INCLUSIVE FINANCE, BANK REGULATION, CONCENTRATION AND FINANCIAL STABILITY IN KENYA

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DECLARATION

This thesis my original work and it has not been presented for a degree award in any other University.

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DEDICATION

To almighty God and my parents, Marriettah Munah Nyambura and Christopher Jimmy Atellu.

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ABSTRACT

Kenya has over the years supported the expansion of financial infrastructure and implemented major reforms in bank regulations to ensure efficiency and stability of the financial system. Despite these reforms, the financial system is still being exposed to volatilities in form of liquidity and credit risks that threatens the stability of the financial system. Empirical evidence on how inclusive finance, bank regulation and bank concentration affect financial stability is scant. This thesis contributes to a growing literature on financial stability by investigating whether there are trade-offs or synergies between inclusive finance, bank regulation, bank concentration and financial stability in Kenya. The novelty of this study lies on the use of Structural Equation Model (SEM) technique in uncovering the determinants of financial stability. The analytical framework utilizes time series data for the period 1990 to 2017. Estimation results reveals that financial access and usage plays a significant role in ensuring stability of the financial system. Specifically, deposit mobilization, opening of branches and automated teller machines (ATMs) in rural areas, internet banking and utilization of electronic systems fosters financial stability. The study also established that inflation, credit growth and real interest rate negatively affects financial stability.We also established that micro and macro prudential regulations affect financial stability. Regulatory authorities should therefore complement micro and macro prudential regulations to ensure financial system stability. Finally, the study findings reveals that higher concentration negatively affect financial system stability. This thesis concludes that inclusive finance, prudent bank regulation, bank competition and concentration are important drivers of financial stability.

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ABBREVIATIONS AND ACRONYMS

ATM	Automated Teller Machine
BCBS	Basel Committee on Banking Supervision
CA	Cronbach Alpha
CBA	Commercial Bank of Africa
CBK	Central Bank of Kenya
CBS	Compliance Based Supervision
CEEC	Central and Eastern Countries
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMA	Capital Markets Authority
CRB	Credit Bureau Reference
DEA	Data Envelope Analysis
DPFB	Deposit Protection Fund Board
DSTI	Debt Service to Income
DTI	Debt to Income
DTM	Deposit Taking Microfinance
EFA	Exploratory Factor Analysis
ERS	Economic Recovery Strategy
ES	Efficiency Structure
FAS	Financial Access Survey
FIIT	Financial Inclusion Insight Tracker
FSB	Financial Stability Board
FSD	Financial Sector Deepening
FSSR	Financial Sector Stability Report
GDP	Gross Domestic Product
GFDD	Global Financial Development Database
GFC	global Financial Crisis
GMM	Generalized Method of Moments
GoK	Government of Kenya
ICAAP	Internal Capital Adequacy Plan
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IRA	Insurance Regulatory Authority
JB	Jarque-Bera
KCB	Kenya Commercial Bank
KMO	Kaiser Meyer Olkin
LIC	Low-Income Countries
LTV	Loan to Value
MDC	Most Developed Countries
MIC	Middle-Income Countries
MLE	Maximum Likelihood Estimator
NBFI	Non-Bank Financial Institutions
NPL	Non-Performing Loans
NSE	Nairobi Stock Exchange
OLS	Ordinary Least Square
PCA	Principle Component Analysis
PCAML	Proceeds of Crime and Anti-Money Laundering
RBA	Retirement benefit of Authority
RMSEA	Root Means Square Error of Approximation

RMSR	Root Mean Square Residual
ROA	Return on Assets
ROE	Return on Equity
SADC	South African Development Community
SAP	Structural Adjustment Programmes
SASRA	Sacco Society Regulation Authority
SCP	Structural Conduct Performance
SEM	Structural Equation Model
SFA	Stochastic Frontier Analysis
SME	Small and Medium Enterprises
SSA	Sub-Saharan Africa
TLI	Tucker Lewis Index
VAR	Vector Auto Regression
VaR	Value at Risk
VECM	Vector Error Correction Model
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Background

1.1.1 Financial Stability in Kenya

After the 2008 global financial crises, financial sector regulators and the government of Kenya realized the importance of improving accountability and transparency of financial intermediation (Financial Sector Stability Report, 2010). This was to safeguard financial stability and soundness of commercial banks. Kenya's financial sector in the past had been exposed to dangers stemming from weak risk-management frameworks, poor corporate governance, cross border trade risks, socio-economic shocks and rapid technological innovation. These dangers were leveraged to provide financial services without commensurate development of safeguards. The financial sector regulators therefore mitigated these risks by creating a platform of easy access and usage of financial services.

Systemic risks arise due to threats that impair the financial system (Morgan and Pontines, 2014). Systematic risk is categorized into time and cross-sectional dimension. The time dimension covers the procyclicality of the financial sector because of a positive feedback in the macro-financial channel (Borio, 2011). These channels include bank assets, capital and lending (reduction in capital and asset value implies less lending by banks) and balance sheet mismatches. Cross-sectional element includes how risks are distributed in the system due to frequent vulnerabilities and associations in the financial system. These associations comprise of ownership composition, infrastructure risks and vulnerabilities during counter party transactions with related asset classes. All these systemic risks coupled with a weak regulatory framework and poor policies may lead to financial instability.

There is no convergence on the definition of financial stability in existing literature. Padoa-Schioppa (2002) define financial stability as a situation where the financial system can endure shocks and sustain financial intermediation to support economic growth. Financial stability has also been defined as a situation in which the financial system including market structure, financial markets and financial institutions can facilitate economic activities effectively and are able to

forecast and absorb financial shocks[1]. Financial system covers dynamic interlinkages comprising of financial institutions, financial infrastructure, macro economy and financial markets (Vasilescu, 2012).

Price stability in the financial market also plays a major role in ensuring financial system stability (Alfi, 2014). An effective and straightforward instrument central bank uses to ensure financial stability is macro prudential regulation (Corbo, 2010). In many developing countries, central bank collaborates with other agencies to implement macro prudential policy. Therefore, there should be a well-defined framework to ensure effective partnership and efficient delivery of services (Padoa-Schioppa, 2003). Macro prudential policies mainly use counter cyclical buffers and minimum capital requirements (Borio et al., 2003).

Financial sector's assets increased to 89.5% of the GDP in 2014 up from 85.9% in 2013. Market capitalization at Nairobi Stock Exchange (NSE) stood at 42.9% by end of 2014. Banking subsector assets stood at 60.8% of the country's nominal GDP by end of 2014. Contribution of financial sector to the economy continued being significant due to the incorporation of domestic financial system to the global fiscal system by issuance of Eurobond (CBK, 2014). Increased innovation and invention of financial products (for example mobile money and agency banking), expanding insurance and pension fund institutions and competitive capital markets also added to the importance of financial sector in the economy. There was also an increase in non-performing loans in banks, deposit taking micro finance institutions (DTMs) and SACCOs, sluggishness in implementing important legislation, concentration risks in capital markets and increasing private sector debts.

Resilience of the financial sector continued up to 2016 notwithstanding shocks and exposure of the financial systems to possible systemic risks originating from both internal and external shocks. The financial system was recovering from financial risk exposure following liquidation of one bank (Dubai bank) and receivership of two banks (Imperial bank and Chase bank) within seven months (CBK, 2016). Financial vulnerability was made worse as the 'new normal' model based on three pillars of improved transparency, business models and governance was implemented. Kenya's Banking Ammendment Act 2016 of interest rate capping compelled commercial banks to increase their lending to government. Government securities in commercial banks' balance sheet increased

[1] Financial shocks include risk taking shocks, bank lending shocks and securitization shocks

from 32% in 2014 to 53% in 2018. They consequently reduced lending to private sector from 52% in 2014 to 32% in 2018. Reduced borrowing of the private sector also threatened growth of the financial sector. Further, with events in Britain and USA the amount of exports to these countries reduced from 48% in 2014 to 32% in 2017 (CBK, 2017).

Banks reduced credit to small and medium enterprises from 75% in early 2016 to 51% in 2018. The reason for this reduction was both due to demand and supply factors. On the demand side weak corporate balance sheet, cash flow problems and reduced demand for credit led to low uptake of credit. On the supply side, banks tightened lending conditions and resorted to investing in a more risk-free government security. The interbank market also had liquidity problems when interest rate widened in the first quarter of 2016. The CBK intervened and offered support that led to the reduction of interbank rates. Reduced profits and liquidity glitches also faced several companies listed on Nairobi Security Exchange (NSE). Some companies failed to meet their cash requirements leading to court cases. Decline of asset quality was also experienced following the increase in level of Non-Performing Loans (NPL) and provisions. Due to deplete buffers by most banks in the last quarter of 2016 three acquisitions were actualized[2] (CBK, 2016). The challenging economic conditions and efficiency in operation also led to the insurance sector recording lower profit margins with Return on Assets reducing significantly (CBK, 2016).

Table 1.1 presents the trend of asset quality from 2006 to 2018. The ratio of total non-performing loans to total loans decreased over time from 14.9 percent in 2006 to 3.6 percent in 2011, following improvement in the economic performance, before showing flactuations in the next years from 2012 to 2017. This fluctuation of loan quality and advances was attributed to unfavorable business environment characterized by high interest rates, stumpy progress due to, among other factors, unfavorable weather conditions, insecurity and improved reclassification and provisioning of bad debts.

Non-performing loans to net loans similarly decreased for the period 2006 to 2011. However, it started increasing from 2012 to 2017. Banks made specific provisions, enhanced credit appraisal monitoring standards, reduced the level of new non-performing loans, write offs, recoveries, resolutions and a marginal shift in the loans' risk classification from doubtful and loss categories to normal and watch categories (Table 1.1). However, it appreciated from 2012 hence forth to 5.2 per

[2] I&M bank acquired Giro commercial bank, SBM bank Kenya acquired Fidelity commercial bank and Diamond Trust bank acquired Habib bank

cent in 2017 following high interest rates and the sluggish movement of financial activities during the period towards and after March 2013 general elections. Economic activities were also impacted negatively due to the realignment of the national government operations with that of the county government as per the requirement of the constitution of Kenya 2010.

The ratio of gross loans to total assets and the gross non-performing loans to gross loans also exhibited the same pattern as the other asset quality ratio as explained in Table 1.1. The proportion of gross non-performing loans to gross loans reduced significantly for the period 2006 to 2011. This was attributed to the favorable economic conditions and improved business environment. It later started increasing for the period 2013 to 2017.

Table 1.1: Asset quality ratios 2006-2017

Years	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total NPLs/Total loans (%)	14.9	8.1	7.3	7.3	5.3	3.6	3.8	4.3	2.5	5.7	7.9	8.3
Net NPLs/Net Loans (%)	5	3.4	3.4	3.4	2.2	1.2	1.7	2.3	2.6	3.5	4.8	5.2
Gross Loans/Total Assets (%)	62.6	56.1	56.6	56	54.5	58.9	57.1	58.4	60.7	62	62	64
Gross NPLs/Gross Loans (%)	21.3	10.6	9.2	8	6.3	4.4	4.7	5.2	5.6	6.8	9.2	9.5

Source: CBK (Online database)

1.1.2 Inclusive finance in Kenya

Inclusive finance (also known as financial inclusion) plays a vital role in ensuring economic growth and development of a country (Levine, 2002). However, globally the number of financially excluded has been a key concern for policy makers. Africa has highest number of financially excluded globally (Zins and Weill, 2016). A financial system is deemed relevant if it enables the society to achieve its financial objectives.

Alliance for Financial Inclusion[3] (AFI) defines inclusive finance in terms of three dimensions; access (physical distance and affordability of financial services), usage (how regularly and frequently the financial services are utilized) and quality (financial products are well tailored to customers' needs). Inclusive finance offers a platform for the low-income earners to increase their income (Subbarao, 2013). For service providers' viz., micro-finance and banks, financial inclusion

[3] https://www.afi-global.org/

offers low cost savings. The Government also benefits from inclusive finance as it mitigates leakages of funds meant to reduce poverty.

Demirguc-Kunt et al. (2018), found out that the number of adults owning a bank account globally increased from 62% in 2014 to 69% in 2017. This translates to 515 million who were able to access financial services. Account ownership is defined as an individual who has an account with a formal financial institution or through a mobile money provider (Zimmerman et al., 2014). In Sub-Saharan Africa 21% adults had mobile money accounts by 2017, which was the highest globally. However, there is still a large population of poor adults, especially women who do not own an account. By 2017, 65% of women had an account compared to 75% of men. Furthermore, the gap between the rich and the poor has widened since 2014. The wealthiest individuals who constitute 60% of the population have a 13 percentage point higher access to financial services compared to 40% of the poor (Demirguc-Kunt et al., 2018).

Inclusive finance in Kenya started with reforms that date back in 1989 when the World Bank under its Structural Adjustment Program (SAP) advocated for financial market liberalization and equity market development among other requirements. However, inclusive finance did not receive much attention until after the global financial crisis of 2007 when Government of Kenya (GoK) through its Kenya vision 2030 decided to improve Kenya's global competitiveness, encourage savings and investment. These objectives were incorporated in the 2008 blueprint and they included a deepened financial sector system with strong banks, appropriate legal regulations and institutional reforms (GoK, 2007). These reforms led to the inception of Sacco Societies Regulation Authority (SASRA), Retirement Benefit Authority (RBA), Insurance Regulatory Authority (IRA) and Capital Market Authority (CMA). Further, GoK presented the Micro Finance Act in 2007 to regulate Deposit Taking Microfinance institutions (DTM). In 2009 the first credit reference bureaus (CRBs) was registered. It aimed at sharing information on creditworthiness of borrowers in the banking sector. Financial sector is recognized by GoK as one of the main six driving factor of the economy (GoK, 2007). This is exhibited by introduction of four regulatory authorities within a decade.

Despite challenges in promoting financial inclusion, Kenya has the highest percentage of population with bank accounts in East Africa. According to FSD (2014), 82% of Kenyans lived within 5 kilometers proximity to financial services compared to Uganda and Tanzania, which were 62% and 55% at that time. Table 1.2 shows financial sector reform for the period 2006 to 2016.

Table 1.2: Reforms in the financial sector 2007-2016

Years	Reforms undertaken
2006	Launching of Micro-Finance Act (No. 19)
2007	Rolling out of MPESA services by Safaricom limited
2008	Enactment of Sacco Societies Regulatory Authority Act (No. 14)
2009	Establishment of Credit Reference Bureau (CRB) and rolling out of YuCash money transfer
2010	Introduction of Agency Banking- MKESHO
2011	Rebranding of Zap to Airtel Money
2012	Prudential guidelines for Deposit Taking Micro-finance institutions and licensing
2013	Launching of the Anti-money laundering guide
2014	Review of positive information sharing guidelines between financial institutions
2015	CBK starts publishing lending rates of all commercial banks and all hidden charges
2016	Amendment of Banking Act to cap interest rate to 4% above the base rate

Source: Central Bank of Kenya

1.1.3 Bank Regulations in Kenya

Regulation is "a set of rules and laws that banks are required to follow which include certain restrictions, guidelines and requirements" (Eugene and Mouhamadou, 2015). These set of rules ensure that there is transparency in businesses that banks conduct with other entities in the financial sector (Financial Stability Oversight Annual Report, 2003). Banking systems will work efficiently if the government defines regulatory rules and establish several authorities that will assist in implementing the laws. The role of banks in an economy is to efficiently allocate funds from savers to borrowers. Freixas and Santomero (2002) assert that banks play a significant role in generating safe assets, monitoring and supervising potential borrowers in terms of their actions and their efforts and finally, offer insurance to credit risk. The main reason of these functions is to reduce information asymmetry and moral hazard to invest in profitable and predictable ventures in the financial market. However, banks cannot fully mitigate the problem of information asymmetry. Therefore, their function of intermediation is not perfect. To cushion themselves against such risks banks would always operate in their best interest instead of stakeholders' interests. Bank managers can also invest in risky ventures with an aim of getting high returns. However, when such investments fail to yield expected returns it may lead to fragility of banks and in worst case scenario may lead to bank failures with associated externalities. This calls for government intervention through regulation and supervision (Heremans, 2000).

The main goal of regulation and supervision in the financial system is to safeguard stability of the financial system. Further, bank regulations are meant to guard lenders (depositors) against activities of the bank (mediator), protect the economic system against negative externalities caused by banks and alleviating additional risk-taking ventures. These risky ventures can affect the interest of

creditors leading to systematic risk that affect the economic system (Eugene and Mouhamadou, 2015). In Kenya, systemic risks over the period 1995-2017 led to the decline of portfolio value, higher interest rates and unfavorable balance of payment with the Kenyan shilling loosing value against the dollar. Bank regulations can either be macro prudential or micro prudential. Macro prudential regulation focuses on variables that affect stability of the financial sector as a whole whereas; micro prudential regulation only affects financial stability of an individual bank (Mwega, 2014).

Central Bank of Kenya (CBK) formulates and implements regulatory requirement for banking institutions, which is the authorized framework for financial operations. Kenya used Basel I guidelines in regulating banks up to the year 2013 where the new policy guidelines on regulating banks incorporated some aspect of Basel II and Basel III (Oloo, 2013). Despite Kenya not being a member of the Basel Committee on Banking Supervision, CBK has tried to integrate and implement Basel standards whenever possible. Continued compliance with prudential requirements has ensured capital adequacy and liquidity among banks leading to a more stable financial sector.

The CBK concentrates on regulations that target stability of a given bank (micro prudential regulations) and stability of the financial system (macro prudential regulation). It should be noted that banks' performance could be influenced by external financial shocks. Thus, the introduction of changes in the minimum capital requirement over the years in Basel III was meant to ensure there are adequate buffers for credit expansion. It also protected banks against imbalance between assets and liabilities maturity (Mwega, 2014). CBK has also utilized other indicators that target assets and liabilities of the banking sector including ceiling on foreign exchange exposure and diversity of the distribution of bank loans in all sectors of the economy (Kasekende et al., 2011). With increase of non-interest income among different banks in Kenya, it is evident that banks have started diversifying their incomes to different sectors of the economy. There have been synergies among different financial segments and the banking sector leading to banks owning insurance companies and stock brokerage companies (Mwega 2014). However, this leads to a regulatory challenge because different financial segments have different regulatory requirements. This prompted many entities in the financial system to advocate for the introduction of an all-inclusive financial regulatory authority (Mutuku, 2008). It is imperative to note that different financial segments are exposed to different regulations. Therefore, CBK introduced a joint supervision method, which

necessitates coordination and sharing of information among the various regulators in the financial sector in areas of mutual interest. These regulators include Central Bank of Kenya (CBK), Insurance Regulatory Authority (IRA), Retirement Benefit Authority (RBA), Societies Regulatory Authority (SASRA) and Capital Market Authorities (CMA).

1.1.4 Bank Concentration in Kenya

Bank concentration is commonly defined in terms of the assets that three or five largest banks in a country holds (Beck et al., 2005, Ali et al., 2012). There have been two existing opposing views as to whether bank concentration truly augments financial stability. Proponents of concentration-stability assert that banks with larger market share are capable to diversifying extensively, reap more returns, invest in less risky ventures and are easy to monitor and regulate by the government (see Freixas and Rochet, 2008; Berger et al., 2009; Vives, 2010; Berger and Bouwman, 2013). On the contrary, bank consolidation encourages government intervention with the notion of 'too big to fail policies', which encourages moral hazard behavior on large banks. Large banks also have greater complexities that would make them more difficult to supervise and monitor leading to a crisis (see Berger et al., 2009; Soedarmono et al. 2013; Feldman, 2015).

There has been a major change in the level of bank concentration in the Kenyan financial sector since the year 1990 to 2017 (CBK, 2017).The reduction of market share of five largest banks in Kenya has been attributed to a change in the political environment that came along with reforms that are more constructive. These reforms encouraged competition in the banking sector (Tarus et al., 2015). Furthermore, the improvement of information technology in the banking sector through mobile banking, electronic payment system and internet banking also revolutionized the banking sector in Kenya. This led to reduction of costs of services, efficiency and increased profits by many medium sized banks that dominate the financial sector in Kenya (Mdoe et al., 2016). Reorganization of grouping criteria of banks in terms on their asset sizes and market share index might have led to the decline in the level of bank concentration in Kenya.

Table 1.3 shows the number of deposit accounts per 1,000 adults (NDA), concentration ratio of five largest banks (CON) and proportion of gross non-performing loans to gross loans (NPL) in Kenya.

Table 1.3: Deposit Accounts (NDA), Concentration Ratio (CON) and Gross Non-Performing Loans to Gross Loans (NPL) 2004-2017.

Years	NDA	CON	NPL
2004	51	0.70	27.00
2005	83	0.67	33.70
2006	160	0.65	33.30
2007	192	0.62	33.10
2008	291	0.60	34.90
2009	373	0.57	29.30
2010	506	0.55	10.60
2011	588	0.54	8.80
2012	634	0.54	8.00
2013	842	0.52	6.29
2014	1061	0.49	7.89
2015	1270	0.47	8.43
2016	1442	0.44	9.32
2017	1662	0.38	12.3

Source: World Bank's Global Financial Development Database (GFDD)

It is evident that the number of deposit accounts has significantly increased for the period 2004 to 2017. This can be attributed to the government through CBK instituting changes in the regulatory framework to support inclusive finance through introduction of major financial amendments since 2004. Prudential guidelines for deposit taking micro-finance institutions and licensing was also introduced in 2012. The bank concentration ratio of the five largest banks in Kenya also reduced over the period 2004-2017. This can be accredited to the financial reforms that liberalized the financial sector and encouraged deposit mobilization in a more competitive manner.

Consequently, innovations in the banking sector that led to introduction of mobile banking and agency banking further increased the level of competition leading to medium and small sized banks operating efficiently and earning more profits than expected (Mdoe et al., 2016). Despite the significant improvement in inclusive finance and reduction in bank concentration the level of non-performing loans flactuated over the period 2004-2017. This fluctuation was due to sluggish economic growth and increased lending to high risk borrowers. Increased lending was due to a competitive market that started reducing profits earned by large banks. For example, large banks disbursed more than 20 billion Kenya shillings between 2012 and 2015 through mobile money, increasing the level of non-performing loans in large banks' balance sheet by more than 3% (FSD, 2016). This was attributed to increase in NPLs for mobile loans.

1.2 Link among Financial Inclusion, Bank Regulation, Concentration and Financial Stability

There are significant interactions between inclusive finance, bank regulation, concentration and financial stability. For instance, bank regulations that reduce concentration and foster competition lead to rapid and efficient deposit mobilization as banks try to capture their market share. Less concentration further leads to innovations that ensure customers have easy access and usage of financial services. It further promotes diversification of risks, which increases the ability of banks to withstand shocks (Cihak et al., 2012). Furthermore, stability of the financial system can create assurance and trust in the financial system, making bank regulations effective in ensuring less bank concentration, which in turn increases access, usage, and quality of financial services through competition (Demirguc-Kunt et al., 2018). It is therefore important to investigate how these four variables interlink to mitigate sub optimal outcomes that may lead to financial crises.

This background section has provided the trends of inclusive finance, bank regulation, bank concentration and financial stability in Kenya. What is evident is that inclusive finance, bank regulations and bank concentration influence financial stability in Kenya. Utilizing the growth of agency banking and mobile banking agents from 2007 and amendments of bank regulations since 2006, we have seen resilience of the financial system over time. However, due to both internal shocks like political uncertainties, poor business environment and external shocks like global financial crises the economy has shown mixed results over time. These varied outcomes on financial system stability despite amendments of bank regulations, changes in bank concentration and increased financial inclusion lays down the basis for the three essays.

