1997). The CUSUM test essentially detects if there are any systematic changes in the regression coefficients, while the CUSUM Square test identities any sudden changes from the constancy of the regression coefficients. The CUSUM and CUSUM Square tests results are respectively presented in Figures 4.2 and 4.3 bellow.

Figure 4.2.a: CUSUM Test (CBB)

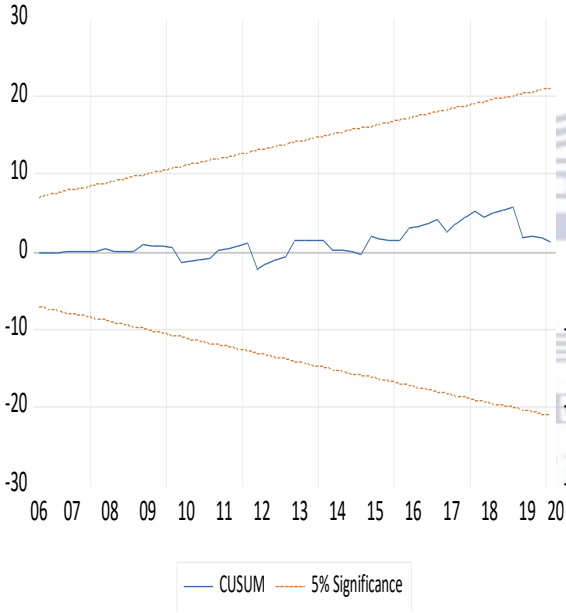
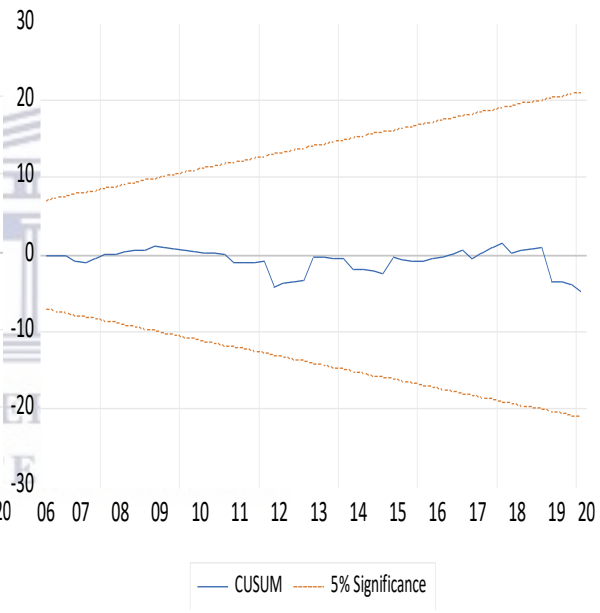


Figure 4.2b: CUSUM Test (ATMs)



According to Figure 4.2a the model has no stability problems. The conclusion of the absence of any instability can only be made when the plot of the CUSUM statistics fall within the critical bands of the 5 per cent confidence intervals of parameter stability, that is, the blue line falls inside the red lines as it is in this case. After running the test for the regression using ATMs as a measure the CUSUM test the shows still shows no structural change occurrence, where the test statistics starts crossing the any critical line. This indicate that the null hypothesis of coefficient stability of the model should be cannot be rejected, as the test essentially suggests that this model is also stable.