It is worth noting that too much access of financial services through credit provision might lead to credit risks in form of increased non-performing loans as experienced in Kenya for the period 2011 to 2017. Further, rise in non-performing loans continuously diminished the quality of assets in Kenya from 2011 to 2017. If asset quality continues deteriorating, financial system may be exposed to systemic risks that would threaten financial stability. The government of Kenya made efforts to minimize credit risks due to increased borrowing by launching credit bureau reference to allow banks to share credit information. However, more still has to be done to regulate how individuals are included in the financial system. From the observed trends of inclusive finance, bank regulation, concentration and financial stability in Kenya, we find that the three policy variables play an imperative role in guaranteeing financial stability. Our intention therefore is to comprehend the

tensions, trade-offs and synergies between inclusive finance, bank regulation, bank concentration and financial stability.

1.3 Problem Statement

Inclusive finance is significant in reducing poverty, financial empowerment and promoting equality in the society. The aim of Inclusive finance is to ensure that all individuals and institutions irrespective of their financial status can access and be able to utilize financial services effectively to increase their incomes. An all-inclusive financial system will therefore lead to economic growth, employment and effective implementation of development and financial policies. This would in turn lead to stability of the financial system. Kenya has experienced a significant growth of inclusive finance since 2006. The percentage of individuals excluded from financial services dropped from 41% to 11% of adults between 2006 and 2019 while the number of Kenyans in the informal financial sector also reduced tremendously from 32% in 2006 to 6% in 2019. Further, there was an increase in access to formal financial services from 27% in 2006 to 83% in 2019. The depth and extent to which financial services are utilized improved significantly. Usage of mobile money improved from 27.9% in 2009 to 79% in 2019 (FSD, 2019). However, despite significant growth, concerns remain on the extent at which inclusive finance may influence financial stability over time.

Since 2004, the government has introduced different micro-prudential and macro-prudential regulations in the banking sector. There have also been major regulatory reforms such as launching of mobile banking in 2004 and introduction of agency banking in 2010, which fostered competition in the market leading to less concentration. Theory and empirical evidence suggest trade-offs and synergies between bank regulation and financial stability (see Mwega, 2014; Kanittha, 2015; Amanja, 2015). Mwega (2014) asserts that regulations especially in the banking sector are meant to ensure less concentration, enhance financial inclusion and strengthen financial stability. Most developing countries including Kenya seem to prioritize financial stability by constricting financial regulations. This tends to negatively affect inclusive finance and increase bank concentration, with consequences on stability of the financial sector. However, without effective regulation, financial system can become volatile leading to systemic risks that would lead to a financial crisis as demonstrated by global financial meltdown of 2007-2009 (Spratt, 2013). This has been realized to some extent. However, Kenya still experiences occasional systemic risks and instability of the

financial system. This is evidenced by volatility of the financial sector in terms of liquidity and credit risks over the past years (CBK, 2016). Liquidity risks led to a record three banks being placed under receivership between 2015 and 2016. Furthermore, slowdown in economic activities affected debt repayment as well as the overall bank asset quality. This led to the increase in non-performing loans from 8% in 2015 to 12.3% in 2017 (CBK, 2017).

Empirical evidence on the link between bank concentration and financial stability also remains inconclusive. Theoretical postulations also remain unclear (Soedarmono et al. 2013; Feldman, 2015). proponents of "concentration-stability" hypothesis suggest that a concentrated banking system is easy to manage and banks are able to spread their portfolio to cushion themselves during a financial crisis (Beck et al., 2003). Another strand of literature supports "concentration-fragility" hypothesis which suggests that fewer larger banks are complex to monitor and supervise. These banks take advantage of their complexity by charging high lending rates, which tempts customers to invest in risky businesses to be able to service their loans (Boyd and De Nicolo, 2005). Furthermore, bank concentration encourages moral hazard behaviour based on 'too big to fail' policies (Mishkin, 1999). As observed in Table 1.3 concentration ratio of the five largest banks reduced from 70% in 2004 to 38% in 2017. However, the level of non-performing loans increased to 12% in 2017 up from 6% in 2013.

These trends shows a challenge in balancing the four policy objectives given that the main goal of less concentration and inclusive finance is to smoothen and promote efficiency in economic activities, while regulation is meant to sustain financial stability and bolster inclusive growth. Too much emphasis on financial stability could hamper efficiency in economic activities, while focus on less concentration and inclusive growth can trigger future crises if not well monitored. To make this research more practical and manageable we focused on the banking sector, which is the largest and significant in ensuring financial stability.

Despite the government encouraging expansion of financial infrastructure and implementing major reforms in bank regulations that encourage less bank concentration and more competition, financial stability in Kenya has remained volatile over the last decade (CBK, 2016). This suggests that, first the policy designs or implementation of these policies are hindered by the tensions, trade-offs and synergies between these variables. Second, emphasis has not been laid on benefits and risks of less bank concentration on the stability of financial system. Third, rigorous empirical evidence on how

inclusive finance, bank regulation and bank concentration affects financial stability in Kenya is still scarce. Finally, the problem of identifying appropriate manifest variables in case of Kenya to proxy inclusive finance, bank regulations, bank concentration and financial stability is still a challenge. Understanding how inclusive finance, bank regulations and bank concentration affects financial stability plays a key role in policy formulation. This necessitates a systematic examination of the tensions, trade-offs and synergies between inclusive finance, bank regulation, bank concentration and financial stability in Kenya.

Existing empirical evidence on financial stability, intermediation and transaction costs explain the risks and challenges the economy faces. It also suggests how policy makers can mitigate against such systemic risks to ensure financial stability in Kenya (see Kamau et al., 2004; Okioga, 2007; Josiah and Elizabeth, 2012; Gudmundsson et al., 2013).That notwithstanding; these studies fail to analyze how inclusive finance, bank regulation and concentration affect financial stability. This thesis introduces the use of structural equation modeling (SEM) approach in analyzing determinants of financial stability. SEM allows us to tackle the problem of implicit estimates of measurement errors which is unexplored in financial stability literature in Kenya. SEM further allows us to estimate latent construct, which are multidimensional in nature using proxy measurement variables. Consistent with the research problem, this study seeks to address the following questions: How does inclusive finance affect financial stability in Kenya? What is the impact of bank regulation on financial sector stability in Kenya? How does bank concentration affect stability of the financial system in Kenya?

1.4 Objectives of the Study

The main objective of this study is to investigate the impact of inclusive finance, bank regulation and concentration on financial sector stability. Specifically, this study seeks to:

i. Determine the impact of inclusive finance on financial stability in Kenya.
ii. Establish the effect of bank regulation on financial stability in Kenya.
iii. Examine how bank concentration affects stability of the financial system in Kenya.

1.5 Significance of the thesis

This thesis contributes to an emerging empirical literature on financial stability in several ways: First, the study findings will enable policy makers to make informed decisions on the four policy objectives to ensure complementarities between inclusive finance, bank regulation, bank concentration and financial stability. Previous empirical studies in Kenya have not incorporated inclusive finance as one of the major determinants of financial stability leaving out one of the main ways to capture how low-income earners influence stability of the financial system.

The study also contributes to existing empirical literature on financial stability by examining the extent to which regulation and bank concentration affects financial system stability. Several theoretical and empirical literature have accentuated the significance of complementing macro and micro prudential regulation to ensure stability of the financial system. This study attempts to identify both micro and macro prudential regulation variables that can complement each other to ensure financial stability in Kenya. Further, theories of bank concentration suggest that concentration can either positively ('concentration-stability' hypothesis) or negatively (concentration-fragility' hypothesis) affect stability of the financial system. We conduct a study to confirm which hypothesis holds in the Kenyan financial system to draw appropriate policy implications.

Another novel contribution of this study is that it pioneers the use of structural equation model (SEM) in studies that link inclusive finance, bank regulation and bank concentration in determining financial stability in Kenya. This will enable us to tackle the problems of estimating measurement errors, combining latent variables with indicator variable and to allow covariance between different latent variables.

1.6 Limitations of the thesis

Despite our efforts to explore both theoretical and empirical literature on financial stability, this thesis has some limitations. First, there is scarcity of data on variables that proxy inclusive finance in Kenya. Dataset on inclusive finance were available only from the year 2004 when major reforms on bank regulation and inclusive finance were made. Second, the study could not capture quality of finance due to scarcity of data. Nevertheless, the data we utilized provided plausible information

for providing policy implications on the link between inclusive finance, bank regulation, bank concentration and financial stability. All the findings should be interpreted on this light.

1.7 Structure of the Thesis

This thesis is structured into five chapters. The next chapter analyzes how inclusive finance affects financial stability in Kenya. Chapter three investigates the effect of bank regulation on financial stability in Kenya, while chapter four examines how bank concentration affects financial stability in Kenya. Chapter five concludes the thesis.

CHAPTER TWO

INCLUSIVE FINANCE AND FINANCIAL STABILITY IN KENYA

2.0 Introduction

Financial inclusion can be determined from both demand and supply side of financial services provision. According to existing literature, inadequate access emanates from frictions associated with information asymmetry and transaction costs (Honohan, 2004; Beck and De la Torre, 2007). Consequently, information asymmetry may compel banks not to provide financial services to those who need these services. Banks may not have enough information about the riskiness of their customers. Therefore to cushion them against such riskiness, banks introduce precautions such as documentation, prerequisite of collateral or higher service charges that majority of the population cannot meet (Stiglitz and Weiss, 1981). Market segmentation, poor accessibility and dispersal of producers in developing or rural economies have significantly led to very high transaction costs (Roa, 2015). Existing empirical literature use different distribution channels for financial services. These include financial service points, ATMs, bank branches, non-bank institutions branches and agent banking to represent access to financial services.

Though the financial system in Kenya has grown fast from 2006 to 2019, access to banking services is still skewed favouring the large private and public enterprises in urban areas. According to FinAccess survey of (2019), Nairobi County was first in terms of access to formal financial services, Mombasa County was the second followed by Central Rift region. However, there was a wide disparity of access to formal financial services at 29% in North Rift region of Kenya (Turkana, West Pokot and Samburu Counties). Population in these areas has not successfully been able to access financial service despite positive reports on the state of inclusive finance in Kenya. Comparable demand-side data on financial inclusion collected at micro level is scarce. To address this problem World Bank launched its Global Findex database in 2011. IMF's Financial Access Survey (FAS) and FinAccess survey launched in 2006. FinAcess (2019) indicates that there has been tremendous increase in inclusive finance since 2006. It also indicated that the number of commercial bank branches per 100,000 adults increased from three to seven in the period 2007-19. Consequently, 99% of individuals who have attained tertiary education in Kenya have access to formal financial services.

Literature has documented several factors that may lead to financial exclusion. These include inadequate savings, lack of employment or income, lack of financial knowledge, fear of falling into debts and mistrust of financial institutions among others (see Demirguc-Kunt et al., 2018). Information on use of financial services mainly comes from the demand side. This is because proxy of use of financial services are mostly represented by regularity, frequency and period individuals utilize credit, savings, payment system or insurance products (Roa, 2015). FSD (2019) shows that uptake of financial services has significantly improved in Kenya. Kenyans attributed this to the use of new mobile banking services and digital loans applications, which recorded 79% and 8% increase in usage. Despite this improvement, data confirms that there is still a big opportunity for improving financial inclusion.

Although it is difficult to have proxies that measure quality of financial services, Alliance for Financial Inclusion (2011) emphasizes on four indicators. These include diversity and adaptability to clients of the product, proper framework for regulation and supervision of financial systems, strategies associated with financial awareness and consumer protection, variability of and options to financial services. Defining and measuring financial stability compared to other past policy goals like price stability is difficult due to complex interconnections and interdependence of different financial sectors and the real economy. Therefore, to effectively design policies for intervention it is important to define the concept of financial stability in depth. Nevertheless, from different existing literature and policy studies we can derive common elements that define financial stability (see Alawode and Al Sadek, 2008; Ponce and Tubio, 2010).

Financial stability is always associated with the main functions of the financial system, which is investing in profitable ventures from the savings available, facilitation of payment and the ability of the financial system to withstand different shocks. Padoa-Schioppa (2002) defines financial stability as a condition where financial system is capable of absorbing shocks without allowing spillover effect in the economy, which will destabilize allocation of savings to productive investment opportunities and the dispensation of payments. Mishkin (1999) defines financial instability as a situation where shocks to financial system lead to information asymmetry such that financial systems cannot perform their function of lending to most productive investment opportunities. The financial crisis of 2007- 2008 shows that micro prudential regulation alone could not ensure stability of the financial system. This is because it pays no attention to systemic risks that affect the financial systems. The causes of systemic risks are mainly tied to bank runs,

contagion effects, foreign exchange disparities in the banking sector, fall in the prices of assets due to a bank crisis, uncertainty in investments and financial architecture (Allen and Gu, 2018).

Globally, many central banks including Kenya adopted these definitions when introducing policy guidelines that would safeguard financial stability established financial stability departments and started printing financial stability reports (Alawode and Al Sadek, 2008). There is no widely accepted specific indicator that can measure and monitor financial stability over time. Different proxies of financial stability are used depending with the economic setting of the country. Policy makers use proxies such financial soundness indicators, financial development indicators (bank's liquid liabilities, private sector credit and stock market capitalization) and stress testing. It is therefore reasonable to conclude that financial stability is a multidimensional aspect that looks at stability, flexibility and efficient functioning of the financial markets and settlement system over time.

The most important challenge of inclusive finance and financial stability is that there can be policy trade-offs between the two objectives. For example, it is known that not all individuals are creditworthy or can handle credit sensibly; therefore, an increase in financial inclusion through provision of credit can impair financial stability (Cihak, 2016). The subprime mortgage crisis in the United State of America that led to the global financial meltdown in 2007-08 is a good example. Consequently, bad policies could lead to unintended consequences that would lead to trade-off between financial inclusion and financial stability. On the contrary, expanding inclusive finance in the utilization of electronic payment, deposits or insurance will foster financial stability. In addition, advancing financial inclusion may lead to greater utilization of financial services hence aiding in diversification of risks that supports stability (Pearce and Ortega, 2012). Financial stability also boosts confidence and trust in financial systems and exploitation of financial services. Inclusive finance will in turn reduce contagion effects associated with risks of financial exclusion. These contagion effects may lead to poverty because of low savings and social exclusion.

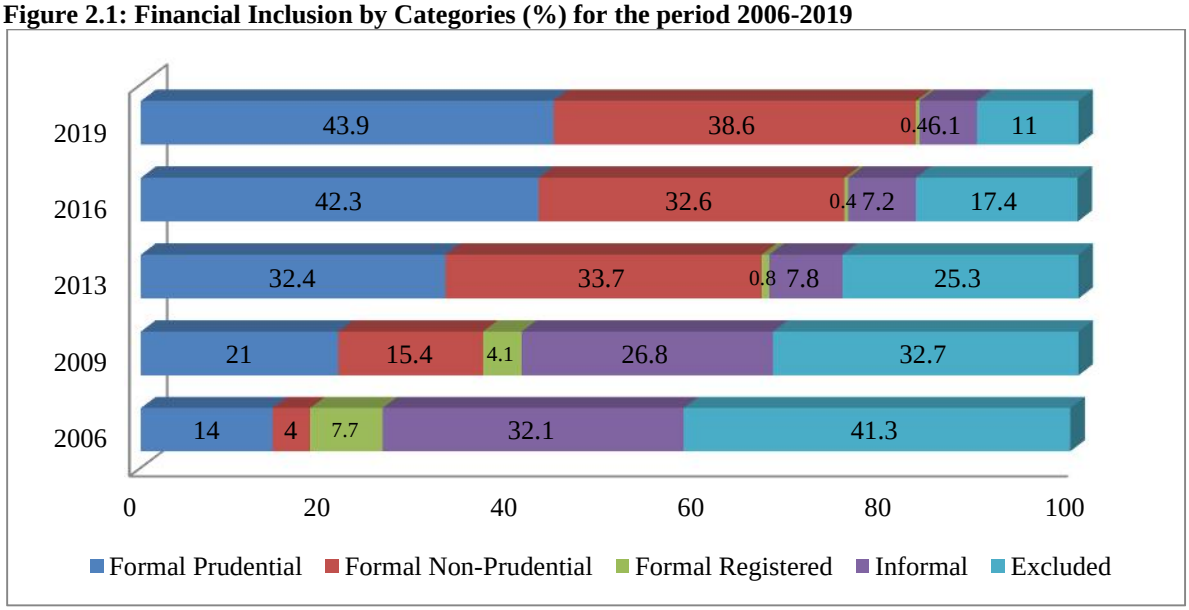
2.1 Inclusive Finance in Kenya

Commercial banks in Kenya and telecommunication companies in the past ten years have made significant investment in distribution channel to ensure inclusive finance in the whole country (FSD, 2016). A good example is equity bank, which by using customer tailored products and employing workers who can speak native language of minority speaking clients was able to

increase the number of formal accounts and the percentage of Kenyans with formal loans (Allen et al., 2014). Further, Microfinance Act 2006 was introduced to provide guidelines for licensing, regulation and supervision of microfinance institutions in Kenya with an aim of facilitating easy access to finance and encouraging usage of financial services by low-income earners. All microfinance institutions were expected to either register as credit only or deposit taking institutions (CBK, 2006). Musinga and Ongayo, (2002) posit that regulation of microfinance institutions in developing countries including Kenya had a direct positive effect on financial inclusion.

Measurement of financial inclusion in Kenya commenced in 2006 through the creation of FinAccess surveys implemented over the years by the CBK, Kenya National Bureau of Statistics (KNBS) and Financial Sector Deepening (FSD) Kenya. Figure 2.1 shows how Kenya financial inclusion landscape has changed over time.

Figure 2.1: Financial Inclusion by Categories (%) for the period 2006-2019



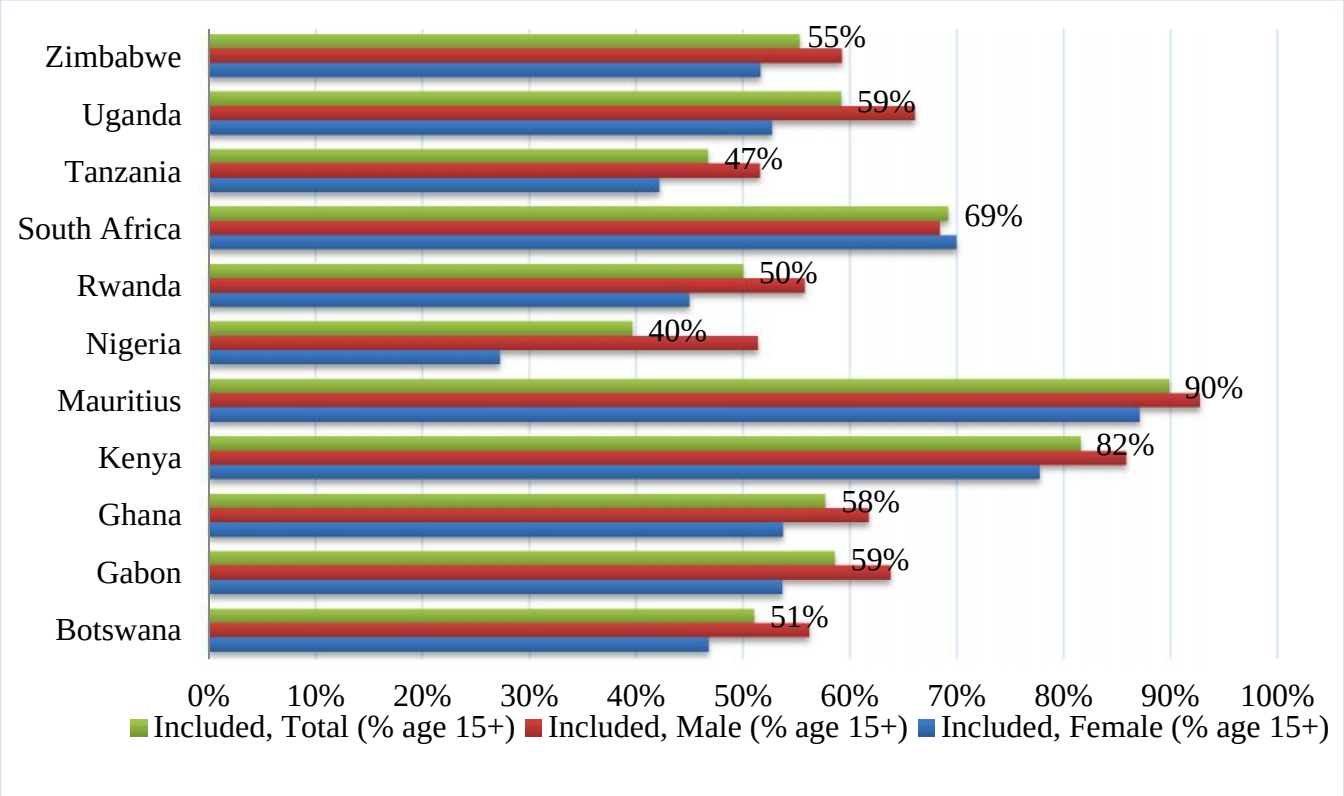
Source: FinAccess, 2019

FinAccess[4] (2019) findings clearly show that Kenya's financial inclusion landscape has undergone significant transformation since 2006. Formal financial inclusion has risen to 83% in 2019, up from 27% in 2006. The informal and excluded group declined from 73% in 2006 to 17% in 2019. This expansion could be explained by introduction of mobile money, agency banking and digital

[4]FSD Kenya and Central Bank of Kenya. FinAccess National Survey 2019: Profiling developments in financial access and usage in Kenya. Nairobi, Kenya: FSD Kenya.

finance and mobile application. Mobile financial services laid grounds to formal inclusive finance especially through digital finance. Figure 2.2 compares the level of financially included male and female in selected Sub-Saharan countries.

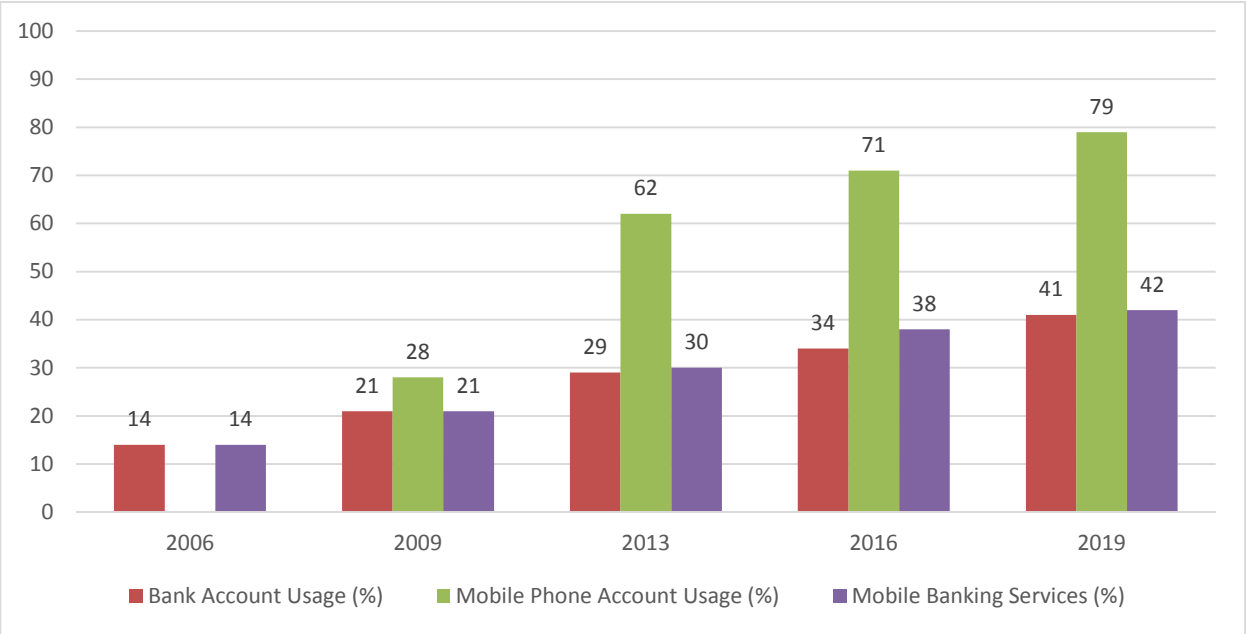
Figure 2.2: Comparison with selected Sub-Sahara Africa countries (%)



Source: Global Findex 2017 database by Demirguc-Kunt et al. 2018

In Sub-Saharan Africa, Kenya is second to Mauritius on the most financially inclusive country, followed by South Africa as shown in figure 2.2. According to the Communications Authority of Kenya (CAK) over 63 percent of the population by 2014 could access mobile money services, digital finance and mobile money applications. All these innovations aimed at providing financial services to the entire population. Utilization of mobile money services increased significantly more than that of banking services as depicted in Figure 2.3.