Figure 4.3a: CUSUM squared Test

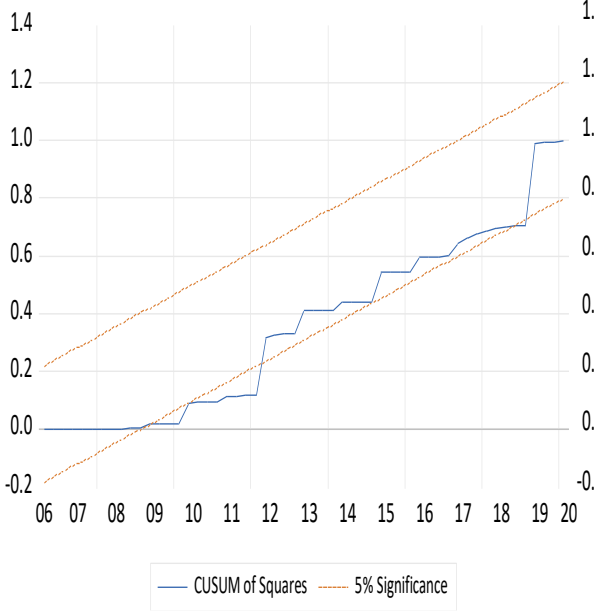
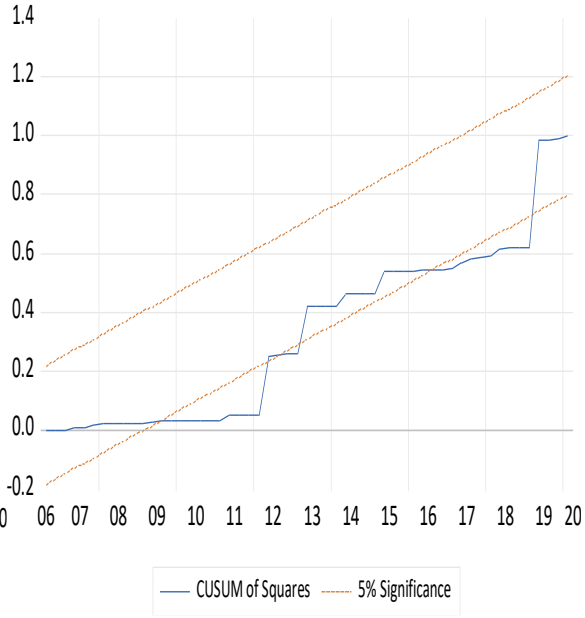


Figure 4.3b: CUSUM squared Test



The results from the CUSUM Square test conducted with CBB as the measure of financial inclusion, presented in Figure 4.3a, indicate some structural changes occurring from observation 10, where the test statistics exceeded the bottom red line and stays outside the critical bands until observation 12, where it then returns and stays inside for the remaining period. As such, because the test statistics ends up within the critical bands, it can be concluded that, instability exists in the coefficients over the sample period, but the model is still reliable. After replacing CBB with ATMs, the CUSUM Square test results depict similar behaviour, as shown in Figure 4.3b.

4.5 Summary

This study was conducted so as to investigate the relationship between financial inclusion and financial stability in South African. To do this, the study estimated two Engle-Granger (Residual Based) Error Correction Models, each with its unique measure of financial inclusion, using quarterly time series data from 2004 to 2020. To our knowledge, this is the first study of this kind conducted for the South African economy, and the findings from it will contribute to the wanting body of literature on this subject, locally and on a global scale.

The two financial inclusion variables used as the explanatory variables in the two EC models estimated in the study are, Commercial bank branches per 100,000 adults (CBB) and number of ATMs per 100 000 adults (ATMs). Bank Z-Score (BZS) was used to measure financial stability, which was the variable of interest (dependent variable) in both regressions. Additional variables used in the models were Gross Domestic Production (GDP), Private credit by deposit money banks and other financial institutions to GDP (%) (PCGDP), and Liquid assets to deposits and short-term funding (%) (LIQ), which were included as control variables.

The results derived from this study indicated quite broad findings. When estimating the model with CBB as the measure of financial inclusion, the study discovered a positive relationship between financial inclusion and financial stability, confirming findings from some of the empirical literature on the subject (Morgan and Pontines, 2018; Neaime and Gaysset, 2018; Khan; 2011, and Neaime and Gaysset, 2018). However, after replacing CBB with ATMs, the results indicate a negative relationship between financial inclusion and financial stability, in line with Rwechungura et al., (2020). The differing results of this relationship is not something new. As indicated in the empirical literature review, Garcia (2016), Morgan and Pontines (2018), Hannig and Jansen (2010), and Pham and Doan (2020) observe mixed results on the link between financial stability and financial inclusion. Moreover, these findings are in line with literature on the subject, which suggests that higher levels of financial inclusion can impact financial stability, either, positively or negatively. In line with existing literature, the study also finds a positive relationship between financial stability and GDP, for both model estimations (Manu et al., 2011; Levine and Zervos, 1998; and King and Levine, 1993). These findings imply that higher economic performance essentially increase the likelihood of financial stability. Greater private sector credit relative to GDP (PCGDP), is also found to leads

to a higher likelihood of financial instability in South Africa. While, higher liquidity by banks (LIQ) is found to result to financial instability.