Figure 2.3: Bank usage, mobile phone Account Usage and Mobile Banking services 2006-2019



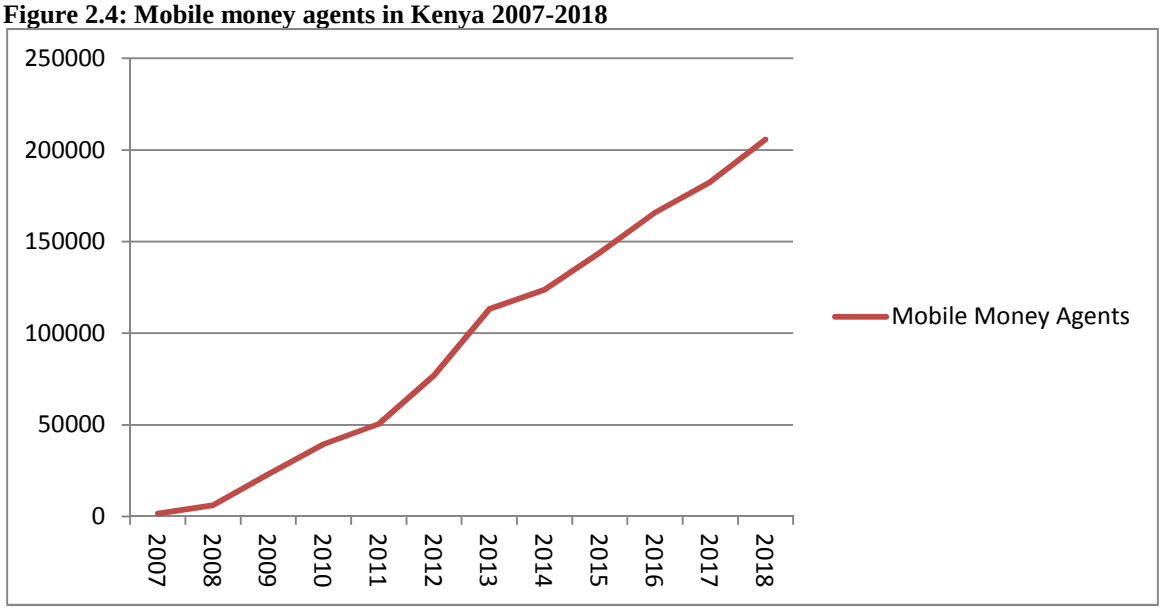
Source: FinAccess, 2019

Mobile phone accounts usage and mobile banking services increased significantly from 28% and 21% in 2009 to 79% and 41% in 2019 respectively. Utilization of bank accounts, slightly increased from 21% in 2009 to 41% in 2019. Increase in the use of bank services was mainly attributed to 30% of the population utilizing recent innovations of mobile banking services such as M-KESHO, M-SHWARI and KCB M-PESA. According to Communication Authority of Kenya first quarter statistics report for the fiscal year 2015/2016, mobile phone penetration in Kenya stood at 88% up from approximately 84% during the previous quarter of their financial year. This depicted an increase in the number of mobile phones subscription from 36 million to approximately 38 million subscribers. The number of mobile money agents also increased tremendously from 1,582 in 2007 to 205,745 in 2018 (CBK, 2018) as shown in Figure 2.4. This increase can partly be attributed to the willingness of the population to embrace mobile banking most especially in rural areas where bank services were non-existent as well as the Banking Act of 2013 that permitted agents to register and provide banking services that included depositing and withdrawal of money.

The dominance of mobile money services in promoting inclusive finance led to the establishment of African Mobile Phone Financial Service Policy Initiative in 2013. This was meant to boost inclusive finance in Africa. Confidence and trust in agency banking led to emergence of financial institutions especially deposit taking micro-finance institutions (DTMs) which were now incurring

low operating cost with huge profit margins. For instant the number of DTMs increased to thirteen by 2016 from eight in 2012 (CBK, 2016). Agency banking also led to emergence 41,746 agents in the financial system and opening of 41.2 million deposit accounts by 2016. Concerning credit information sharing, a total of 13 million credit information request had been recorded by credit reference bureaus (CRBs) by 2016 since establishment of CRBs in 2010 (CBK, 2016).

Figure 2.4: Mobile money agents in Kenya 2007-2018



Source: CBK, (online database 2018)

Table 2.1 shows between 2009 and 2015 banks steadily increased their automated teller machines (ATMs) to ensure easy accessibility of financial services. However, in 2016 the number of ATMs reduced mainly due to the adoption of cost effective channels of offering financial services like mobile money (CBK, 2016). Telephone companies were also building cash-in, cash-out points to facilitate conversion of cash to electronic money and vice versa. Commercial banks then followed suit in building agent network after the amendment of the banking act in 2009, which allowed banks to recruit third parties as agents for some selected banking services (FSD, 2016). Three microfinance banks also started providing agent-banking services after the legislative reforms in 2012 that permitted microfinance banks to provide agent-banking services.

Table 2.1: Growth of distribution channels in Kenya 2009-2017

Distribution channel	2009	2010	2011	2012	2013	2014	2015	2016	2017
ATM(POS)	1,827	2,091	2,205	2,381	2,487	2,113	2,718	2,656	2,825
Bank agents	8,809	9,748	12,100	16,333	23,477	35,789	40,592	53,833	55,350

Source: CBK (online database 2018)

The opening of agency banking with a web of over 155,000 agents including mobile money operators has exceeded the number of ATMs, bank branches, post office and other access points. This has ensured efficient service delivery to the population. According to FinAcess (2015) geo-spatial data, more than 75% of Kenya's population are five kilometers within the proximity of an access point, a significantly higher percentage than most sub-Saharan countries which have less than 50% of its population near five kilometers of financial services. However, there is still a problem with accessing remote and rural population. This is because of high level of illiteracy in these regions coupled with inadequate knowledge on the importance of being included in the financial system. The same study concluded that while approximately 100% of the population in urban areas lived within three kilometers of the proximity point only approximately 60% of rural population was within three kilometers. This was also evident in arid and semi-arid counties of Northern and Eastern Kenya where more than two thirds of the population were far from three kilometers of an access point in 2012. However, these numbers have quite changed over the period due to changes in both the demand and supply side approaches of inclusive finance. FinAccess (2015) geo-spatial data indicated that more than a third of the population in Northern and Eastern counties of Kenya now lives within three-kilometer access points.

Table 2.2 shows an expansion of bank services through investment in channels that provide services to rural population that has led to a significant growth in the number of accounts opened. Bank deposit accounts surged from 2.4 million in 2005 to 30.2 million in 2017, which reflects an increase from 12 accounts per 100 adults who are at the age of 18 year or above to 135 accounts per 100 adults. It is therefore evident that account opening was more than doubling in every two years. Another significant achievement was the growth of mobile money that reached its nine millionth accounts only two years later after its launch as M-PESA in 2007 and increasing to 27.3 million by 2017. With these figures, it is evident that between the periods 2007 to 2017, approximately 3.2 million mobile accounts were being added each year and almost 10,000 each day.

This growth was attributed to a pursuit of more cost-effective channels of distribution. Prior to 2012, locally owned commercial banks like Equity Bank, created customized bank products for lower income earners, expanded to rural areas and invented transaction-based revenue models. As mobile money continued to penetrate the whole country, commercial banks were contemplating on using this opportunity to use mobile phones as a platform to drive growth in the rural areas.

Table 2.2: Deposit accounts, mobile money accounts, mobile subscriptions 2007-2017 (Kshs. Millions)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Deposit accounts	2.4	2.9	4.7	6.4	8.4	11.8	14.3	15.9	21.8	28.4	30.2
Registered mobile money account	-	-	1.3	5.1	8.9	16.4	19.2	21.1	25.3	25.2	27.3
Mobile phones Subscriptions	4.6	7.3	11.3	16.3	19.4	25.0	28.1	30.7	31.8	33.6	35.7

Source: Financial Sector Deepening (Kenya), 2017

Mobile money became a foundation in which both agency banking and digital financial services emerged, enabling banks to increase competition and offering services to additional customers efficiently and at low costs. Buku and Meredith (2013) posit that M-PESA is the most advanced and fruitful mobile payment system globally. This is because it has successfully incorporated almost 74% of the unbanked population since its inception in 2007. Commercial Bank of Africa (CBA) collaborated with Safaricom in November 2012 and launched M-Shwari, a digital financial service that allows anyone with an M-PESA account to open a bank account with CBA and deposit savings or access loans. Kenya Commercial Bank (KCB) followed suit in March of 2015, by collaborating with Safaricom to launch KCB-MPESA, with similar product like M-Shwari. Equity bank launched Equitel sim card in July 2015 to provide banking services to its customers. Equitel sim cards do not depend on M-PESA network, unlike M-Shwari and KCB-MPESA (FSD, 2016).

The rationale of this partnership was to allow customers access credit and save without necessarily going to the bank. A bank customer would receive credit of between one hundred thousand to two hundred fifty thousand depending on his pattern of savings and his credit history with the bank. This partnership between mobile money operators and banks significantly increased the level of financial inclusion as poor people can easily access credit and invest without necessarily having a bank account. According to CBA 2017 report M-Shwari is currently providing financial services to over 21 million customers up from 3.6 million users in 2014 and more than 30 billion Kenya shillings has been disbursed in terms of loans over the 5 years since its inception. By 2013, more than 75 institutions had partnered with Safaricom to provide financial services (Reed et al., 2013). From our argument, it is clear that M-PESA has played a key role in fostering financial inclusion through savings, credit, money transfers and transaction.

Supply side data in Kenya portrays financial services to be more available to larger categories of the population; demand side studies are better placed to measure the degree of inclusive finance in

the broad population and specific sub-groups. Governments of Kenya and donors have conducted nine nationally representative household studies to find out the level and trends in access to and usage of financial services at the individual level. Global Findex survey under the world bank has conducted two surveys in 2013 and 2014, Financial Inclusion Insight Tracker survey (FIIT) was steered by Intermedia with an aim of measuring access to digital financial services. FinAcess survey under FSD Kenya has conducted four studies in 2006, 2009, 2013, 2016 and recently 2019 (FinAccess, 2019).The findings of these demand surveys were almost consistent, and they depicted a broader picture of the trends of financial inclusion in Kenya.

2.1.1 Problem Statement

Financial sector development contributes to economic growth as highlighted in Kenya's vision 2030. Reforms to promote financial development (financial invention, innovation, inclusion and competition) in Kenya started with microfinance revolution in 2003. This revolution ushered in a new dawn in financial inclusion. The enactment of microfinance Act, 2006 by the parliament led to the emergence of 24 large micro finance institutions in Kenya. These micro finance institutions had more than 100,000 accounts and approximately 1.5 million borrowers by 2010 (CBK, 2010). The introduction of Mobile money financial services, agency banking and digital finance among other financial sector reforms since 2006 has made Kenya to be the second most financially inclusive country in Africa (FinAccess, 2019). Further, the Global Findex database 2017 by Demirguc-Kunt et al. (2018) shows that Kenya leads the way on digital finance in Africa. Despite this growth, the financial system has been exposed to occasional systemic risks that have led to fragility of the financial sector over the last decade. This was evidenced by increased level of credit risks with gross Non-Performing Loans (NPL) hitting higher historical trends of 65.1% in March 2017 compared to 57.2% in March 2016 (CBK, 2017).

Further, the ratio of gross NPLs to gross loans significantly increased from 6.1% in 2015 to 11.8% in 2016. The banking sector was also exposed to liquidity risks combined with distorted distribution that led to two banks being placed under receivership and another bank being liquidated, for the first time in over a decade. Four mergers were actualized in 2016 compared to only three that were announced between 2002 and 2015. Credit to private sector also reduced to about 14% of the GDP (CBK, 2016). The increase in fragility of the banking sector amid increase in financial inclusion

has reignited the debate on the effect of financial inclusion on stability and resilience of the financial system.

Stability of the financial sector relies on the interdependence of crucial elements of the system and necessitates that important institutions and markets in the financial system continue being stable. However, this does not rule out occasional failures of Small and Medium Enterprises (SMEs) and large business initiatives, which constitutes normal running of the financial system (Crockett, 2002). Inclusive finance alters the structure of the financial system in terms of access, usage, innovations, new risks created and the introduction of new institutions in the already existing market. Existing empirical literature shows trade-offs (Khan, 2011; Cihak et al., 2016) and synergies (Prasad, 2010; Hannig and Jansen, 2010; Aduda and Kalunda, 2012; Han, 2013; Morgan and Pontines, 2014) between financial inclusion and financial stability in the world. It is therefore important to consider the case of Kenya which has improved its level of inclusive finance over time.

First, a financial sector with high levels of inclusivity is able to diversify investments and stabilize deposit base. This would reduce dependence of non-core financing, which in turn would lead to systematic stability in the financial sector. Second, inclusive finance leads to diversification of loan portfolios by financial institutions to small-scale borrowers hence mitigating systemic risks over time. Third, when majority of the population are included in the financial system monetary policy transmission would be more effective in achieving its objective of a robust financial system (Khan, 2011, Mehrotra and Yetman, 2015). In terms of trade-offs, financial inclusion through non-prudent credit growth would result to an increase in NPLs which would threaten stability of the financial sector. Furthermore, efforts to increase financial inclusion among low income population elevates reputational risks of commercial banks.

It is not clear whether there are trade-offs or synergies between inclusive finance and financial stability in Kenya. There is limited empirical work that links financial inclusion to financial stability with most studies focusing on the impact of financial development on inequality; growth and reduction of poverty (see Kibua, 2007; Gichuhi, 2013). Studies that focus on financial inclusion and financial stability in Kenya are exploratory in nature (see Aduda and Kalunda, 2012; Mwega, 2014; Amanja, 2015) and therefore anecdotal. Further, literature on inclusive finance and growth tends to ignore the connection between financial inclusion and

financial stability in Kenya. Based on the theoretical context it is imperative to examine why despite an increase in the level of financial inclusion in Kenya, financial system is still prone to periodic systemic risks that threaten stability of the financial sector.

Consistent with this research gap, two unrelenting questions need to be answered: At what point should policy makers strike a balance between these two policy objectives? Does financial inclusion influence financial stability? This chapter is exceptional because we select proxies of the two latent variables viz. financial inclusion and financial stability and use SEM to establish causality between the two variables. SEM helps us when variables cannot be measured directly; it corrects measurement errors and evaluates the variance and covariance of a model. Further, it assists in establishing causal relationships in multivariate multiple regressions and non-recursive models.

2.1.2 Research Objectives

The main objective of this chapter is to investigate the effect of financial inclusion on financial stability in Kenya. Specifically, we:

i. Examine the trade-offs between financial inclusion and financial stability in Kenya.
ii. Establish the synergies between financial inclusion and financial stability in Kenya.

2.1.3 Significance of the Study

Financial inclusion is seen as one of the prerequisites of financial development in a country. Therefore, at policy level this study guides policy makers in examining which variables of inclusive finance are important in mobilizing the unbanked population into the banking system. Inclusive finance promotes consumption smoothing which could guide essential monetary policy preferences as well as which price index to target.

There has been abundant literature on determinants of financial stability and its effect on economic growth in Kenya. However, no study has paid attention on the effect of inclusive finance on financial stability in Kenya. Financial inclusion gives commercial banks an advantage during financial crisis. This is because banks can cushion themselves against a financial crisis by diversifying their deposit and lending base. Therefore, this study contributes to financial intermediation hypothesis, which emphasizes on the importance of deposit mobilization to ensure stability and development of the financial system. In particular, we try to fill this research gap by

looking at the trade-offs and synergies between inclusive finance and financial stability in Kenya which has been exploratory in nature over the years.

Our study breaks new grounds by using structural equation model (SEM) estimation technique, in studying the effect of financial inclusion on stability of the financial system in Kenya. This will enable us tackle the problem of approximating measurement errors, using both latent constructs and indicator constructs and allowing covariance between different latent constructs to explain the nexus between inclusive finance and financial stability.

This study contributes to already existing literature in three folds. First, it identifies the determinants of financial stability by estimating a multivariate model using SEM approach. This enables us to understand the characteristics of financial stability in Kenya over time and to identify some procyclicality behaviour. Second, we look at a new perspective by examining how access and usage of financial services affects financial stability. Finally, paying more attention to a single country allows us to overcome the drawbacks of cross-country empirical studies on policy implications.

2.2 Literature Review

This chapter attempts to get detailed information on already existing theoretical and empirical literature in connection with our research topic. The chapter is divided into three components. The first section explores the existing theoretical underpinnings that link inclusive finance and financial stability. The second component deals with review of already existing empirical literature in line with the variables to be estimated. The third part summarizes the findings in the empirical literature section. A critique of empirical literature is done to identify research gaps and areas that need further inquiry.

2.2.1 Theoretical Literature

Financial asymmetry theories

These theories stem from economics of imperfect information that started during 1970 with seminal papers by Arkelof (1970), Spence (1973) and Stiglitz (1976). They argued that financial intermediates play a key role of mitigating information asymmetry between lenders and borrowers by reducing cost of information and transaction cost. Asymmetric information occurs when one individual in a contract has more information than and he uses it to his advantage in the transaction.

Arkelof (1970) posited that financial institutions find it difficult to differentiate between risky and safe borrowers. Information asymmetry may lead to adverse selection and moral hazard problems between banks and their customers. This may lead to reduction in credit because of the mistrust between lenders and borrowers thus affecting the returns and stability of the banking system.

Further, increase in non-performing loans is attributed to moral hazard issues where the borrowers provide wrong information about their property and credit capability to banks. Financial institutions have restricted loan contracts. However, they cannot differentiate the diverse level of risks among their customers to advance loans to less risky borrowers. This leads to high possibilities of credit defaults that result to increase in non-performing loans. Inclusive finance is characterized by mobilizing the unbanked population in to the banking system (Hansen and Jansen, 2010). However, these customers are not screened to determine their risk levels. Therefore, when banks lend to high risk customers probability of default is also high. This threatens the performance and hence stability of the financial system.

Financial instability hypothesis (FIH)

Minsky (1976) in his paper argued that a more financially included population tend to create financial instability in the economy through asset bubbles that would eventually burst in future. When individuals are optimistic about higher future returns on assets, borrowers will access more credit than usual. The capitalized expected future returns act as collateral on the money borrowed at present to finance these investments. However, the value and returns of these future investments cannot be assessed based on any firm value, they depend on the degree of confidence markets have on certain states that will happen in future. This speculation implies that if there is a slowdown in economic performance in relation to what had already been capitalized in the asset prices then the prices of these assets will be more than the expected returns. Once these prices are higher than expected, they stop being a stimulant for economic activities and they start propagating risks in the financial system that lead to financial instability (Erturk, 2006).

Financial intermediation theory

Diamond and Dybvig (1983) introduced this theory. The theory posits that financial intermediaries play an important delegated role of linking surplus units (lenders) with deficit units (borrowers). Banks get a competitive advantage in the market because they are able to scrutinize many

borrowers at lower costs. A financial intermediary therefore ensures efficient functioning of the financial system and monitors any other factors that would affect the effective channeling of credit to most productive ventures. When individuals have confidence in financial intermediaries they will want to be included in the financial system to benefit from reduced information and transaction cost. This will lead to majority of the population being financially included and financial institutions reserves also increase. With increase in their monetary base, financial institutions can be able to diversify their risks even further buy investing in different ventures hence insuring themselves against systemic risks.

Diversity of deposits with low probability of being demanded motivates banks to undertake risky lending. This increases the likelihood of default by borrowers, which reduces the quality of loans. The expansion of cheap and reliable retail deposit on the liability side also insures banks against systemic risks (Huang and Ratnovski, 2011). This theory further examines how banks convert illiquid assets into long-term liquid liabilities. It assumes that depositors are like investors who are risk averse; they are indecisive about their expected expenditure needs. Through intermediation, banks may prevent depositors from investing in long term ventures that generate high returns to future clients. Therefore, financial intermediaries are able to lengthen maturity of liabilities and loans, which reduces liquidity risk over time.

Finance growth theory

Bagehot (1973) argues that inclusive finance is a prerequisite for both growth and stability of the economy. The theory further posits that when individuals are unable to access financial services, there may be slow growth in the economy coupled with persistence inequality and financial imbalances. Therefore, when financial institutions operate smoothly, the intermediation process will operate efficiently leading to stability in the financial system. Spratt (2013) concludes that the economy will grow when majority of the population are included in the financial system and that financial institutions are efficient. Further, financial institutions improve economic growth by providing different investment opportunities (Schumpeter, 1911). When there is growth in the economy, financial inclusion deepens because individuals demand more services from financial institutions to conduct their businesses. For financial institutions to be able to offer these services, they must be solvent and stable (Levine and Zervos, 1996).

2.2.2 Empirical Literature

Studies that link financial inclusion and financial stability are limited and at the same time contradicting in explaining how these two policy objectives are related. The first strand of existing empirical literature shows how financial inclusion has positive effect on financial stability (Hanning and Jansen, 2010; Khan, 2011; Cull et al., 2014; Han and Melecky, 2013; Rahman, 2014). Financial inclusion may lead to diversification of funds to a wider group of economic agents who contribute to a more stable economy, which in turn leads to a more efficient intermediation role of saving. Improved saving will assist households in managing different risks to which they are vulnerable and provide a more concrete base for deposit on retail level (CGAP, 2009). Financial inclusion also assists in reducing income inequality, provides a platform for implementing money laundering, terrorism financial laws and monetary policy, thus aiding both financial and socio-political stability.

Another strand of existing empirical literature established that rapid credit growth may lead to financial instability (Mehrotra and Yetman, 2015). Financial risks also emanate from low-income clients, outsourcing financial activities, local unregulated financial institutions and poor innovations of financial products (Roa, 2015). Financial inclusion of low-income earners may lead to high information and transaction costs, which in turn develops to inefficiencies in service delivery and information asymmetries.

Financial Access and Stability

In their study of 95 countries, Han and Melecky (2013) find that wider use of bank deposits would greatly reduce deposit withdrawals in times of a financial crisis. However, the study also found out that this effect is not predominantly robust in crisis countries because estimation between the interaction of deposit utilization and banking crisis dummy variable proved to be statistically insignificant. The study investigates relationship between wider access to bank deposits before 2008 crisis and changes in bank deposit growth during the crisis. Further, they examine how resilient bank deposits funding were during economic meltdown. Growth of bank deposits (percentage of individuals who saved in the past years) was used as a proxy for access and the Z-score and liquid assets to deposit ratio captured stability of the financial system. The study employed robust standard errors and general methods of moment's regression (GMM). These findings are consistent with that of Cull et al. (2014) and Prasad (2010).

Consequently, Mostak and Sushanta (2015) investigate the role financial inclusion plays in ensuring banking system stability across 87 countries. They establish that as financial inclusion expands stability of the banking system improves as reflected by Z-score, insolvency risk and return volatility. A multidimensional index of financial inclusion that included access (number of bank accounts per 1,000 population), availability (bank branches and ATMs per 10,000 population) and usage (volume of credit plus deposit relative to GDP) was used to explain stability in the banking system which in turn ensured financial system stability. Consistent with this finding, Hannig and Jansen (2010), found that during business cycle, low-income individuals rarely change their financial behaviour. Therefore, during a financial crisis banks depend on low-income savers to continue providing funds when they do not have funds or when they cannot roll over their loans. Financial institutions can therefore shield themselves against changes in interest rates and volatile market conditions by having a more diversified and steady funding base. This can be achieved by concentrating on low-income saver to mobilize deposits (Khan, 2011; Jansen and Hannig, 2010).