A lesson for policy makers from this study is that, while there is a mixed impact of financial inclusion of financial stability, financial inclusion can indeed be used to influence financial stability. As such, the study provides insightful information to policymakers on how best can the foundation of building a stable financial system for the country, that is influenced by financial inclusion, can be strengthened. An exercise that would face researchers and policymakers would be finding a balance on how to effectively promote financial inclusion without destabilising the financial system. Another important policy implication from this study is that national income can be used to influence the stability of the financial system in South Africa, and that financial stability can be increase by ensuring a higher private bank credit to GDP ratio. Finally, strengthening macroeconomic database for financial inclusion indicators is also a key policy priority to note, as the insufficiency of enough macroeconomics database on financial inclusion disadvantages the tracking the progress of financial inclusion, and, thus its relationship with other key factors such as financial stability.

Future research should look at analysing the relationship between financial inclusion on financial stability in South Africa, using other the dimension and measures of financial inclusion, as well as other measures of financial stability, such as bank loans, bank deposits, or volatility of GDP growth. There is yet to be a study that takes this approach in South Africa. With the availability of data in the future, research can also conduct annual analysis of this relationship, as because of poor data, this has never been done before.

CHAPTER FIVE: CONCLUSION, RECOMMENDATIONS AND AREAS OF FUTURE RESEARCH

5.1 Introduction

Financial inclusion is increasingly being accepted as an instrumental tool in achieving broader inclusive development, economic growth, SMEs development, eradicating poverty and accelerating transformation and the ability for the poor segments of the population to take part in the formal financial sector. However, this remain a key socioeconomic challenge for most countries, particularly the developing ones. In light of this fact, this study took threefold approach to examine the micro and macro-economic impact of financial inclusion in South Africa. The study produces three separate but interrelated articles in the field of financial inclusion, suggesting that, financial inclusion was the primary subject of this study.

5.2 Conclusion of the Dissertation Findings

Chapter Two of the study conducts a microeconomic analysis of financial inclusion by using the NIDS panel data, wave 1 to wave 4, to investigate the usage of financial services and products, and the probability of households being financially excluded in South Africa. This is the first study in South Africa to investigate the levels and trends on the usage of financial products and services using the NIDS dataset, a database rich in information on ownership of financial asset. The study compiles 14 finance assets variables to derive a financial inclusion index, and further estimate two unique models, and OLS and a Probit, to examine the relationship financial inclusion has with the key demographic explanatory variables fitted in the regression, and the probability of financial exclusion.

The chapter found that, while there was an increase in financial inclusion over the observed period, financial inclusion in predominantly associated with higher income earning households, confirming finding from previous studies (Ocran, 2015; Orthofer, 2016). The study further finds that, low real per capita income and fewer employed members increases the probability of a household being financially excluded, while households with many members and those with middle aged heads are less likely to be financial excluded. Recommendations emanating from this chapter were that financial inclusion initiatives of priority should be those targeted at low-income earning households.

Supporting alternative, pro-poor finance models such as low-cost bank accounts and technologically advanced products that deliver financial services to the excluded in a swift, affordable and efficient manner, is one possibility.

The second article, which is the Chapter Three of the study, investigated the impact of financial inclusion on macroeconomic stability South Africa using quarterly time series data from 2004 to 2020. Two measure of macroeconomic stability, namely output and inflation, are regressed against financial inclusion and other control variables in two separate VEC models. This is the first study that looks at the relationship between financial inclusion and macroeconomic stability is South Africa, and departed from other studies conducted in other countries by using more than one measure of macroeconomic stability in assessing the effects of financial inclusion on macroeconomic stability. Consistent with previous studies (Vo et al., 2018; Nizam et al., 2020; Cumming et al., 2014), the study confirms a positive relationship between financial inclusion and macroeconomic stability. Recommendations emanating from this study were that macroeconomic policy maker can use financial inclusion as an instrument to maintain macroeconomic stability and that they should be mindful of finding a balance between financial inclusion and inflation control.

Finally, the third article (i.e. Chapter Four) explored the relationship between, financial inclusion and financial stability, which was also the first study to explore this relationship in the South African context. This study was also unique in that, it used two different measures of financial inclusion to investigate its impact on financial stability. Because of limited macroeconomic data on financial inclusion, the study used quarterly time series data from 2004 to 2021. Making use of multiple measures of financial inclusion in this study was advantageous in that, it broadens the already on-going debate on whether financial inclusion leads to financial stability or presents a risk to the stability of the financial system. In line with literature and empirical evidence to this subject (Garcia, 2016; Morgan and Pontines, 2018; Hannig and Jansen, 2010; Pham and Doan, 2020), the results of the study finds that higher levels of financial inclusion either, positively or negatively impact financial stability, this all depends on the type of financial inclusion initiative. Recommendations emanating from this study were that financial inclusion should be considered as a key instrument to strengthen the foundation of building a stable financial system. Moreover, financial inclusion can be used to manipulate the stability of the financial system.

5.3 Recommendations and Suggestions for Future Research

The study makes some policy recommendation that would encourage policy makers and economies to adopt appropriate and effective pro-poor financial inclusion initiatives that promote sustainable macroeconomic and financial stability.

The first part of the study shows that, in South Africa, financial inclusion is largely associated with low-income earners, and poor households are limited from accessing formal financial services by mainly affordability. As such policy initiatives should be targeted at making available affordable financial services that can service particularly the low-income segments of the population. Initiatives from other countries can be used as case studies, for example, the Indian government provided access to insurance policies to over two million poor Indians through a social security fund initiative that subsidises insurance companies to offer affordable insurance premium policies to poorer households (International Labour Office, 2001). While in the nineteenth century the United States government managed to increase real estate wealth, schooling, labour participation, literacy rate and income for freed black slaves through an initiative that provided them banks accounts (Stein and Yannelis, 2019). Policy makers can also consider promoting initiatives such as money pools. In five Caribbean Countries, these were found to enrich people in better ways than the mainstream banking system (Hossein, 2016). Future research related to this study can be done using a balanced panel component of the data to examine whether the financial inclusion or exclusion of the households is chronic or transitory over time.

Further policy suggestion derived from the study is that, financial inclusion can be used as an instrument to retain macroeconomic stability. Policymakers should find a balance between financial inclusion and inflation control, this is because financial inclusion is found to increase inflation. the positive impact of financial inclusion on output should be considered to channels for innovative measures aimed at efficiently delivering financial services to the great population, in the pursuit of increasing economic output. Just as is for retaining macroeconomic stability, the impact financial inclusion be extended to other aspects of development such as, boosting economic growth, increasing the standard of living of individuals and eradicating poverty.

Financial inclusion is found to have mixed impacts on financial stability, however, it can be used as a tool to influence financial stability. At the same time, economies should find a working balance on how to effectively promote financial inclusion without destabilising the financial system. Other policy implications are that, national income can be used to influence the stability of the financial system and that higher private bank credit to GDP ratio can be used to insure financial stability. A final key implication to note from this study is that, there is a need to strengthen macroeconomic database for financial inclusion indicators. There is a large shortage of financial inclusion data, especially from a macroeconomic point of view, and this disadvantages the tracking of the impact of financial inclusion to the economy.

The study identifies a number of opportunities for future financial inclusion research, particularly in South Africa. Firstly, the shortage of macroeconomic data on financial inclusion has created large gaps for literature on the subject, and as such, there is a need for more research on the macroeconomic relations of financial inclusion. Key developmental crises facing South Africa are inequality and poverty, future research should investigate the channels of financial inclusion that could efficiently promote the eradicating of inequality and poverty. Finally, since financial inclusion is multidimensional, Future research should investigate the role financial inclusion plays on South African economic stability, using other measures of financial inclusion, as well as other measures of stability.

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