In the same vein, Prasad (2010) further found out that inclusive finance (proxied by domestic savings and lending) improved domestic investments compelling countries to reduce dependence on foreign debts, thus leading to enhanced financial stability. In line with this finding, Adasme et al. (2006), Morgan and Pointes (2014) found that availing credit to small and medium enterprises (SMEs) would diversify loans leading to a low systemic risk. An improved share of loans to small and medium enterprises (SME) supports financial stability, primarily reducing probability of default by small business entities and reducing non-performing loans. Further, higher per capita GDP tends to improve financial stability (Khan, 2011; Busch, 2017). Aduda and Kalunda (2014) in their exploratory study also concur with Morgan and Pointes (2014). They suggest that the GoK should intensify its strategies for inclusive finance through financial intermediaries like banks. This would avail services to low income earners who are consistent in their expenditure and consumption behavior hence immune to economic cycles. Therefore, including them in the system would ensure stability in the deposit and loan bases of financial institutions leading to a stable financial system.

In their study, Mehrotra and Yetman (2015) explain the inverse positive relationship between access to better risk management tools and stability of the financial system. When individuals are financially included, they can manage their consumption in case of output instability by adjusting their savings and investment decisions. Similar findings were arrived at by Bachas et al., (2017)

who in their study of over 300,000 bank accounts in Mexico of beneficiaries of conditional cash transfer shows that utilization of debit card facilitates monitoring of bank account balances indirectly leading to increased savings and confidence in the financial system leading to a stable financial system.

On the contrary, Ardic et al., (2013) concludes that when deposit account penetration is used as a proxy for financial inclusion the statistical results show neither positive nor negative correlation. This is due to lack of data or an indirect relationship between financial inclusion and financial stability. To reinforce this argument, Reuttner and Glass (2012) concludes that the link between financial inclusion (estimated by number of loan accounts per 1,000 adults) and financial stability (measured by NPLs and risk premium, bank capital/assets) in Low-Income Countries (LIC) and Middle-Income Countries (MIC) is negative. This is because of severe access barriers and higher loan disbursement in markets with banks that are less capitalized compared to High Income Countries (HIC) with high accessibility and well capitalized banks. We can therefore conclude that financial inclusion may be subtle to the nature of increased financial access. If policy makers concentrate on increasing access to credit then it could increase financial risks, especially when it leads to deterioration in credit quality or tremendous growth in unregulated parts of the financial system.

Financial Usage and Stability

How regular and frequently a financial service is used over time plays a vital role in measuring the level of financial inclusion and stability in an economy. The proxies include but are not limited to average savings balances, borrowers in financial institutions and volume of electronic payments made (Hernandez-Cos and Goofben, 2012)

Using a sample of 300 households evenly distributed in five regions of Kenya, Zollmann (2014) finds that diversification of financial services determines how individuals manage and utilize their short-term liquidity. Further, the study established that when financial institutions customize their products to meet the needs of their customers, usage of financial services increases. Consistent findings is also documented by Ahmed and Mallick (2017) who analyze the balancing effect of inclusive finance on stability of individual banks using FAS data for 87 countries for the period 2004-2014. They use access to, availability and usage (total volume of deposits and loans relative to GDP) as proxies to inclusive finance. A two-step generalized method of moments (GMM)

technique is used to analyze this relationship. Consistent with this finding, Amatus and Alireza (2015) investigate the link between access, usage and stability of the financial sector in Sub-Saharan Africa (SSA). They conclude that outstanding loans from commercial banks have a positive role on financial stability. These findings are also in line with that of Lopez and Winkler (2017).

It should also be noted that usage of financial services by the population also leads to bank stability, which indirectly plays a role in ensuring stability of the financial system as a whole. Ahmed and Mallick (2015) in their study of 87 countries investigated the complementary effect of financial inclusion on stability of the banking sector. The study used volume of credit plus deposit relative to the GDP to represent usage of financial services. They found a statistically significant relationship between usage and soundness of individual banks. Along the same vein, Swamy (2014) examines the inter-relation and dynamics of bank stability in ensuring financial stability and a robust financial market. A significant finding of this study is that liquidity in the banking system is achieved by usage and access of financial services. This in turn improves capital adequacy, quality of assets and profitability leading to a sound banking system and effectively a stable financial system.

On the contrary, Sahay et al., (2015) do not find usage indicator (percentage of adults with accounts who use them to receive government transfers) to be significant in influencing stability of the financial system. Similar inconsistent findings were arrived at by Cihak et al (2016) who conclude that usage of financial services also has trade-offs with financial stability especially when there is wide spread irresponsible borrowing by the population. This may lead to high probability of risky events, unforeseen losses in the financial sector and consequently a financial crisis. To support this counter intuitive argument, Operana (2016) finds that financial inclusion has no impact on financial stability in Philippines. She argues that financial inclusion has neither positive nor negative effect on financial stability since there was insufficient evidence to make any conclusive inference. Perhaps this inconclusive result is due to variables being estimated in terms of access and financial depth. Divergence of these findings on usage can be attributed to the use of different usage indicators.

Quality of Financial Products and Financial Stability

Quality of finance has gone beyond customization of client needs and incorporated consumer education, protection, adequate infrastructure and regulatory environment that is favorable for

innovation and warranting a safe, robust and dependable financial system (Demirguc-Kunt et al., 2017). Therefore, quality of financial services depends on the relevance of the service to meet the needs of economic agents, reliability and availability of services over time across geographical space. Literature on how quality of finance affects financial stability at country level is relatively thin. Most studies concentrate on the two indicators of financial inclusion (access and usage) mostly because of scarcity of data and proxies to measure quality (Cull et al., 2014; Staschen and Gidvani, 2014).

Mismatch between the services that are offered by financial institutions and the demand is a major cause of low uptake of financial services by the population in Africa (Zollmann and Collins, 2010). Upadhyaya (2011) examined segmentation of Kenya's banking sector from 2000 to 2012. He found out that segmentation led to fragility and inefficiency over time, which led to financial instability (see Beck et al., 2010; Cull et al., 2014).

The launch of mobile banking by Equity bank and the linking of Commercial Bank of Africa (CBA) with the mobile phone provider (Safaricom) via M-PESA has tremendously increased competition in the banking industry. This has in turn improved the reliability and consistency of financial services in Kenya. Currently almost sixteen banks have been linked with mobile phone providers. These combined savings and loan products have benefited majority of the population. Their perception towards bank products has significantly improved leading to more individuals opening accounts (Cook and McKay, 2015). These products have led to the integration of payment data into credit files enabling financial institutions to assess credit risks which reduces their NPLs. CBA used payment transactions history from Safaricom data to evaluate credit worthiness of its customers and was able to reduce NPLs of its M-Shwari customers (Cook and McKay, 2015). Reduction of NPLs leads to the overall financial sector stability (Demirguc-Kunt et al., 2017).

The ability of customers making sound financial decisions is important in developing a strong personal savings, which is important in efficient allocation of resources and financial stability. Singh (2017) in his exploratory research of financial literacy and stability in India found that apart from exposure to fraud and abuse, inadequate awareness of financial matters might lead to borrowers' behaviour that intensifies financial fragility. Literate customers exercise innovative-enhancing demand on the financial system and improve monitoring in the financial market. This leads to improved transparency and stability in the financial system (Fomum and Jesse, 2017; Hall, 2008; Soskic, 2011). Further, Lukonga (2015) in his study of selected Islamic states emphasizes on

thex importance of consumer protection to ensure stability of the Islamic financial industry. He asserts that institutional arrangements such as deposit insurance scheme assist in protecting customers from financial losses. This leads to financial stability and development (see Staschen and Gidvani, 2014; FSD, 2015).

Further, a well-developed financial infrastructure ensures effective operation of financial intermediaries, which include credit information bureaus, collateral registries and payment systems. This leads to stability of the financial sector. Financial market infrastructure has grown tremendously overtime in Kenya due to growth of internet, e-commerce, near field communication and mobile phone money transactions (CBK, 2016). Cross-border payment in Kenya can now be made in real time just like normal payment. Therefore, most innovative payments firms are able to compete in retail payments. Banks have widened the range of payment instruments and services, improved cost efficiency and financial innovations (CBK, 2016).

Table 2.3 shows a summary of empirical studies and the methodologies used in estimating how financial inclusion affects stability of the financial sector.

Table 2.3: Summary of the findings

Author	Methodology	Findings
Han and Melecky (2013)	GMM using robust standard errors	Broader use of deposits can improve financial stability
Cihak et al., (2016)	Pair wise-spearman correlation coefficient	There are trade-offs and synergies between financial inclusion and financial stability
Roa(2015)	System GMM	Financial inclusion leads to financial stability
Ahamed and Mallick (2015)	Principle Component Analysis (PCA)	Inclusive finance leads to stability of banking sector
Sahay (2015)	Panel regression with country fixed effects	There are trade-offs and synergies between financial inclusion and financial stability
Morgan and Pontines (2014)	System GMM dynamic panel estimator	Financial inclusion and financial stability are complementary
Amatus and Alireza (2015)	System GMM dynamic panel estimator	Inclusive finance leads to financial stability
Operana (2016)	Reduced form Vector Autoregressive model (VAR)	Inconclusive result between financial inclusion and financial stability
Yetman and Mehrotra (2015)	Panel data regression	Too much access to credit may lead to financial instability
Busch (2017)	System GMM dynamic panel estimator	Inclusive finance leads to stability of the financial system
Ghosh (2008)	3 Stage Least Square	Financial inclusion raises financial fragility
Demetriades (2017)	Instrumental Variable Approach	Financial development in terms of inclusive finance stabilizes financial sector

Philip et al. (2017)	Logit regression	Financial literacy leads to financial stability

2.2.3 Overview of the Literature

Theories that link financial inclusion and financial stability have been supported by existing literature. This is in terms of utilized variables of financial inclusion and financial stability, methodologies used, and case studies of countries. These initial findings suggest a divergent outcome on the link between financial inclusion and financial stability. While some studies find a positive relationship between inclusive finance and financial stability (Busch, 2017; Demetriades, 2017; Philip et al., 2017) others find a negative or inconclusive result (Yetman and Mehrotra, 2015; Operana, 2016). Moreover, studies that have been conducted in terms of how inclusive finance affects stability of the financial system are at cross-country level (see Han and Melecky, 2013; Cihak et al. 2016; Demirguc-Kunt, 2017). Cross-country data has challenges in terms of reliability and quality, country's specific characteristics, the selection process of countries to be compared and issues with the research objective. There are unique country specific characteristics that are not captured. For example, IMF (2016) cited Kenya as a success story in terms of inclusive finance. However, FinAccess (2019) concludes that despite increase in access to financial services, usage, quality, dynamics and welfare of inclusive finance remains a challenge.

Furthermore, inclusive finance and financial stability are multidimensional in nature. Therefore, if we want to examine the real effect of inclusive finance on financial stability we need a multivariate analysis to capture how these variables interact in the long run. Our study pioneers the use of SEM approach, which is a multivariate analysis technique to examine the interaction between inclusive finance (access and usage) and financial stability. To the best of our knowledge, no studies have attempted to establish how inclusive finance affects financial stability in Kenya. This study seeks to fill this research gap.

2.3 Methodology

2.3.1 Theoretical Framework

To estimate the link between financial inclusion and financial stability we adopt Diamond and Dybvig (1983) model who posit that depositors (including firms and households) have random needs for their cash. As a result, individual needs are reflected in the way they withdraw their savings. Since not all depositors can demand for their savings at the same time, banks strive to

mobilize deposits from many different sources including households and firms. Banks expect only a small fraction of withdrawals in the short term. Nevertheless, it should be noted that depositors have the right to demand for their deposits anytime they wish to. Banks therefore have the discretion to lend to their customers over a long horizon, while retaining a small amount to cater for the day-to-day demand by depositors who wish to withdraw. Quantitatively, individual withdrawals are unrelated. Therefore, following the law of large numbers, financial intermediaries expect a steady number of withdrawals in a day.

The converse is also true. Since banks lend for longer periods they cannot quickly call in their loans before maturity. Moreover, even if they attempted to call in their loans, it is assumed that borrowers will not be able to refund immediately because they have also invested in long-term ventures. Thus, if all customers decide to demand their funds simultaneously banks will be unable to honour all their demands and will run out of money before refunding all the customers. Banks will only be able to pay the first customer but will go bankrupt before paying all the customers. This implies that even healthy banks are susceptible to bank runs and bank panics. Diamond and Dybvig (1983) assert that each depositor inducement to demand for their deposit depends on what they anticipate other depositors will do. If depositors expect other depositors to rush and withdraw their money then they will be the first to rush to the bank. As a result, this model provides an example of a Nash equilibrium. If depositors genuinely withdraw money for expenditure needs, they all earn interest benefits on the savings that remain but if they all rush to withdraw; they lose interest that they could have earned. They conclude that the only better way to prevent bank runs is to insure deposits and back it by government or central bank. Such insurance compensates depositors incase of a financial crisis. If depositors are aware of such a scheme they will not rush to withdraw their money even incase of bank run because they will not have a reason to take part in the bank run.

Diamond and Dybvig (1983) assume that the most favorable bank deposit contract is based on preferences, technology and information. Consumers get together and form a bank. They each deposit their money in the bank. Depositors' behaviour after depositing money is considered a Nash game. The contract has two equilibriums; one of them is a bank run equilibrium, which is worse than the maximum outcome, though it can be mitigated by deposit insurance scheme. It is assumed that the economy has three periods where at period zero individuals deposit money, second period they can decide to withdraw or be patient until the third period. If an individual decides to withdraw in the last period he gets $Y > 1$, which is more than withdrawing in the second period where he gets

only 1. Therefore the choice between (0, Y) and (1, 0) is made in the second period. Law of Large Numbers (LLN) is assumed in this model, where one individual is small in relation to the whole economy. The model has depositors withdrawing at random depending on their consumption needs or shocks. Let us assume a depositor is impatient and needs to withdraw at period 1; then his consumption will be $u(C_1)$ with probability 'x', and that another depositor is patient and withdraws at the second period with probability '$1-x$'. His consumption will be $\beta u(C_1 + C_2)$. The impatient depositor's would be equal to his initial wealth $C_1 = 1$ and his utility will be a unit $u(1)$. A patient depositor will receive Y>1 and his consumption in the second period would be returns multiplied by his initial wealth$C_2 = Y * 1$. His utility would be $u(Y)$.

We combine all these and use the probability weighted expected utility. Further, we keep in mind that the impatient depositors do not mind about consumption in period two so that it does not affect their expected utility. This can be presented algebraically as follows:

$$xu(C_1^1) + (1-x)\beta u(C_1^2 + C_2^2) \quad \text{..... (1)}$$

We now pool all the depositors in the economy and maximize their utility subject to their constraint.

$$xC_1^1 + (1-x)C_1^2 + (1-x)\frac{1}{Y}C_2^2 \leq 1 \quad \text{..... (2)}$$

The first period withdrawal for spending is ineffective if Y>1. We first move withdrawals along the available total resource and then get the best possible utility with full information by forming a Lagrangian equation and solving for the first order conditions to get the marginal utility of both impatient and patient depositors as follows;

$$x(\Delta C_1^1) + (1-x)\frac{1}{Y}(\Delta C_2^2) = 0 \quad \text{..... (3)}$$

Make ΔC_2^2 to be the subject of the formula in equation (3):

$$\Delta C_2^2 = -\frac{x}{1-x} Y \Delta C_1^1 \quad \text{..... (4)}$$

The change in expected utility becomes:

$$\Delta EU = xu'(C_1^1)\Delta C_1^1 + (1-x)\beta u'(C_2^2)\Delta C_2^2 \quad \text{..... (5)}$$

Substitute equation (4) in equation (5) to get equation (6):

$$xu'(C_1^1)\Delta C_1^1 + (1-x)\beta u'(C_2^2)\left[-\frac{x}{1-x}Y\Delta C_1^1\right] = 0 \quad \text{..... (6)}$$

Simplifying equation (6) we get;

$$x[u'(C_1^1) + \beta u'(C_2^2)(-Y)\,]\Delta C_1^1 = 0 \quad \text{..... (7)}$$

Therefore, at optimum present consumption of an impatient depositor is equal to:

$$u'(C_1^1) = \beta Y u'(C_2^2) \quad \text{..... (8)}$$

In addition, $(C_2^2) > (C_1^1) if \beta Y > 1$ as explained by Diamond and Dybvig model.

Suppose there is insurance deposit scheme in the optimal contract then we introduce coefficient of risk aversion:

$$u(C) = \frac{1}{1-\theta}C^{1-\theta} \quad \text{..... (9)}$$

We get the maximum utility $u'(C) = C^{-\theta}$ where, θ is coefficient of relative risk aversion. Therefore, if we equate the impatient depositor with the patient depositor with the element of risk aversion we have $(C_1^1)^{-\theta} = Y\beta(C_2^2)^{-\theta}$. Further we make C_2^2 the subject, $C_2^2 = C_1^1(Y\beta)^{\frac{1}{\theta}}$.

We then let $(Y\beta)^{\frac{1}{\theta}}$ be equal to μ and substitute $C_2^2 = \mu C_1^1$ and our resource constraint becomes;

$$x(C_1^1) + (1-x)\frac{1}{Y}(C_2^2) = 1 \implies C_1^1 = \frac{1}{x+(1-x)^{\mu}/_{Y}} \quad \text{..... (10)}$$

Therefore, when $C_1^1 > 1$ then $\mu < Y$ impatient depositor will benefit from withdrawing in period one because utility for consuming now is higher than postponing in future. Thus, substitution effect is lower in period one. Further, if $C_2^2 > C_1^1$ then $Y\beta > 1$ which implies patient depositors will benefit more than the impatient depositors.

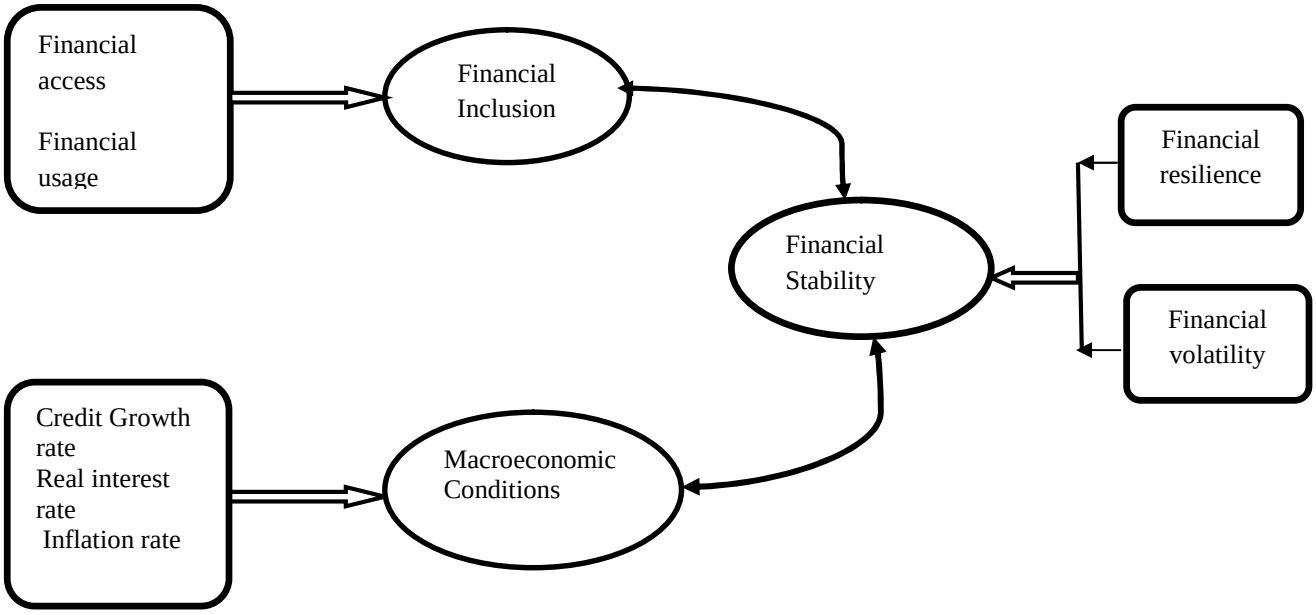
Suppose it is difficult to identify the type of depositor until they identify themselves. The banker will constrain the contracts such that depositors will signal their characters voluntarily. The impatient depositors would not cheat because as per the contract they will not benefit if they cheat. However, patient depositors may cheat but will not achieve optimal utility. A good contract is incentive compatible if a depositor reports his true character and achieves the highest utility possible. For instance, patient depositor will report his true nature if $u(C_2^2) > u(C_1^1)$ where$Y\beta >$

1. So if depositors are truthful the resources would be allocated optimally, which is not always the case.

We have seen a situation where there is equilibrium outcome on a deposit contract and that al depositors identify themselves with their characters. However, it is plausible that in the event of a bank run and our deposit contract awards every impatient depositor the same amount of y_1 for every amount that was deposited in the first period. The bank honours all withdrawal and deposit demands randomly depending on a customer's place in the queue. It does not consider the future when he is expected to be in the queue. If a depositor is in the queue at point k assuming that customers who arrived early and have withdrawn are a fraction q_k but a total portion q of depositors will receive their deposits. Then they will utilize: $y_1 if y_1 q_k < 1$(the bank is still liquid) and $0\ if y_1 q_k > 1$ (bank is insolvent). If depositors do not withdraw, we have, $\max\ (0, Y\ (1 - y_1 q)/(1 - q))$.

The depositors who liquidate at period two own the bank. Depositors who did not withdraw in the first period receive a pro rata share of the Bank's property in the second period. Bank run equilibrium will occur when both patient and impatient depositors rush to withdraw their savings in the first period because they expect the value of the liquidated property of the bank to be less than the real cash. Hence, individuals will demand for cash deposit until the bank becomes insolvent before it reaches their turn in the queue. If there is insurance deposit, one variant of the contract can eliminate the bad equilibrium. The payoffs for an impatient customer and patient customer will be the same and bank runs will not occur because waiting will be the same as rushing to withdraw. Figure 2.5 demonstrates our theory in a conceptual framework.

Figure 2.5: Conceptual Framework



We demonstrate theoretically that if financial intermediaries allow individuals to access and utilize financial services then they would contribute to stability of the financial sector. Financial inclusion through access and usage of financial services would allow banks to mobilize deposits and diversify their investments. This enables banks to forecast, mitigate and absorb systematic shocks in the financial system. Nonetheless, if financial intermediaries invest in high risky ventures and allow high risk customers to access and use financial services they may be vulnerable to liquidity and credit risks that would result into bank runs and financial crisis. We also consider other macro-economic conditions that would affect stability of the financial system (Diamond and Dybvig, 1983). High credit growth rate, inflation and real interest rate may lead to financial crisis. When credit goes to high and risky customers and real interest rate keeps on increasing we expect high levels of credit default as risky individuals are unable to pay leading to bank panics and bank runs, as banks may be unable to honour their customers' demands. This would ultimately lead to a financial crisis over time. Further, there is an inverse relationship between increase in the general price level and stability of the financial sector in the long run.

2.3.2 Model Specification

We use structural equation model (SEM) to explain the statistical relationship between variables by examining data and causal assumptions that are qualitative in nature (Pearl, 2000). This empirical

method is fundamentally motivated by several reasons. Existing studies on how inclusive finance affects financial stability have used Generalized Methods of Moments (GMM), panel regression and pair wise spearman correlation (see Han and Melecky, 2013; Morgan and Pointes, 2014; World Bank, 2014; Sahay, 2015, Cihak et al., 2016, Amatus and Alireza, 2015). However, these estimation techniques are much applicable to multiple regression and cross-country comparative estimation and have their own limitations. For example, when weak instrument are selected in GMM, they are weakly correlated with endogenous variables leading to misleading inferences (Kiviet, 2009). Consequently, the challenge of panel regression is to control the impact of unobserved heterogeneity, inflating the standard errors, design of the model, data collection challenges and distortion of measurement errors (Yaffee, 2003). Use of Spearman's correlation coefficient is quite complicated, difficult to work out and can easily be misinterpreted (Lehman, 2005). Further, inclusive finance and financial stability are multi dimensional in nature and therefore it would be inaccurate to proxy these constructs using one measurement variable. One is therefore bound to incorporate different measurement variables to proxy a latent construct and conduct a multivariate regression analysis using SEM.

We therefore turn to SEM because it is suitable in our case where we have inclusive finance, macroeconomic conditions and financial stability as indicators variables that cannot be estimated directly and have measurement errors. SEM can also be used to confirm our hypothesis that looks at the trade-off and synergy between inclusive finance and financial stability by theoretically developing a model to represent our postulations. SEM would further report the variance, covariance and multiple multilevel regression results of our non-recursive model that examines inclusive finance and financial stability. Unobservable (latent) variable are explained by directly observable variables and interpreted using hypothetical construct to determine how best it fits the data (Rabe-Hesketh et al., 2004).

Consequently, worldwide fit measurements can offer a quick summary estimation of multifaceted models that involve a substantial number of linear equations. Other estimation methods like multiple regressions would give separate mini-tests on model components carried out in equation-to-equation basis (Tomarken and Waller, 2005). SEM allows the use of confirmatory factor analysis to obtain measurement variables that effectively proxy the latent constructs which comprises of inclusive finance, macroeconomic conditions and financial stability to ensure better estimation results. We are therefore able to evade having to determine suitable weights, a problem

usually experienced when utilizing aggregate estimates or composite variables. Further, SEM helps to solve the identification problem by constraining the mean of exogenous latent construct to zero. Similarly, the intercept of the endogenous latent constructs are also constrained to zero while constraining the coefficient path of the first endogenous measurement indicator variable to have a coefficient of one.

According to Bollen (1989) and Kline (2004), SEM is utilized mostly for exploratory factor analysis and therefore divided into two parts: the measurement model (shows the association between a latent variable and measurement variables) and the structural model (shows the relationship between latent variables). Latent variables cannot be observed directly but are rather explained by observable measured variables. After estimation of parameters in the model, the actual covariance or correlation is compared to an empirical correlation or covariance matrix to ensure consistency.

This study adapts Bollen (1989) and later Kline (2004) models to estimate how inclusive finance influences financial stability in Kenya. SEM is a combination of both structural and measurement models. Structural model is represented as follows:

$$\mu = [\beta_1, \beta_2, \dots, \beta_n]\begin{bmatrix}\delta_1\\ \delta_2\\ \vdots\\ .\\ \delta_n\end{bmatrix} + \varepsilon \qquad (11)$$

Equation (11) shows the relationship between exogenous latent variables$(\delta_1,\ \delta_2, \dots, \delta_n)$, where δ_1 signify inclusive finance, and δ_2 represents an intervening macroeconomic (control) variables, and endogenous latent variable μ representing financial stability. $[\beta_1, \beta_2 \dots, \beta_n]$ proxy the coefficients of the exogenous latent variables. Indicator variables represent each set of latent variablesx in the model. The inexplicable element of the model is measured by an error term(ε).

In exogenous quantifiable model, the exogenous latent variable is linked to its indicator variable as follows:

$$\begin{bmatrix} z_1 \\ z_2 \\ z_3 \\ \cdot \\ \cdot \\ \cdot \\ z_n \end{bmatrix} = \begin{bmatrix} \gamma_{11} & 0 & 0 \\ 1 & 0 & 0 \\ \gamma_{31} & 0 & 0 \\ \cdot & \cdot & \cdot \\ \vdots & \vdots & \vdots \\ 0 & 0 & \gamma_n \end{bmatrix} \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \cdot \\ \vdots \\ \delta_n \end{bmatrix} + \begin{bmatrix} \vartheta_1 \\ \vartheta_2 \\ \vartheta_3 \\ \cdot \\ \vdots \\ \vartheta_n \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (12)$$

Where: $z_1 \ldots z_n$ represents the indicator variables for the latent exogenous variables. Inclusive finance is defined by two categories of indicator variables given as financial access and financial usage. Further, another intervening indicator variable included is macroeconomic (control) variables. The regression coefficients of latent exogenous variable are represented by: $\gamma_{11}, \ldots, \gamma_n$. $\vartheta_1 \ldots . \vartheta_n$ denotes the error term. Inclusive finance and macroeconomic conditions represent our exogenous latent variables in the model. Latent variables are not directly observable but are rather inferred from other observable variables. Consequently, in endogenous measurement model, financial stability, which is the endogenous latent variable, is linked to indicator variables as shown below:

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_m \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \vdots \\ \alpha_m \end{bmatrix} \mu + \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \\ \vdots \\ \epsilon_m \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (13)$$

Where $y_1 \ldots y_m$ denotes the indicator proxies for the latent endogenous variables. Indicator variables for financial stability are measured along two dimensions that include financial resilience and volatility. A parsimonious set of variables are chosen to consistently capture financial stability. The regression coefficient of the latent endogenous variable are characterized by $\alpha_1 \ldots \alpha_n$ and $\epsilon_1 \ldots \epsilon_m$ represents the residual term. The information in the indicator variables' covariance matrices is used to estimate the parameters of the model. This process is followed to confirm that the values of the parameters that will be reported can give an approximation for the models' covariance matrix $\sum(\boldsymbol{\theta})$, $\hat{\sum} = \sum\hat{\boldsymbol{\theta}}$ that closely corresponds to the samplex covariance matrix of the indicator variables.

The association among the exogenous variables and the endogenous variable is then analyzed after testing the hypotheses about the theoretical relationship between the latent variable and measurement indicators that proxy the latent variables. The study will then use confirmatory factor

analysis (CFA) to test the hypothesized relationship between the indicator variables and the latent constructs.

2.3.3 Definition and Measurement of Variables

Previous studies have used different variables to proxy financial stability. Sahay et al., (2015) and Melecky and Han (2013) use bank's Z-score as a proxy of financial stability. However, as theory explains definition of financial stability remains elusive because of the interconnectedness of different elements within the financial system and the economy (Dattels et al., 2010). System wide risks emanate from bank runs, fall in prices of assets, financial architecture and behavioral impact of banks, contagion effects and foreign exchange divergence that lead to financial instability in the long run. This study shall use variables that measure system wide risks through resilience and volatility of the financial sector to capture the interrelated nature of the system.

Banks' Z-score and ratio of non-performing loans is used to measure financial system resilience. These indicators measure solvency of the financial system over a period of time that are affected by systemic risks. Bank's Z-score is calculated by taking return on asset (ROA) and summing it up with equity to asset ratio then we divide it by the standard deviation of ROA. Z-score is the inverse of the probability of insolvency and it shows the number of standard deviations the ROA must decrease below its predictable value before capital is exhausted and the bank is insolvent (De Nicolo, 2000). A higher value of Z-score therefore portrays a greater banking stability and a lower value indicates instability (Li et al., 2017). It is computed from underlying banks unconsolidated data from Bank Scope that is annual and not seasonal. Other studies that have used bank's Z-score include (Hesse and Cihak, 2007; Lepetit and Strobel, 2013; Amatus and Alireza, 2015; Morgan and Pointes, 2015; Cihak et al, 2016). The ratio of non-performing loans to total loans is used to measure the exposure of bank's credit to systemic risks in the financial system. As this ratio increases, banks will be vulnerable to potential risks in the financial system that would threaten stability of the financial system (Delis et al., 2014).

Volatility is estimated using the standard deviation of deposit growth rate and standard deviation of lending growth rate. The more spread apart the data is, the higher the deviation. Standard deviation is calculated as the square root of variance. We apply the same procedure in deriving the standard deviation of banks' deposit rate (Mare et al., 2015; Cihak et al., 2016). Our study used these

variables to proxy for financial stability since it captures the two dimensions of stability of the financial sector. Furthermore, using these variables circumvents the problem of data availability.

Financial inclusion is defined by accessibility, usage and quality of financial services. Due to data paucity on measurement of quality over time, we use the two different indicators of financial inclusion, which include access and usage. We develop proxies of these indicators as established in the existing literature of financial inclusion. Previous studies that have used this data include World Bank (2012), Morgan, Pointes (2015), Ahmed, Mallick (2015), Amatus, Alireza (2015), and Cihak et al., (2016). Financial access is proxied by the number of deposit account per 100,000 adults, branches of commercial banks per 100.000 adults and automated teller machines per 100,000 adults (Morgan and Pointes, 2015 Han and Melecky, 2015; Cihak et al., 2016). To capture usage of financial services we use internet use penetration as percentage of the total population, average growth rate of electronic payment and borrowers from commercial banks per 1000 adults (Amatus and Alireza, 2015; Cihak et al., 2016, World Bank, 2015).

In addition, the study includes intervening control macroeconomic variables that could have an impact on financial stability. Among other exogenous indicators is credit growth to GDP growth rate. A decrease in this ratio due to improved GDP growth rate or reduction in credit growth rate leads to stability of the financial sector because it signifies stability of the economic sector (Hardy and Pazarbasioglu, 1999). Consequently, real interest rate, which is nominal interest rate less actual inflation, captures the value of real investment. When real interest rate is high, it implies that lenders are benefiting from their investment that leads to the stability of the financial system because lenders have buffers to protect themselves against any eventuality (Frankel and Saravelos, 2010). We therefore predict a positive relationship between financial stability and changes in real interest rate.

Inflation also plays a significant role in ensuring stability of the financial system. High inflation rates reflect a persistent increase in the general price level. This will make credit products more expensive increasing the probability of default by borrowers and reducing the value of money lent by the bank. This increases the amount of non-performing loans leading to instability in both the financial system and growth of the economy

Table 2.4 provides a summary of the definition and measurement of variables of interest, predicted coefficient signs according to theory and signs from previous empirical studies.

Table 2.4: Definition and Measurement of Variables

Variable	Notation	Definition and measurement	Sign predicted by theory	Sign from previous studies
Dependent variables				
Banks Z-score	ZSC	Return on asset (ROA) plus equity to asset ratio divided by standard deviation of ROA. Measures insolvency risk.		
Ratio of Non-performing loans	NPL	Total loans which payment has not been made for at least 90 days divided by total loan portfolio. Measures credit risk exposure		
Standard deviation of banks' lending rate	SLE	We compute year on year growth in lending rate then standard deviation of the growth rate. Measures volatility in cost and provision of credit		
Standard deviation of banks deposit rate growth	SBA	We compute year on year growth in deposit rate then standard deviation of the growth rate. Measures volatility in cost and volume of funding.		
Independent variables				
No. of deposit account (per 100,000 adults)	NCA	Deposit accounts (per 100,000 adults). Demographic measure of access to financial services	Positive	Positive
No. of branches (per 100,000 adults)	NBA	Bank branches (per 100,00 adults). Demographic measure of access to financial services	Positive	Indeterminate
ATMs (per 100,000 adults)	NAA	Automated Teller Machines (per 100,000 adults). Demographic measure of access.	Positive	Indeterminate
Internet use penetration (% of population)	IUP	Examines population using internet as percentage of total population. Measures usage of financial services.	Positive	Positive
Average growth rate in volume of electronic payment	VEP	Includes growth rate in volume of electronic payments and real time gross settlement. Measure of usage	Positive	Positive
Borrowings from commercial banks per 1,000 adults	BCB	Borrowings from commercial banks (per 1,000 adults). Proxies usage of financial services	indeterminate	Indeterminate
Annual credit growth rate	CGR	Ratio of annual credit growth to annual GDP growth. It measures	Negative	Negative

		growth of the economy.		
Real interest rate	RER	Nominal interest rate minus expected or actual inflation. It measures the rate of return of investments.	Negative	Negative
Inflation rate	INF	General persistence increase in price level over a period. Measures the changes in cost of credit.	Negative	Negative

2.3.4 Estimation and Testing

Considering three different indicators are estimated, we applied an iterative procedure to check on the general specification of the model and omitted variables problem. The goodness of fit test, robustness of the model and statistical significance of the estimated parameters to be included in the study was tested. Maximum likelihood estimation (MLE) was used as our estimation technique to determine the relationship between the latent variables and the indicator variables.

To measure the goodness of fit we adopted the Chi square statistics, Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Root Means Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (RMSR). We used these three tests to compare the different model specifications because they offer options for selecting the best model. A model that has a value closex to zero in RMSEA indicates a best fit and a robust model that is likely to be superior (Blunch, 2008).

Multivariate normality (assumes that data is normally distributed) and multicollinearity of the model was assessed. Higher deviation from multivariate normality leads to overestimation of the statistics hence leading to a type 1 error (Powell and Schafer, 2001). Overestimation of the model may lead to inaccurate measures of goodness of fit and hence biased standard errors. To address the problem of multivariate non-normality we used bootstrapping technique.

When normality assumptions are violated, bootstrapping assists in randomly collecting multiple sub-samples of equal sizes as the original sample and the distribution of these samples can be used to describe the actual population distribution. If association between two independent variables is higher than 0.70 then there is a problem of multicollinearity (Gujarati, 2003). To address the problem of multicollinearity we either drop one or more of the affected variable or combine the variables to form a single variable.

2.3.5 Data Sources

Annual data for the period 2004 to 2017 was used in our analysis. Yearly data on number of deposit accounts per 100,000 adults, number of branches per 100,000 adults, number of ATMs per 100,000 and borrowers from commercial banks per 1,000 adults was retrieved from International Monetary Fund (IMF) Financial Access Survey (FAS). Internet use penetration as percentage of the population was obtained from Internet Live Statistics (ILS), average growth rate in volume of electronic payments was retrieved from CBK. Further, yearly data on inflation and standard deviation of banks' lending and deposit rate data was obtained from CBK. Data on credit to GDP growth rate and financial stability indicators proxied by banks' Z-score, ratio of non-performing loans to total loans was obtained from World Bank's Global Financial Development Database (GFDD). While, annual data on real interest rate growth was retrieved from World Development Indicators (WDI).

2.4 Empirical Findings

2.4.1 Descriptive Statistics

Descriptive statistics such as Skewness, Kurtosis, Jarque-Bera (JB) Statistics and Probability Value are calculated for variables of interest. Results of the same are presented in Table 2.5. The assumption of univariate normality requires skewness to lie between ±2, kurtosis to lie between ±7 and JB statistics should not be statistically significant because the null hypothesis is not distributed normally. The highest mean is that of borrowings from commercial banks per 1,000 adults at 101.1 followed by credit growth rate at 24.94, while the lowest mean is that of standard deviation of banks deposit rate growth at 0.37. Skewness and kurtosis are established to determine multivariate and univariate normality of the sample data. Most of the variables are positively skewed except banks Z-score, number of deposit account per 100,000 adults, ATMs per 100,000 adults, real interest rate, credit growth rate and inflation that are negatively skewed.

Table 2.5: Descriptive Statistics

Variables	Notation	Obs	Mean	Std. Dev.	Min	Max	Kurtosis	Skewness	Pr(JB-Stat)
Banks Z-score	ZSC	14	14.65	2.16	10.75	18.70	2.68	-0.01	0.90[0.96]
Ratio of Non-performing loans	NPL	14	9.97	6.59	4.70	27.50	4.71	1.70	10.12[0.0]
Standard deviation of banks deposit rate	SBA	14	0.41	0.27	0.1	0.90	1.83	0.41	2.60[0.27]
Standard deviation of banks' lending rate	SLE	14	0.47	0.19	0.20	0.80	1.81	.070	1.96[0.37]
No. of deposit account per 100,000 adults	NDA	14	4.92	1.40	2.50	6.50	1.79	-0.48	3.33[0.19]
No. of bank branches per 100,000 adults	NBA	14	2.57	1.04	1.00	4.65	2.37	0.01	0.30[0.98]
ATMs per 100,000 adults	NAA	14	6.57	2.79	2.50	9.90	2.14	-0.65	2.27[0.32]
Internet use penetration (% of population)	IUP	14	17.86	12.22	3.00	40.20	2.12	0.59	2.02[0.37]
Average growth rate in Volume of electronic payment	VEP	14	0.36	0.22	0.10	0.70	1.72	0.32	3.28[0.19]
Borrowings from commercial banks per 1,000 adults	BCB	14	101.1	35.23	20.2	272	2.08	0.09	1.36[0.51]
Real interest rate growth	RER	14	6.02	2.36	2.00	10.00	1.76	-0.12	0.53[0.76]
Credit growth rate	CGR	14	25.42	4.38	15.00	30.00	3.47	-0.26	6.22[0.04]
Inflation rate	INF	14	7.55	2.05	5.20	12.00	2.71	-1.02	4.16[0.12]

However, most variables have a relatively high peaked distribution as shown by the positive kurtosis in all variables. The highest peaked distributions are evident on non-performing loans and credit growth rate. Maximum and minimum numbers represents the highest and lowest values respectively. All variables were fairly dispersed from their mean values as shown by their standard deviations. For JB statistics, variables were normally distributed at five percent level of significance except ratio of non-performing loans and credit growth rate. However, at one percent significant level all variables were normally distributed. The probability numbers of adjusted chi-squared distribution is adjusted because small sample distribution values take long to converge under JB test. The data therefore, satisfied the assumption of normality.

2.4.2 Correlation Analysis

Correlation analysis is used to check for collinearity between our variables of interest. We use correlation matrix and variance inflation factor (VIF) to establish whether there is perfect linear relationship among variables. Our main concern though is whether multicollinearity is so pronounced to nullify simultaneous inclusion of the explanatory variables in our regression. Table 2.6 shows results of our correlation matrix.

Table 2.6: Correlation Matrix

	NDA	NBA	NAA	IUP	VEP	BCB	INF	RER	CGR	ZSC	NPL	SBA	SLE
NDA	1.000												
NBA	0.332	1.000											
NAA	0.411	0.409	1.000										
IUP	0.436	0.249	0.305	1.000									
VEP	0.258	0.462	0.432	0.091	1.000								
BCB	0.541	0.210	0.450	0.094	0.080	1.000							
INF	-0.437	0.196	-0.447	-0.648	0.291	0.504	1.000						
RER	0.136	-0.448	0.199	0.228	0.422	-0.456	-0.325	1.000					
CGR	0.463	0.538	0.600	0.520	-0.131	0.061	-0.613	0.050	1.000				
ZSC	0.323	0.215	0.276	0.449	0.267	0.319	-0.391	0.422	0.413	1.000			
NPL	-0.499	0.256	0.178	-0.433	-0.462	-0.499	0.368	-0.088	-0.362	-0.729	1.000		
SBA	0.366	-0.308	0.352	0.238	-0.194	-0.002	-0.447	-0.004	0.303	0.199	-0.232	1.000	
SLE	0.587	-0.175	0.446	-0.408	-0.193	0.024	-0.549	-0.074	0.413	0.186	-0.337	0.406	1.000

Multicollinearity is contentious when the score is higher than 0.70 (Gujarati, 2003) to warrant a reduction in the t-statistics. This may lead to inestimable standard errors and undetermined parameter estimate. Further, the researcher may accept the null hypothesis which otherwise was supposed to be rejected leading to a Type-2 error. Gujarati (2003) asserted that the cut-off of multicollinearlity is 0.70 as the border of "extreme". Our matrix of implied correlation among variables of interest in Table 2.6 suggests there is a relatively low correlation among variables of interest.

We further used VIF to establish the possible degree of multicollinearlity among our variables. According to the rule of thumb, variables that have a VIF higher than 10 and a tolerance value expressed as 1/VIF higher than 0.1 may warrant further investigation. Table 2.7 shows our VIF results and the tolerance value of our variables. The VIF and tolerance value of our measurement

variables show there is no multicollinearlity among these variables. The mean VIF is at 6.45, which is below the expected threshold of 10. We can therefore conclude that our variables are suitable for estimating our model.

Table 2.7: Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
NDA	6.67	0.16
NBA	4.30	0.23
NAA	3.94	0.25
IUP	7.81	0.13
VEP	8.09	0.12
BCB	7.86	0.13
INF	5.08	0.20
RER	9.01	0.09
CGR	6.03	0.17
ZSC	4.30	0.23
NPL	7.58	0.14
SBA	8.23	0.11
SLE	4.65	0.21
Mean VIF	6.45	

2.4.3 Exploratory Factor Analysis

Exploratory factor analysis was utilized to identify the most efficient factors that express maximum information in our model (Henson and Roberts, 2006). We performed a factor analysis and created a communality table, which indicates the extent to which extracted factors elucidate the variability in the observed measurement variables together with their Eigen values and the percentage of variation that each factor explicates. The first and second steps assisted us in determining how many factors to use in our analysis. We begun by extracting a table of factor analysis and selecting factors with Eigen values greater than one in line with the KMO rule. Table 2.8 shows the factor loadings, corresponding Eigen values and variability of these factors. We choose three factors with Eigen values greater than one and explaining 85% of the variation in the data. The first factor explains 56% of the variation; the second factor explains 19% of the variation while the third factor explains 10% of the variation.

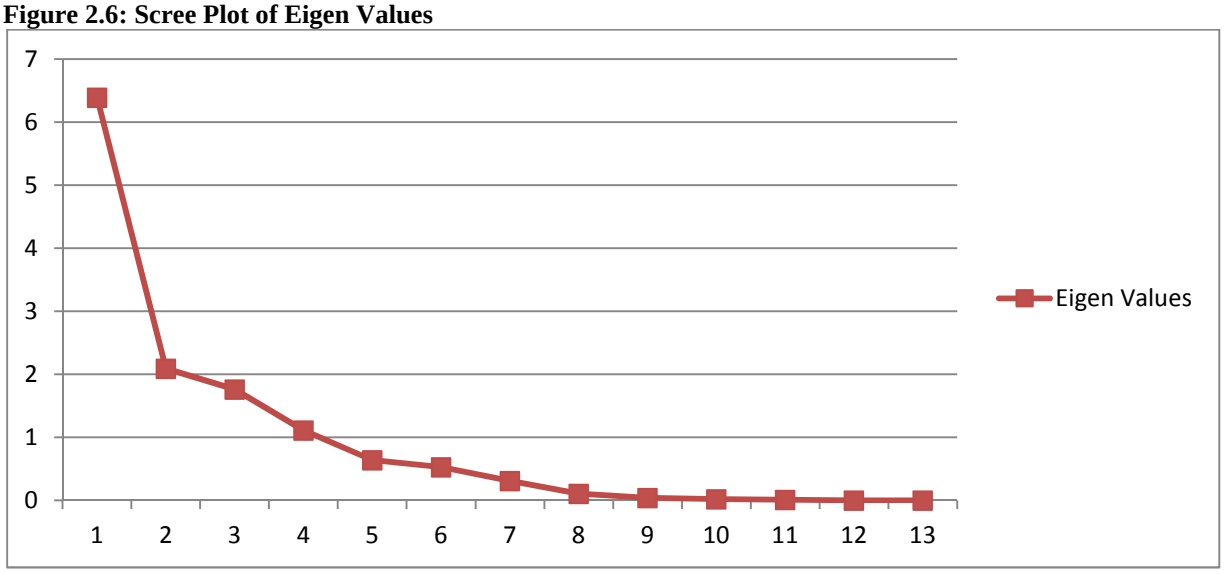
Table 2.8: Factor Loadings

Factor	**Eigen value**	**Proportion**	**Cumulative**
1	3.39	0.56	0.56
2	2.38	0.19	0.75
3	1.29	0.10	0.85
4	0.92	0.06	0.91
5	0.64	0.03	0.92
6	0.53	0.04	0.97

7	0.31	0.02	0.99
8	0.11	0.01	1.00
9	0.04	0.00	1.00
10	0.02	0.00	1.00
11	-0.01	0.00	1.00
12	-0.00	0.00	1.00
13	-0.00	-0.00	1.00

Further, the choice of factors was reinforced by the construction of a scree plot in Figure 2.6. The scree plot showed that only three factors have Eigen values above one. We therefore extracted the three factors that had a significant effect in our data.

Figure 2.6: Scree Plot of Eigen Values



We chose the three factors and performed a factor rotation to determine the factor loadings of the different original measurement variables. Factor rotation shows the correlation between the factors and the original measurement variables. Table 2.9 shows the outcome of varimax rotation (orthogonal matrix rotation to align with coordinates) and how the original measurement variables load on factor one (inclusive finance), factor two (financial stability) and factor three (macro economic conditions). Uniqueness is the error term of the original measurement variables that is not explained by the common factors. Uniqueness is inversely related to communality in that communality is what is explained by the common factors($communality = 1 - uniqueness$). The highest unique value in our data is that of internet use penetration as percentage of the population (IUP) which shows that 29% of the residual is not explained by this factor.

Table 2.9: Factor Rotation Matrix using Varimax

Variable	Factor 1	Factor 2	Factor 3	Uniqueness
NDA	0.87			0.11
NBA	0.75			0.03
NAA	0.92			0.10
IUP	0.80			0.29
VEP	0.81			0.10
BCB	0.78			0.20
INF			-0.76	0.17
RER			0.92	0.09
CGW			0.96	0.03
ZSC		0.88		0.07
NPL		-0.96		0.08
SBA		0.91		0.15
SLE		0.95		0.03

Blanks represent observation loadings less than 0.7.

2.4.4 Reliability and Adequacy Test

To test for reliability in factor analysis we used Cronbach's Alpha reliability test (CA) which calculates the internal consistency of summative rating scale comprising of the items stated in the data. The total number of individual item score is referred to as the scale and they can be constructed using raw item scores or sometimes standardized scores. The square root of reliability outcome (α) is the measurement of correlation of a test with true scores that contain minimal errors (Nunnally and Bernstein, 1994). A value above 0.7 of CA shows that the data is reliable when performing a confirmatory factor analysis (see Nunnally and Bernstein, 1994). Table 2.10 shows the outcome of our reliability test. Scale derived from our chosen variables in the data appears to be statistically meaningful since the measured correlation between the scale reliability coefficient and the square root of the basic factor it measures ($\sqrt{0.89}$) is approximately 0.94. The reliability and scale of the variables is based on total standardized variables. The average interim correlation was 0.38 with a corresponding alpha coefficient of 0.89 comprising of all items. All the included variables seem to fit well in the scale as shown by the item-test and item-rest correlations.

Table 2.10: Cronbach's Alpha Reliability Test

Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average Interim correlation	Alpha
NDA	14	+	0.93	0.91	0.34	0.85
NBA	14	-	0.18	0.05	0.44	0.90
NAA	14	+	0.93	0.91	0.34	0.85
IUP	14	+	0.85	0.81	3.35	0.85
VEP	14	+	0.21	0.09	0.44	0.90
BCB	14	+	0.72	0.65	0.37	0.86
INF	14	-	0.58	0.48	0.39	0.87
RER	14	+	0.87	0.83	0.34	0.85
CGR	14	+	0.42	0.30	0.41	0.88
ZSC	14	+	0.90	0.88	0.34	0.84
NPL	14	-	0.86	0.82	0.35	0.85

SBA	14	+	0.88	0.80	0.36	0.86
SLE	14	+	0.38	0.26	0.41	0.88
TEST SCALE					0.38	0.89

Further, we used Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy to check whether our data matrix was adequate for factor analysis. This is reported in Table 2.11. KMO measures sampling sufficiency for individual variables in the model and for the complete model. The statistics estimates the percentage of variance among the variables with higher proportions showing that data is more suited to factor analysis. KMO measure of sampling adequacy is interpreted with values between 0 and 1. Small KMO measurement values of less than 0.7 shows that in general variables are not mutually related to warrant a factor analysis (Kline 2004). We obtained 0.83 as our KMO that is just above 0.70 threshold. Therefore, we performed a factor analysis.

Table 2.11: Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Variable	**KMO**
NDA	0.86
NBA	0.64
NAA	0.77
IUP	0.69
VEP	0.89
BCB	0.85
INF	0.67
RER	0.73
CGW	0.82
ZSC	0.73
NPL	0.88
SBA	0.74
SLE	0.77
OVERALL	0.83

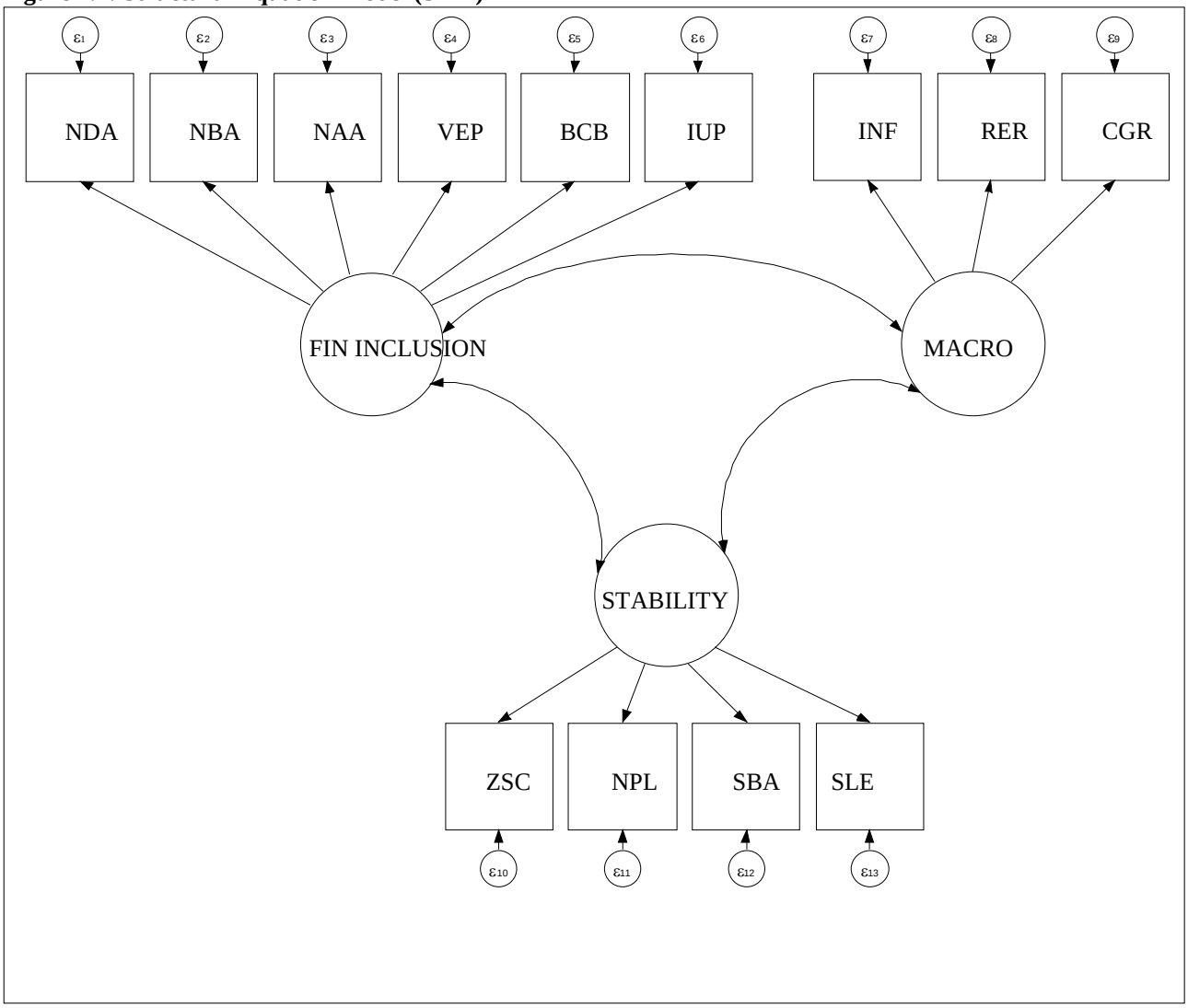
2.4.5 Confirmatory Factor Analysis (CFA)

CFA is theory guided and therefore before proceeding with our analysis we examined the association between the observed and unobserved variables. We used the already hypothesized model to measure a population covariance matrix and compared it with the observed covariance matrix. The numbers of factors and patterns of indicator-factor loadings are specified before CFA analysis is conducted. Figure 2.7 indicates SEM model used in CFA. Indicator variables are included in rectangular boxes while latent variables are shown in the oval shaped diagram. The circles represent the residual terms. Single headed arrows show our predicted relationships. To be able to determine if our model is well-identified one of the exogenous indicator from each latent

variable is constrained to a unit (Kline, 2004). In our analysis, we placed a factor loading of one on number of deposit accounts per 100,000 adults, inflation and banks' Z-score. Constraining an indicator variable permits us to exploit the relationship between the latent construct and the exogenous indicator variable in a non- recursive model to determine the variance of the latent variable.

CFA analyzes the factor loadings of each measurement variable on the expected latent variables and confirms if they are significantly associated (Thompson, 2004). After conducting CFA, we measure the structural relationship of the latent variables (inclusive finance, macroeconomic conditions and financial stability) using SEM.

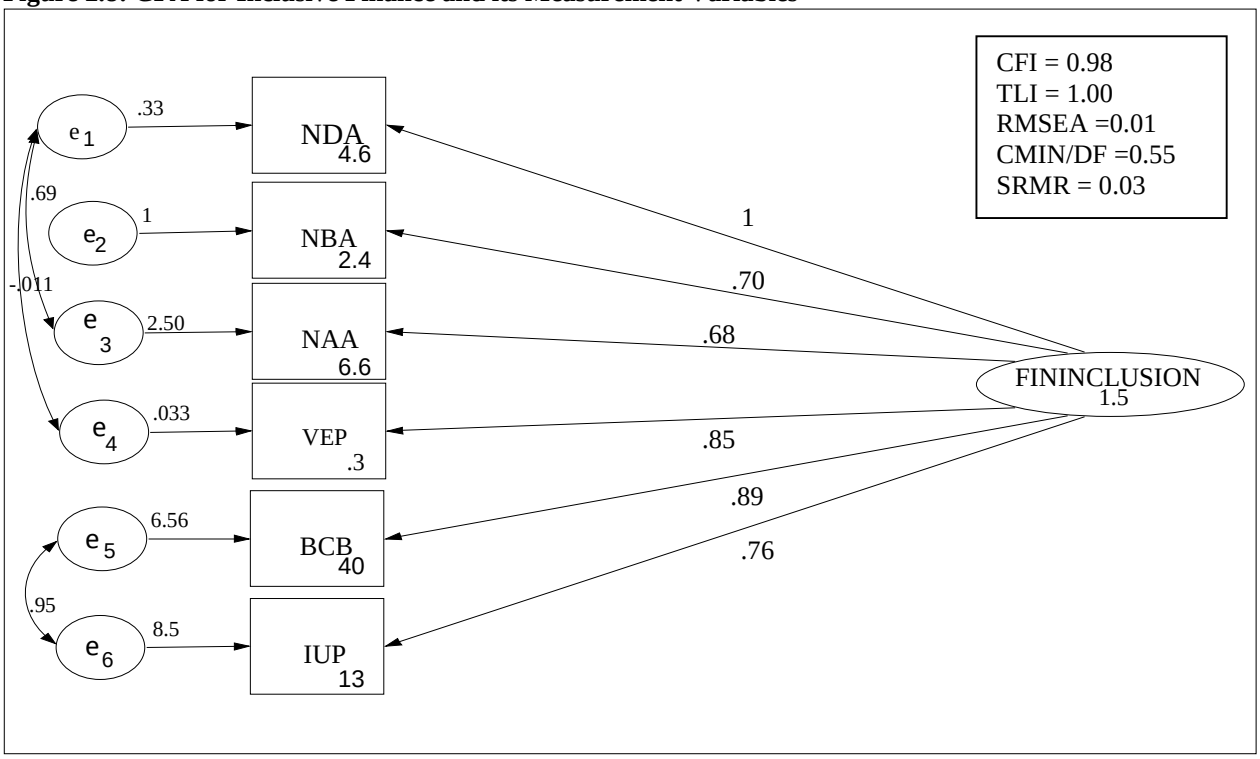
Figure 2.7: Structural Equation Model (SEM)



Note: Fin Inclusion is financial inclusion, Macro is macroeconomic conditions and Stability is financial stability.

Confirmatory factor analysis for inclusive finance as a latent construct and its measurement variables are displayed in Figure 2.8. The observed endogenous measurement variables included number of deposit account per 100,000 adults, number of branches per 100,000 adults, number of ATMs per 100,000 adults, average growth rate in volume of electronic payments, borrowings from commercial banks per 1,000 adults and internet use penetration as percentage of the population. The unobserved variables included inclusive finance (latent construct) and the error terms.

Figure 2.8: CFA for Inclusive Finance and its Measurement Variables



Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

Estimation of regression weights showed that inclusive finance is significant in predicting all the measurement variables that represent it. The regression weight for inclusive finance in forecasting the number of deposit accounts per 100,000 adults (NDA) was constrained to 1.00 basing on a sound economic theory, which asserts that, inclusive finance expands when every individual at least owns a deposit account. This implies that when individuals open deposit accounts and utilize them then inclusive finance expands rapidly (Han and Melecky, 2013). The estimation weights for inclusive finance in forecasting the number of branches per 100,000 adults (NBA), number of ATMs per 100,000 (NAA), average growth rate in volume of electronic payments (VEP), borrowings in commercial banks per 1,000 adults (BCB) and internet use penetration as percentage of the population (IUP) were all statistically significant with p-value less than 0.05. This shows that

when there is increased access and usage of financial services through opening of bank branches, increasing number of ATMs and availing internet banking to the population, majority of the population will be included in the financial system. This is consistent with the findings of Cihak et al. (2016), Han and Melecky (2013) and Demirguc-Kunt et al., (2015).

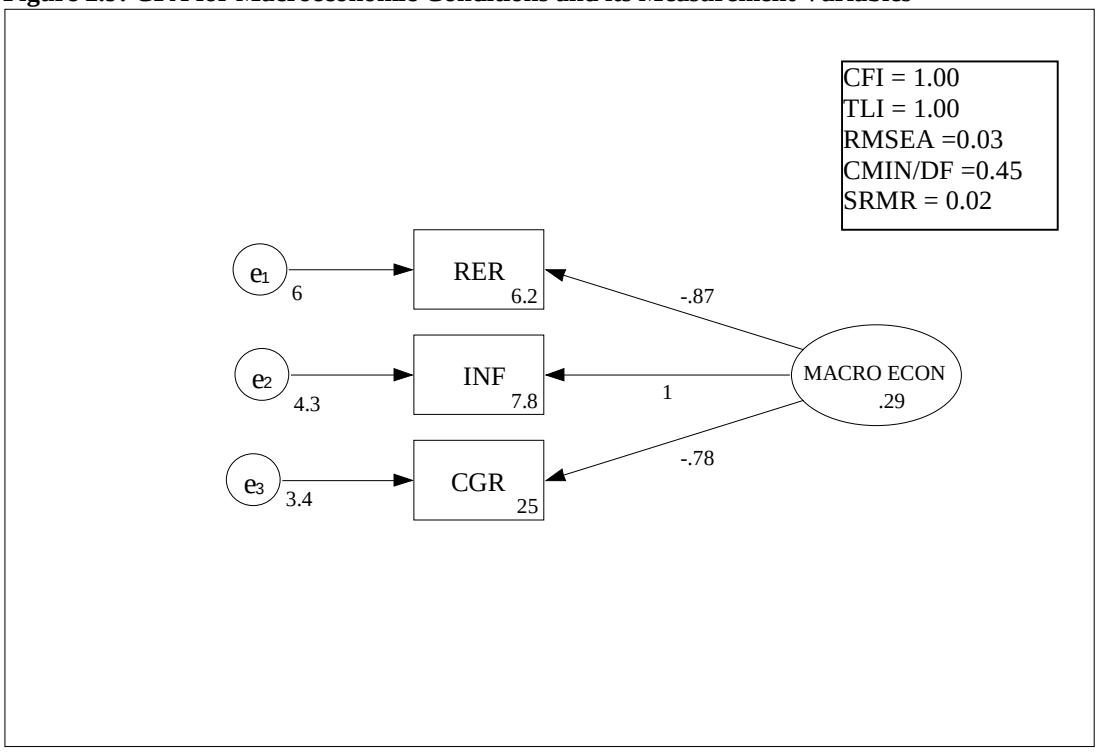
The factor loadings that explain the effect of NBA, NAA, VEP, BCB and IUP on inclusive finance was 0.70, 0.68, 0.85, 0.89 and 0.76 respectively. Furthermore, estimates of the variance of the residual of measurement variables were found to be statistically significant. This implies that the spread for inclusive finance measurement variables was efficient and that all the measurable construct of inclusive finance had adequate factor loadings. The error terms of measurement variables were modified using the modification indices command to allow correlation between the residuals. This aimed at ensuring an ideal spread of variances and that all observable variables of inclusive finance had adequate factor loading. Further, modification indices assists in ensuring that thex modelx has a good fit. The values in the boxes represent the variances of our measurement variables.

An assessment of the fit indices obtained from CFA was conducted to determine how the model fits the theoretical assertion. Chi-square test (CMIN/DF) is the most commonly used test of goodness of fit. We expect the Chi-square value not to be statistically significant for a model to be fit. Our Chi square value was 0.55, which suggested that the model was fit. To further confirm our results we tested additional measures of fit.

Comparative Fit Index (CFI) was introduced by Bentler, (1990) as a comparative measure which includes the values that lie between zero and one; a model is considered a good fit if CFI $\geq$ 0.9. Our model stated a CFI greater than 0.9, which portrays a good fit. Tucker-Lewis (TLI) measure of goodness of fit also shows a value higher than its threshold of TLI$\geq$ 0.9 as in CFI. Another important test is the Root Mean Square Error of Approximation (RMSEA), which provides a satisfactory fit founded on non-central chi-square distribution. For a model to be fit the RMSEA$\leq$ 0.05, the RMSEA in our model is less than 0.05, which indicates a good fit. We also report the standardized root mean square residual, which considers a model to be fit if SRMR is below 0.05 as in RMSEA. Our model shows an SRMR less than 0.05 showing a good fit. This further confirmed that our model has observable measurement variables that efficiently describe the latent construct.

CFA for macroeconomic conditions as a latent construct and its measurement variables was also conducted. Figure 2.9 shows the outcome of the analysis.

Figure 2.9: CFA for Macroeconomic Conditions and its Measurement Variables



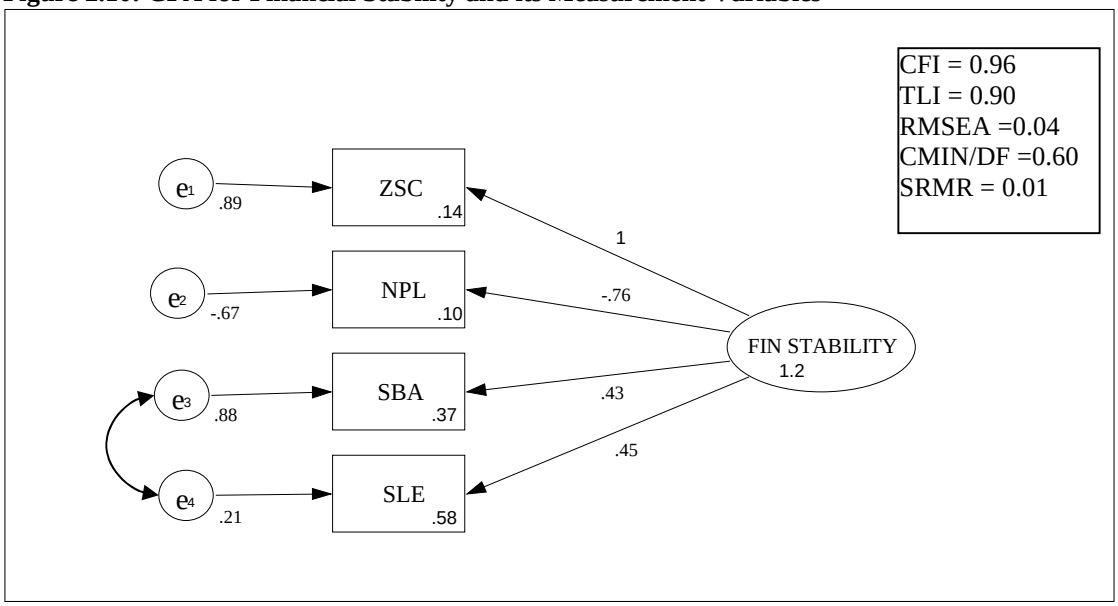
Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

The regression weight of macro economic conditions in forecasting inflation was set at 1.00 and for that reason it was not estimated. This was found on existing theoretical literature that macroeconomic instability increases as inflation increases (Duttagupta and Cashin, 2011). Therefore, when inflation increases by one unit macroeconomic instability also increases by one unit. Consequently, the estimation weight of macroeconomic condition in prediction of real interest rate was estimated at -0.87. This implies that when macroeconomic condition becomes stable by one unit then real interest rate decreases by 0.87 units ceteris paribus (Von Hagen and Ho, 2007). Further, the regression weight of macroeconomic condition in forecasting credit growth rate was estimated at -0.78. This implies that an increase in stability of macroeconomic condition by one unit leads to reduction in credit growth by 0.78 units other factor kept constant (Frankel and Saravelos, 2010). All the observable measurement variables were significant at p-value less than 0.05. Thus, the path coefficient that explains the impact of real interest rate and credit growth rate on macroeconomic conditions is -0.3 and -0.7 respectively.

We further establish if the CFA indices fits the model in line with the hypothesized conjecture. Chi-square test (CMIN/DF) and all the other model fit statistics confirmed that macroeconomic conditions indices had a good fit in Figure 2.9. This shows that factor loadings for macroeconomic condition measurement variables loaded adequately on the latent construct (macroeconomic conditions).

CFA was further conducted on the four measurement variables of financial stability. The variables were allowed to correlate without restraints with each other but there was a parsimonious correlation between the residuals. The path diagram is presented in Figure 2.10.

Figure 2.10: CFA for Financial Stability and its Measurement Variables



Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

We constrained the Z-score variable with a factor loading of 1.00. This was based on the existing literature that a higher value of bank's Z-score implies that there is stability in the financial system (Li et al., 2017). The model hypothesized that the four-measurement variables viz. Z-score (ZSC), ratio of non-performing loans (NPL), standard deviation of banks' deposit rate (SBA) and standard deviation of banks' lending rate (SLE) were correlated. The latent construct that represented all the measurement variables was financial stability. All the unconstrained paths for the measurement variables were statistically significant with p-value below 0.05. The regression weight of financial stability in forecasting the ratio of non-performing loans had a coefficient of -0.76. This means that financial stability improves by one unit when the ratio of non-performing loan reduces by 0.76 units

(see Baum et al., 2005; Talavera et al., 2012). Consequently, the weight of financial stability in predicting SBA and SLE was estimated at 0.43 and 0.45 respectively.

However, the deviation is not far from zero, which implies that the financial system is stable when the deviation is marginal but positive to allow banks earn interest from lending and at the same time encouraging individuals to deposit money in banks. The residual measurement variables were modified using the modification indices command to allow correlation between SBA and SLE error terms. This was intended to guarantee a perfect spread of the variances and to ensure that all observable variables of financial stability had higher factor loadings (Kline 2004).

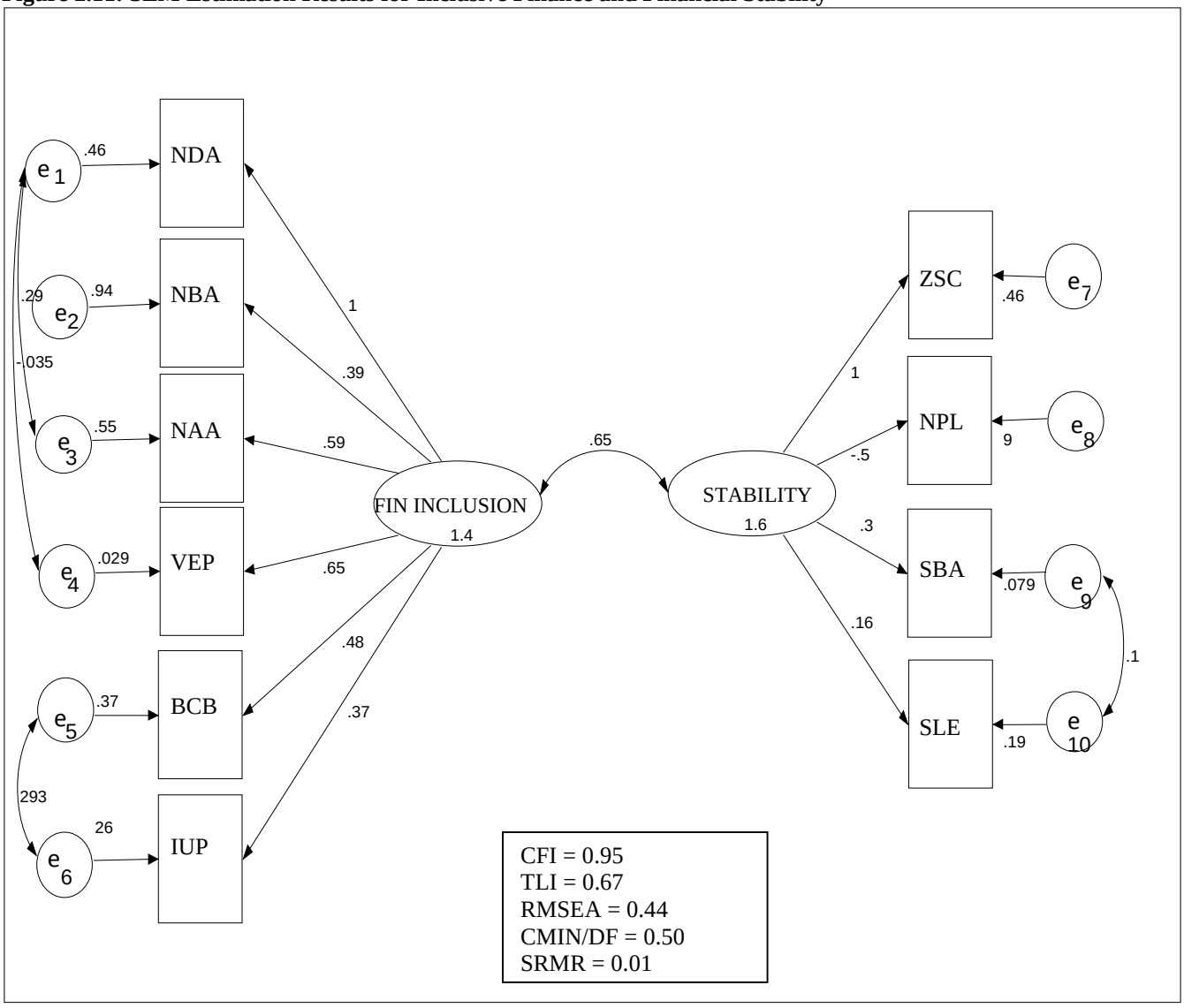
A goodness-of-fit test was performed to confirm whether our model has a good fit. The model fit statistics of all financial stability indices met the requisite threshold. We therefore concluded that the factor loadings for the measurement variables could be relied on to measure the latent construct (financial stability).

2.4.6 Structural Equation Model Results

In the SEM model, we estimated a non-recursive model of three latent constructs (inclusive finance, macroeconomics and financial stability). The unstandardized coefficient paths of: number of deposit account per 100,000 adultsx (NDA), inflation (INF) and Z-score (ZSC) were constrained to one and therefore there was no test of significance of these three paths. The constraint was based on sound economic theory (see Kline, 2004). We estimated our non-recursive unstandardized SEM model in three phases to examine the covariance between inclusive finance and financial stability, macroeconomic conditions and financial stability and finally the covariance between inclusive finance and macroeconomic conditions. We further explained the channels through which inclusive finance and macroeconomic conditions affect stability of the financial sector.

Figure 2.11 shows the channel through which inclusive finance affects financial stability. The distribution channels that proxy access to financial services include number of deposit accounts, bank branches and ATM machines per 100,000 people. Another channel through which inclusive finance affects financial stability is usage of financial services. Usage is represented by volume of electronic payments, borrowings from commercial banks and internet usage penetration.

Figure 2.11: SEM Estimation Results for Inclusive Finance and Financial Stability



Note: Fin Inclusion is financial inclusion and Stability is financial stability.

Figure 2.11 further reveals a significantly positive covariance between inclusive finance and financial stability. Thus, inclusive finance has a significant causal effect with financial stability. A one percent increase in inclusive finance leads to a 0.65 percent increase in financial stability ceteris paribus. This finding is consistent with existing literature (see for example Prasad, 2010; Morgan and Pointes, 2014; Cull et al., 2014; Han and Melecky, 2015; Amatus and Alireza, 2015; Cihak et al., 2016). When uptake of financial services increases through access to banking services, banks are able to diversify their loan portfolio, which in turn reduces credit risks over time. This enables bank to absorb shocks (see Khan, 2011; Sahay et al., 2015).

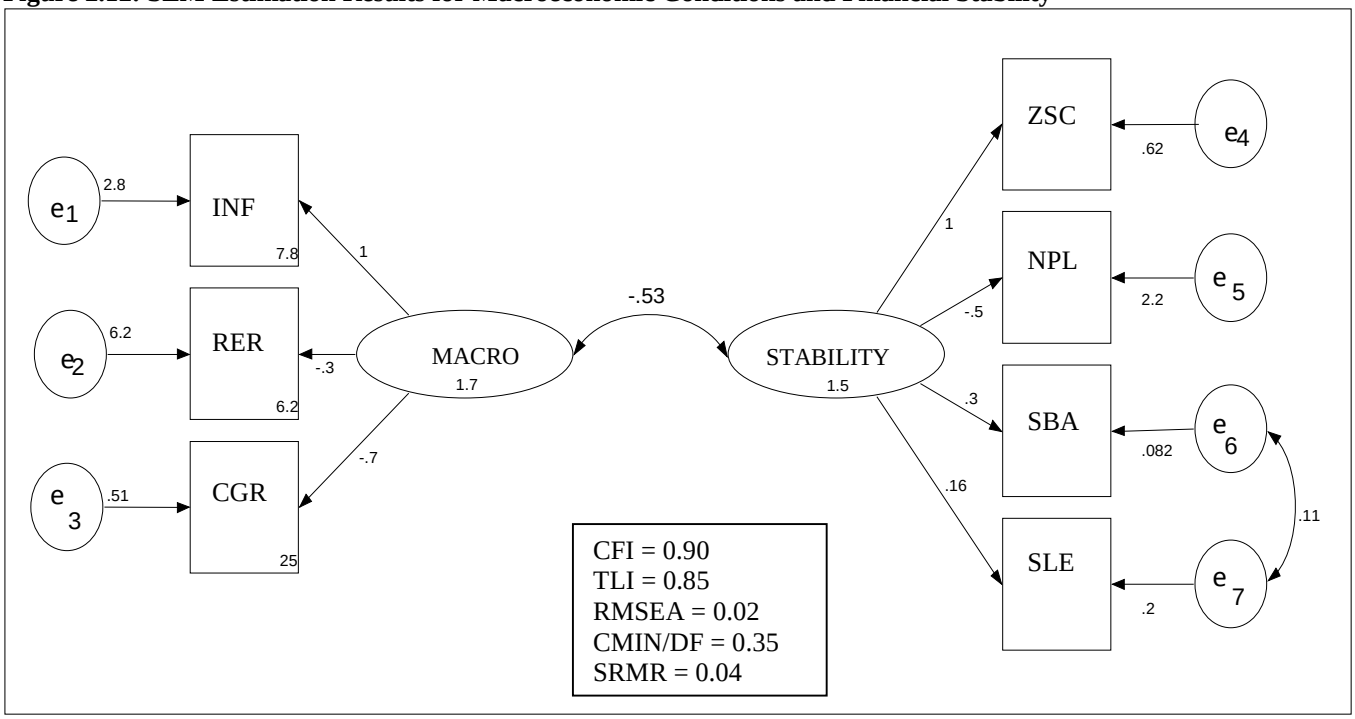
When the population is able to access their deposits and borrow from banks they are able to plan for their consumption. Therefore, during economic downturns consumers are able to cushion themselves by utilizing their savings. This reduces the likelihood of panics that lead to bank runs and ensures that the consumption patterns do not change in the long run (Prasad, 2010; Sahay et al., 2015). However, it should be noted that customers can withdraw their savings at once and that savings decisions can be influenced by other factors.

A stable financial system may also enhance confidence and trust in financial systems and foster utilization of financial services. When there is a strong regulatory structure through robust institutions and well-controlled governance structures of financial institutions, financial stability improves (Morgan and Pontines, 2014). It therefore becomes easier for regulators to predict, mitigate and absorb financial shocks. Hence, the government can come up with better policies that allow access and usage of financial services. Inclusive finance in turn decreases contagion effects linked with risks of financial exclusion. Accordingly, banks will find it easier to forecast their income hence encouraging them to diversify their investments (Sahay et al., 2015).

For post estimation tests, we assess the goodness of fit of our SEM model to verify whether the model fits the hypothesized theory. Our model fit statistics shows mixed results as follows: CFI = 0.95; TLI = 0.67; RMSEA = 0.44; CUMIN/DF = 0.50 and SRMR = 0.01. Apart from Tucker-Lewis index all other model of fit statistics show that the model met the expected threshold of a good model.

Figure 2.12 shows the causal link between macroeconomic conditions and financial stability. The channels through which macroeconomic variables affect financial stability include real interest rate, credit growth rate and inflation.

Figure 2.12: SEM Estimation Results for Macroeconomic Conditions and Financial Stability



Note: MACRO is macroeconomic conditions and STABILITY is financial stability.

Regarding macroeconomic environment, the covariance between financial stability and macroeconomic condition is statistically significant with a negative coefficient. This implies that there is an inverse causal relationship between macroeconomic conditions and stability of the financial system. A one percent increase in severe macroeconomic conditions leads to a 0.53 percent reduction in financial stability. Thus, high real interest rate, credit growth rate and inflation may enhance credit risks. Borrowers will be unable to repay loans leading to increased ratio of non-performing loans to total loans. Increased ratio of non-performing loans threatens stability of the banking system and with its contagion effects spread in the entire financial system leading to financial crisis (see Mohr and Wagner, 2013; Aikman, 2016). Therefore, stability of the financial system can be addressed through policies that reduce inflation and ensure price stability. Further, adopting measures that control persistent increase in real interest rates and risky ventures could reduce financial instability.

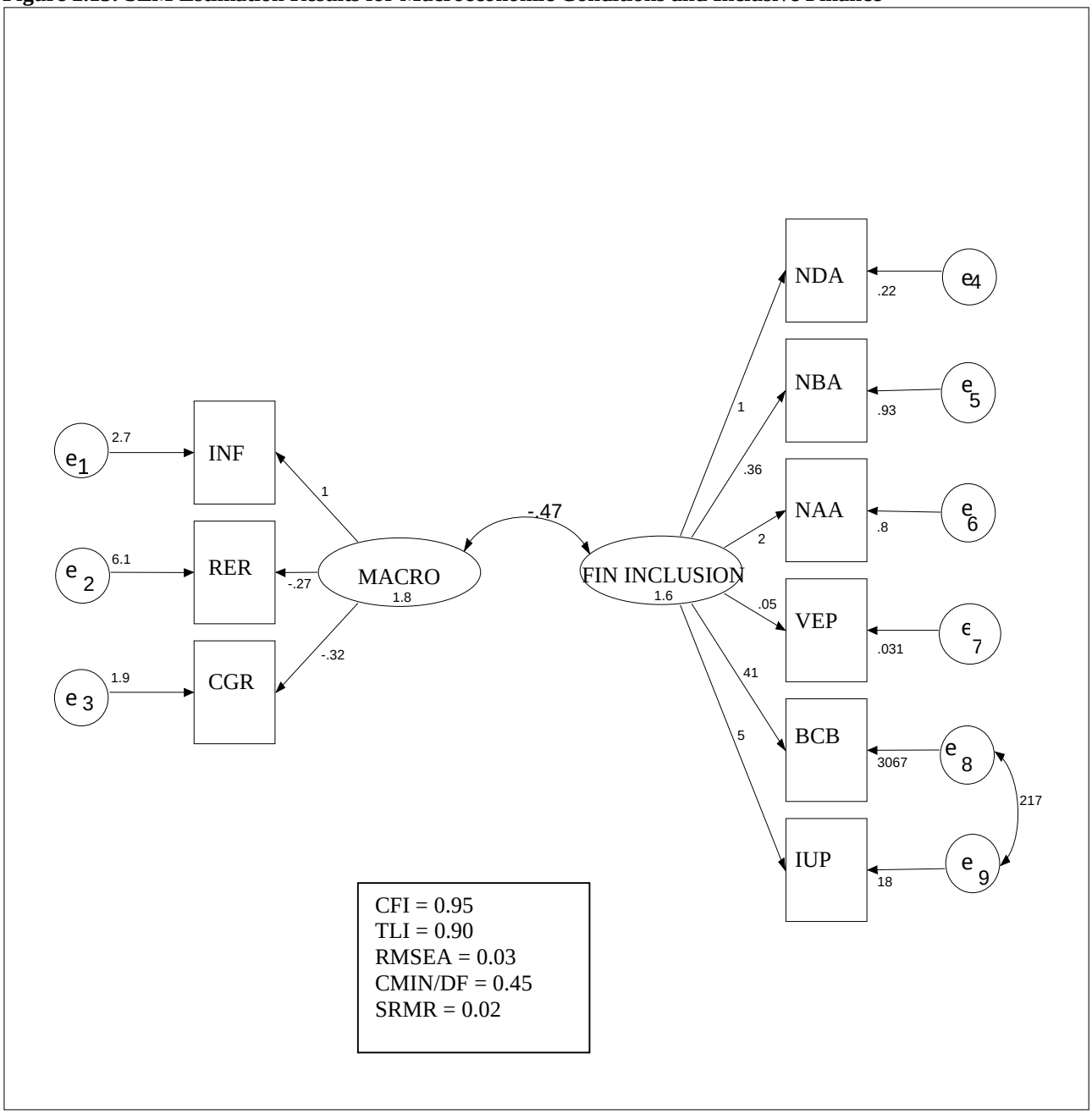
The SEM results suggest that there is still high level of inflation, real interest rates and credit growth in Kenya. The conjecture that adverse macroeconomic conditions will lead to instability in the financial system is supported by Dhal et al., (2011), Cazla et al., (2004), Mohr and Wagner (2013) and Aikman (2016), who suggest that higher credit to GDP gap leads to instability in the financial system and recession in the long run. Further, these studies contend that real interest rates

growth also affects the borrowing power of the population. Therefore, macroeconomic conditions may also have a significant effect on the financial stability of a country. The goodness of fit statistics shows mixed results as follows: CFI = 0.90; TLI = 0.85; RMSEA = 0.02; CUMIN/DF = 0.35 and SRMR = 0.04. All model of fit statistics shows that, our model met the expected threshold of a good model.

We further sought to establish the relationship between macroeconomic conditions and inclusive finance. Figure 2.13 illustrates the channels through which macroeconomic conditions can affect the level of inclusive finance. Concerning the covariance between macroeconomic condition and inclusive finance, we find a significant inverse relationship between the two exogenous latent variables. This implies that a one percent increase in severe macroeconomic conditions leads to a 0.47 percent reduction in inclusive finance.

The high lending rates and other indirect bank charges in Kenya have in the past discouraged many Kenyans from opening accounts. Further, those who had accounts were not utilizing them (Upadhyaya and Johnson, 2015). Banks did not set their lending rates in relation to the CBK rate, but instead they used their own calculation of risks leading to many Kenyans opting to borrow money in the informal sector (Toroitich and Anyango, 2017). This prompted parliament to pass a bill in 2016 that sought to amend the Banking Act by placing restriction on the rate, which banks offer loans (CBK, 2016).

Figure 2.13: SEM Estimation Results for Macroeconomic Conditions and Inclusive Finance



Note: MACRO is macroeconomic conditions and FIN INCLUSION is inclusive finance

The results of our model fit shows that our model is fit for SEM. It is as follows: CFI = 0.95; TLI = 0.90; RMSEA = 0.03; CUMIN/DF = 0.45 and SRMR = 0.02. All model of fit statistics show that the model met the expected threshold of a good model.

The SEM model also proposes some covariance between residuals of measurement variables to complement the relationship between latent constructs in ensuring stability of the financial system. Covariances are recommended to be implemented between the dimension of number of deposit

accounts and ATMs per 100,000 people. This implies that as the number of deposit accounts increase, banks should open more ATM machines to allow customers access their savings conveniently. Further, the covariance between number of deposit accounts and the average growth rate in volume of electronic payment suggests that, as the number of deposit accounts increase customers tend to prefer using the electronic payment system to conduct their transactions. Therefore, banks should consider improving their electronic payment systems as the number of depositors increase.

Standard deviation of bank deposit rate and bank lending rate should also be evaluated together to reduce the lending and deposit rate spread. This will encourage individuals to deposit money in banks and to borrow money for investments leading to stability of the financial system and the economy as a whole. The correlations of these novel factors could be seen as a new dimension.

2.4.7 Robustness Check

We conducted robustness check on the nature of association between financial inclusion, macroeconomic conditions and financial stability using a multivariate analysis of variance and covariance (MANOVA). We further, conducted a multivariate regression (MVREG) analysis on our variables of interest. Table 2.12 gives a summarized result of our analysis of variance and covariance for selected inclusive finance and macroeconomic condition variables. The outcome of our analysis is generally the same as those obtained from SEM estimation. Therefore, the inferences on the nature of association among our variables of interest are not significantly affected. The last column shows whether the F- statistics is exactly distributed, approximately distributed or it is an upper bound. The test for the overall model shows that the model is statistically significant regardless of the type of multivariate estimation used. The multivariate tests for each measurement exogenous variables is also statistically significant and it is exactly F-distributed as shown by the letter (e) after the P-values.

Table 2.12: Multivariate Analysis of Variance and Covariance

Source	Initials	Statistics	F	Prob>F
MODEL	W	0.00	12.07	0.00 (a)
	P	2.91	2.23	0.03 (a)
	L	0.13	26.18	0.04 (a)
	R	0.12	100.08	0.00 (u)
NAA	W	0.02	13.35	0.01 (e)
	P	0.90	13.35	0.01 (e)
	L	2.70	13.35	0.01 (e)
	R	2.70	13.35	0.01 (e)
NBA	W	0.03	39.62	0.02 (e)
	P	0.98	39.62	0.02 (e)
	L	7.92	39.62	0.02 (e)
	R	7.92	39.62	0.02 (e)
VEP	W	0.04	12.9	0.04 (e)
	P	0.96	12.9	0.04 (e)
	L	2.57	12.9	0.04 (e)
	R	2.57	12.9	0.04 (e)
INF	W	0.03	16.68	0.05 (e)
	P	0.97	16.68	0.05 (e)
	L	3.34	16.68	0.05 (e)
	R	3.34	16.68	0.05 (e)
RER	W	0.01	27.35	0.02 (e)
	P	0.99	27.35	0.02 (e)
	L	11.4	27.35	0.02 (e)
	R	11.4	27.35	0.02 (e)
CGR	W	0.04	14.05	0.07 (e)
	P	0.97	14.05	0.07 (e)
	L	2.81	14.05	0.07 (e)
	R	2.81	14.05	0.07 (e)

Note: (e) = exact, (a) = approximate, (u) = upper bound; W= Wilks's lambda test, P= Pillai's trace, L= Lawley-Hotelling trace and R= Roy's largest root.

Our estimation results indicate that the F- statistics and the corresponding P-values for Wilks's lambda, Pillai's trace and Lawley-Hotelling trace are approximate. Whereas, that of Roy's largest root is an upper bound, which implies that the P-value is a lower bound.

2.5 Conclusion and Policy Implications

This Chapter analyzed the effect of financial inclusion and macroeconomic variables on financial stability in Kenya. A nonrecursive Structural Equation Model was developed with unstandardized variable that proxy financial access, financial usage and macroeconomic environment as determinants of financial stability. From the empirical analysis, we find that access to financial inclusion in form of banks mobilizing deposit accounts, opening bank branches and increasing ATM machines in all regions would increase the uptake of financial services in Kenya. Banks can therefore diversify their portfolio and expand their deposit base to absorb financial shocks.

Further, we find that usage of financial services in terms of borrowing from commercial banks, electronic payments system and e-commerce facilitates effective transmission of monetary policy. Some of these policies indirectly aim at ensuring stability of the financial system. However, it should be noted that higher borrowings by individuals, might increase unexpected losses of the financial system and eventual bank crises.

Our findings further reveal that a more stable macroeconomic environment in terms of low inflation, credit growth rate and real interest rate would reduce credit risks. Borrowers' ability to repay their loans will improve and this will reduce the ratio of non-performing loans in commercial banks.

Finally, for easy access of financial services (through deposit mobilization, bank branches and ATM services) and usage (through borrowing from commercial banks, utilization of electronic payments and e-commerce) the macroeconomic conditions proxied by inflation, credit growth rate and real interest rate should be low.

At the policy front, the government should therefore introduce policies that will enhance accessibility and usage of financial services. There is need for multiple government agencies to come up with financial sector strategies that will encourage easy uptake and usage of financial services. This can be done by easing bank regulations to encourage competition among commercial banks and creating a framework that ensures stability of the financial sector.

Commercial banks should also play a role in financial inclusion by mobilizing deposits to expand their customer base. This can be done by opening more branches in the rural areas, increasing the number of ATM machines and agency banking in the country, improving digital finance and internet banking. They should also strengthen their electronic payment system to ensure easy transfer of funds at lower costs. These measures are critical in ensuring that financial services reach the unbanked population.

Further, commercial banks should encourage usage of financial services by reducing bureaucracies involved in opening bank accounts and accessing loans. This can be done by utilizing existing

innovative channels that can easily be accessed by majority of the customers like mobile and agency banking. Banks should also follow CBK regulations before advancing loans to their customers to reduce insolvency, credit and liquidity risks.

Based on these findings and policy implications, we can conclude that financial inclusion (in terms of access and usage) and stable macroeconomic conditions play a significant role in ensuring financial system stability in Kenya.

2.6 Areas of Further Research

This study could be extended as follows. It is necessary to factor in well being and quality of finance as a proxy of inclusive finance. This is because inclusive finance is multidimensional in nature and quality of services plus the well being of individuals would also affect the uptake of financial services in developing countries like Kenya. Measuring quality in addition to access and usage is vital as it provides a platform for guiding policy makers to make relevant policies that factor in all economic agents. However, this will only be possible with availability of data.

CHAPTER THREE

BANK REGULATIONS AND FINANCIAL STABILITY IN KENYA

3.0 Introduction

The financial system in most developing countries is banking oriented and more entrenched within the economy. Banks are the predominant source of finance for firms and households. The Kenyan economy is bank led because of a thin illiquid capital market and strong intervention by the central bank in the foreign exchange market. This intervention prevents temporary speculative attacks in the spot market. This implies that developments within the banking industry may have severe macroeconomic effects in developing economies relative to advance economies. Banks are therefore required to fulfill specific requirements, guidelines and restrictions for them to be able to operate. These requirements are intended to ensure openness between banking institutions and their customers. Given that banks are linked to global economies, it is imperative for regulatory authorities to maintain control over their day-to-day affairs. Justification for regulation is supported by the belief of too big to fail nature of banking institutions.

Many financial institutions especially commercial banks influence economic performance, hence fragility of these institutions. It is this realization of externalities induced by fragility of commercial banks that has given the government impetus to intervene in the banking sector (Borio, 2003). Depositors, managers and owners, comprise of stakeholders in a financial intermediary who have different interests. Owners of banks desire to maximize profits and therefore, they hire experienced managers to bid for their interest. However, a bank holds a higher stake of depositors' shares compared to that of its shareholders. This implies that the assets of the bank are not only financed by capital but also deposits. In the event of a bank failure, depositors stand to loose more than the shareholders. Regulation tries to influence the incentive faced by managers and owners to act in the best interest of depositors and the bank (Harm, 2002). Despite depositors being exposed to larger losses incase of a bank failure, they have no mechanism to effectively protect their interests because of lack of knowledge and the costs involved. Therefore, the regulator is compelled to intervene to cushion the depositors and the economy against the losses incase of a bank failure (Diamond, 2001). Commercial banks may sometimes manipulate the central bank regulation policies to enrich

themselves and in the process they may affect stability of the financial sector. For example central banks may sometimes reduce its central bank rate to ensure that commercial banks reduce their lending rates to the public. This aims at ensuring individuals are able to borrow and pay comfortably. However, commercial banks would increase their lending rates making it difficult for customers to pay their credit despite reduction in the central bank rate leading to increased non-performing loans. This makes the policy objectives of the central bank ineffective leading to regulatory capture. A good example is the amendment of Banking Act in 2016 to cap interest rates.

The rationale for government intervention as a social welfare maximizer is because the financial institution may not only collapse leading to market failures, but may also have negative externalities in the economy (Barth et al., 2001). Bank regulations further assists in solving the principal-agent dilemma where banks (agents) promote their own selfish interests at the expense of the principals who are the shareholders of the business. This makes it costly to owners and depositors leading to slow growth of the financial sector and the economy. Furthermore, the costs of bank failure may be borne by the government (Kareken and Walace, 1978). Banks have more information about their financial products than their customers do. To avoid exploitation of customers due to asymmetric information, the state is obliged to introduce regulations that protect consumers of financial service against such exploitation (Posner, 1974). Regulations also safeguard banking ethics and corporate social responsibility through licensing, supervision, minimum requirements (micro and macro prudential regulations) and market discipline (Borio, 2003).

Bank regulations are used by different countries globally to achieve certain policy objectives. For instance, direct controls aimed at promoting government policies, which targeted resource allocation to specific industries. Bank regulations (micro and macro prudential regulations) play an important role in ensuring safety and soundness of the financial system (Sinha, 2011). This was evidenced by the role macro and micro prudential regulations played to solve the global financial crisis of 2007-2009. It became clear that a stable and sound financial system plays a significant role in fostering growth and equity in a real economy. Macro prudential regulations mitigate exposure of the entire financial system while micro prudential regulation is concerned with safety and soundness of individual banks (Guerineau et al., 2016).

An efficient micro prudential regulation compels banks to take timely remedial measures when a bank is operating against the expected norms that threatens stability of an individual bank or against regulatory requirements (Ekpu, 2016). Traditional compliance based supervision (CBS) expected banks to operate in a certain laid down micro prudential rules set by the regulator. However, micro prudential regulation has evolved from CBS to risk based supervision (RBS) (Randle, 2009). RBS entails assessment of individual bank risks and its threat to the system by the regulatory authority and applying a micro prudential remedy based on the evaluation of the risk. This appraisal is linked to elements of pillar 2 supervisory review procedure and frequently utilizes the CAMELS rating model, which consists of Capital adequacy, Assets quality, Management efficiency, Earnings, Liquidity and Sensitivity to Market risks, introduced by USA in 1979 (Barr et al., 2002).

However, to achieve the full effect of micro and macro prudential regulation in ensuring stability of the financial system, Goodhart (2015) and Ekpu (2016) emphasize on the importance of striking a balance between the two dimensions of financial system stability. Recent studies show that information sharing, mutual discussions and joint risk analysis can strengthen complementarities and reduce potential tensions between micro and macro prudential regulation of the financial system (Claessens et al., 2013; ECB, 2014; Blahova, 2015; Ekpu, 2016).

3.1 Banking Regulation in Kenya

The financial crisis between 1985 and 1987 in Kenya led to the collapse of 24 banks and non-banking institutions. This crisis was attributed to large loans advanced to the management, massive fraud and mismanagement by directors of financial institutions, which became an eye-opener to CBK. Bank regulations under the Basel Accord were introduced in July 1988, which targeted the financial market. Pre-requisite of the Accord was that major banks in 12 developed countries should maintain their capital to risk weighted assets ratio at 8% beginning from 1992. However, with the complexity of financial instruments the 8% capital to risk weighted ratio requirement became a simple design with various restrictions. To supplement on the Basel Accord requirement, a set of ‘Core propositions’ were introduced by Basel Committee in 1997 on Banking Supervision (BCBS) with an aim of strengthening banking supervision in the Most Developed Countries (MDCs) and emerging economies. In 2004, BCBS decided to introduce Basel II, which was a framework, used to ensure bank’s risk management strategy in details with BCBS being present to supervise and endorse reliability of the system.

Basel II was used to recognize the minimum capital requirement for commercial banks (Pillar 1) and to measure capital adequacy. Further, BCBS introduced two more pillars to regulate banking activities and supplement the already existing capital adequacy obligation. The second pillar aimed at encouraging communication between financial institutions and their regulators to be able to accommodate the ever changing and developing business environment. Consequently, the third pillar targeted transparency of banks to the public on their financial position to mitigate risks in banking activities (Goodhart, 2011; BCBS, 2013).

The CBK acts as the principle regulator of banking sector under the Banking Act Chapter 488 of the laws of Kenya (CBK, 2001). However, despite direct control of the financial sector up to 1990s, real interest rate was adequately high to stimulate lending and saving (Simpton, 2007). Therefore, there was a steady expansion of the financial sector witnessed by high liquidity, diversity and easy access of credit by the private sector. During this period, foreign owned banks continued being financially stable while their counterpart- locally owned private banks, experienced two major bank crises: one over the period 1984-1986 that led to the revision of the Banking Act in 1989 to strengthen CBK role of supervision, ensure capital adequacy and transparency in auditing. The second crisis was during 1991 to 1993 that led to amendment of Central Bank Act to foster effective supervision, improve corporate responsibility and insuring small depositors. According to Johnson (2004) the main causes of these two bank crises were insider lending to politically connected individuals, fraud and mismanagement of bank assets, rising macroeconomic instability and absence of effective regulatory and supervision machinery in the banking sector (Okioga, 2013).

The two banking crises stifled the implementation of reforms in the banking sector. To salvage the situation and ensure that the Central Bank plays its transformative and stabilizing role effectively, Government of Kenya championed employment of professionally qualified managers and incorporated all regulations to be under the banking law except the Central Bank Act. CBK decided to improve financial stability by ensuring that financial institutions were well capitalized. By late 1996, almost 17% of NBFIs amalgamated with parent banks and 38% had changed to commercial banks. The board of directors appointed by the president was given the mandate to appoint the governor of central bank with an aim of reducing political interference and favours (CBK, 1997). Banks were required to publish their book of accounts including information regarding non-

performing loans and procedures on provision for non-performing loans were laid down after a series of bank failures in 1998 (CBK, 1999).

CBK in 2000 provided guidelines expecting banks to adopt the Basel I requirements in terms of capital adequacy and the regulatory capital ratios. The Central Bank sought to amend its Act in 2001 in what was known as the 'Donde Act'. The amendment aimed at pegging the lending and deposit rates to the 91 days Treasury bill rate. However, the Act was challenged on the grounds of its technicality in terms of its initiation and was declared illegal (CBK, 2001). GoK embarked on an Economic Recovery Strategy Program (ERS) for the period 2003-2007 that aimed at reducing the costs of doing business and providing investment opportunities in Kenya.

By 2005 comprehensive changes and amendments had been made on the Banking Act and related prudential guidelines. Key changes included licensing of new institutions, granting loans to Deposit Protection Fund Board (DPFB), corporate governance, capital adequacy requirements and liquidity management. Efforts were also underway on the implementation of Basel II that was adopted later in 2007 (CBK, 2005). Improvement in regulatory and political institutions created a better environment for the financial sector to thrive and effectively intermediate (Zollmann, 2010).

The most common risks that face the financial sector in Kenya include; market risks, management risk, liquidity risk, interest rate risk, credit risk, foreign exchange risk and operational risk (CBK, 2009). Policy makers have centered on ensuring better macroeconomic environment, well-capitalized banks, appraisal of banking laws in line with international requirement and ensuring bank stability through mergers. Furthermore, policies that ensure financially stable banks that are able to meet the needs of depositors, maintenance of minimum cash requirement to control the level of risks banks take and to encourage banks to expand their investments were introduced in 2006 (Simpton, 2007). To reduce incidences of bank failures the regulatory authority introduced credit risk controls that were meant to cushion depositors against bank failures in 2010 (Stuart and Cohen, 2011).

Basel III supplemented Basel II and Basel I frameworks (Agoraki et al., 2011). The financial meltdown of 2007-2008 was caused by low liquidity on banks' balance sheets and therefore Basel III introduced a more stringent capital requirement with doubled core capital ratio. Capital requirement is used to measure the minimum core capital that banks are expected to hold relative to the risk profile of its assets. Banks were expected to hold mandatory excess capital and a

discretionary buffer capital to cushion themselves against changes in business cycle (Angelini and Cetorelli, 2003). In line with the international standards CBK through the Finance Act, (2008) increased banks core capital requirement from two hundred and fifty million Kenya shillings in 2005 to one billion Kenya shillings as of the end of 2012. In addition, from 2005, banks were required to have 2.5% capitalconservation buffer for losses during periods of financial and economic stress. Table 3.1 shows the changes in minimum capital requirement for the period 1956 to 2017.

Table 3.1: Regulatory minimum capital requirement for banks in Kenya 1956-2017

Year	Kshs. million	US $ million
1956-68	2	0.28-0.28
1968-80	2	0.28-0.27
1980-82	5	0.67-0.46
1982-85	10	0.92-0.61
1985-92	15	0.91-0.41
1992-98	75	2.07-1.37
1999-00	200	2.74
2000-05	250	3.20-3.45
2006-09	350	3.46-4.61
2010	500	6.2
2011	700	8.7
2012	1000	12.4
2013-2017	2000	21

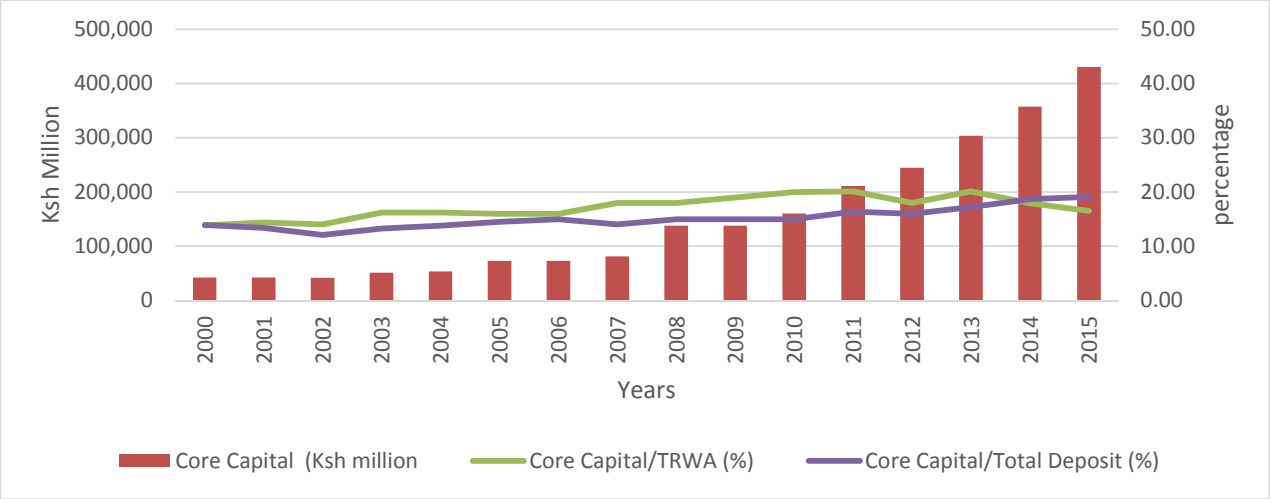
Source: Brownbridge (1998), Central Bank of Kenya (1999-2017)

The main rationale for additional capital was that financially stable banks are able to withstand systemic risks and hence ensure stability in the financial market. Kenya aligned its prudential regulation with best practices as set down by the BCBS. Assessment of Kenya's compliance with the 25 Basel Core Principles was instituted. BCBS concluded that Kenya was compliant with 18 principles by 2009 (CBK, 2009). It should be noted that the minimum capital requirements were given in Kenyan shillings and it was stable during the period included in Table 3.1.

Capital is the most critical indicator of the relative strength of an institution and it is evaluated in terms of core capital and capital adequacy. Figure 3.1 shows the core capital and capital adequacy ratios of commercial banks in Kenya for the period 2000-2015. It indicates that there has been a continuous increase in commercial banks core capital since 2000 to 2015. This can be attributed to

sound macroeconomic policy and stringent bank regulation and supervision by CBK that ensures commercial banks diversify to expand their capital base. Further, there has been a slight increase in the two important ratios of capital adequacy: core capital to total risk weighted asset and core capital to total deposit. However, core capital to total risk weighted asset reduced below core capital to total deposit ratio in 2014 and 2015. The main reason of this fall was due to collapse of Imperial bank that caused panic in the financial market hence increasing the level of risk in the banking sector.

Figure 3.1: Core capital and capital adequacy ratios of commercial banks in Kenya 2000-2015



TRWA- Total Risk Weighted Assets
Source: CBK (various issues)

In 2008, a bill was passed to allow the establishment of credit registries and this led to the formation of Credit Reference Bureau Africa Limited which was the first company licensed by the CBK to operate a credit reference bureau and it started operating in June 2010. Metropol Credit Bureau was the second company that came into play in 2011 (FSD, 2015). The introduction of credit bureaus led to a reduction of non-performing loans to gross loans from 6.5% in 2010 to 4% in 2012. Credit information sharing platform enabled banks to extend more credit to productive sectors by tackling the twin problem of information asymmetry (moral hazard and adverse selection) and lack of physical capital. Effective January 2017, the credit information sharing mechanism was expanded to bring on board utility companies as well as Savings and Credit Cooperative Societies (Saccos).

By 2009 Proceeds of Crime and Anti-Money Laundering (PCAML) Bill (2006) was published. There was introduction of 'In-Duplum' rule, which restricts interest levied on loans to the initial

money borrowed on non-performing loans (NPLs). A memorandum of understanding was signed to launch a Financial Sector Regulatory forum between CBK, Sacco Societies Regulatory Authority (SASRA), Insurance Regulatory Authority (IRA) and Capital Market Authority CMA in 2009 (CBK, 2015). In 2010, CBK introduced regulations that allowed financial innovations to take place in the banking sector. This led to the introduction of agent banking, where commercial banks and microfinance banks mandate third parties to engage in offering some precise bank services on behalf of the institution. Agent banking in Kenya is regulated by CBK under the Agent Banking (CBK, 2012).

CBK started introducing consumer protection guidelines to protect consumers against information asymmetry, which would lead to market failure. The enactment of the National Payment System Act in 2011 was meant to provide a regulatory framework for the evolving payment system. This included the adoption of mobile phone platforms as well as the roll out of various innovative products. This move received massive support from consumers who were exposed to continuous flow of financial innovations and introduction of customized product. This exposure had no counter balance on user education of the same financial products. CBK started publishing deposit and lending rates that each commercial bank charges and by September 2016, the parliament enacted a new law to cap interest rates in Kenya. All these initiatives aimed at reducing distinctive risks related to introduction of new financial products. Further, it intended to reduce interest rate spread in Kenya (CBK, 2017).

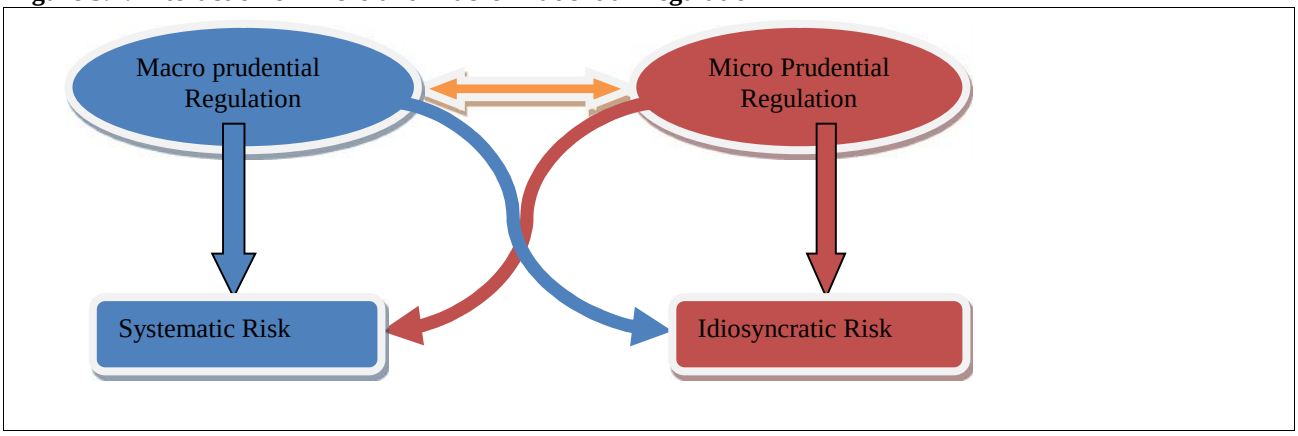
However, despite significant improvement in CBK prudential regulations the financial sector is still subjected to periodic instability. In 2002, one bank was liquidated due to under capitalization. An additional bank and a building society were also placed under legal management by CBK (CBK, 2003). Consequently, in 2011 the high levels of inflation, interest rates and exchange rate volatility also posed a major risk to the financial sector. The banking sector was again exposed in 2015 when it was faced with, transparency problems, liquidity risks and corporate governance challenges that led to three banks being placed under receivership by early 2016 for the first time over a decade (CBK, 2016). There were also instances of increased risks on credit with Non-Performing Loans (NPLs) increasing to historic trends and private sector lending reducing to 14% of the GDP. Further, interest rates and exchange rates volatility significantly affected the credit market exposing the financial system to additional systematic risk. It should be noted that despite an attempt to link

chronology of changes in regulation and changes in the stability of the financial system over time in kenya so as to appreciate the importance of regulation in ensuring financial stability, financial stabilitiy can also be attributed to monetary policy, fiscal policy and global developments.

It is not apparent how interlinkages between micro prudential and macro prudential policy mandates lead to either synergies or tensions in ensuring financial system stability in Kenya. It is argued that micro prudential policy target financial soundness of individual banks and not the whole system hence, dealing with exogenous risks and excluding endogenous risks (Borio, 2003). Conversely, macro prudential policy aims at addressing negative externalities of the whole banking system. It controls systemic risks in boom and acts as a shock absorber during recession. CBK regulates the largest segment of the financial system in Kenya, which includes 42 commercial banks, 1 mortgage finance company, 9 representative offices of foreign banks, 13 micro-finance banks, 3 credit reference bureaus, 19 money remittance providers and 73 forex bureaus as at end of December 2017 (CBK, 2017).

To ensure financial stability after the GFC of 2007-2009, CBK borrowed the IMF bank regulation framework that ensured early identification, monitoring and evaluation of systemic risks. Before the crisis central banks stressed on the importance of controlling, idiosyncratic risks using micro prudential regulation and neglecting the importance of identifying systemic risks at its early stages to mitigate financial system instability. It was only after the GFC of 2007-2009 that central banks realized the importance of complementing micro prudential regulation with macro prudential regulation to ensure stability of the financial system. Figure 3.2 shows the complementarities between macro and micro prudential regulations as proposed by IMF.

Figure 3.2: Interaction of Micro and Macro Prudential Regulation



Source: IMF, 2013

This chapter extends the previous study of inclusive finance and financial stability by examining the role of bank regulations in facilitating stability of the financial system. Bank regulations ensure soundness of individual financial institutions and the financial system in general. This in turn builds confidence in terms of their investments leading to increased uptake of financial services.

3.1.1 Statement of the Problem

Banks screen potential borrowers, monitor their activities after lending, provide insurance on potential liquidity risks and provide an opportunity to invest in safe assets. However, banks need Pareto optimal inducement to be able to monitor their customers efficiently. If optimal incentives are not achieved and financial system is not regulated, banks and other financial institutions are exposed to pecuniary externalities that would eventually lead to market failure. Economists have spelt out the side effects of market failure in the financial system over time (Stiglitz, 1994; Bhattacharya et al., 1998). These catastrophic effects may be because of breakdown of the law of demand and supply in the financial system due to the absence of regulation. Pecuniary externalities are experienced when a price change not only affects the customer's but also the banker's budget constraint and the opportunity to engage in opportunistic behaviour. There are many examples of pecuniary externalities in literature but the most pronounced is that of Diamond and Dybvig (1983). They posit that pecuniary externalities lead to low supply of liquidity leading to volatility in the financial system.

Speculation bubbles that are due to banks willingness to lend may also lead to financial instability. Therefore, it is important for the government to commit its resources to mitigate such losses and to ensure efficient resource allocation in the financial system. Freixas and Santomero (2002) argue that banking sector is regulated with the aim of reducing monetary liquidity costs, cost of bank failure and enhancing efficiency in the banking system. Central bank is charged with the responsibility of ensuring sufficient liquidity in the financial system. Therefore, regulation assists in overseeing all activities of financial intermediaries. Further, regulation reduces negative externalities associated with bank failures that lead to destruction of capital and contagion losses in the financial system (Friedman and Schwartz, 1970; Gorton 1988). An efficient operation of the financial sector is determined by how financial institutions follow rules and regulations that protect the shareholders and financial institutions interests. These rules should therefore be impartial and

transparent. However, regulation is an economic game with each player seeking to maximize his own interests given the available constraints.

Banks will introduce innovations to counter an existing regulation that seeks to maximize objectives of the regulator (Krosner and Rajan, 1997). Thus, to achieve the best outcome, regulators have to establish trade-offs and complementaries between micro and macro prudential regulations (Goodhart, 2011; Blahova, 2015; Ekpu, 2016). Nevertheless, there are cases where micro and macro prudential regulations overlap leading to contradictions in their execution or even uncertainty on which policy to be used. Uncertainty arises when there is no clear guideline on which regulation is to be applied when tackling upcoming systemic risks and what steps should be taken to maintain financial stability. Further, CBK has the powers to implement both micro and macro prudential regulation therefore while implementing bank regulations it has to consider both endogenousx and exogenous risks at the same time. This may lead to situation where regulations are ineffective in dealing with financial instability.

Compared to other countries in Africa, Kenya has made considerable strides in amending financial regulations to cope up with the ever-changing domestic and global financial risks. CBK through its macro-prudential and micro-prudential regulation has ensured that there is adequate supervision and quick response to mitigate any systemic risk that would lead to financial system instability. However, interlinkages between micro and macro prudential regulation in ensuring financial system stability in Kenya is still not clear. Existing empirical studies in Kenya concentrate on how capital requirement (a tool of prudential regulation) affects banking sector stability (Obiero, 2002; Kamau et al., 2004; Gudmundsson et al., 2013). These studies concentrate on macro prudential regulation and ignore the importance of micro prudential regulations in ensuring stability of the financial system. Further, they ignore other important macro prudential tools that play a significant role in ensuring financial system stability.

The direct and indirect effects of prudential regulation on financial stability in Kenya are still not known. Understanding financial sector vulnerability to future systemic risks is therefore significant in policy formulation. This merits a critical examination on the relationship between different dimensions of prudential regulation and financial stability in Kenya. Thus, consistent with these research problems this chapter seeks to address the following research questions: to what extent

does micro prudential regulation affect stability of the financial system in Kenya? What is the effect of macro prudential regulation on financial stability in Kenya? Is there a trade-off between micro and macro prudential regulation?

3.1.2 Objectives of the Study

The main objective of this study is to establish the effect of bank regulation on financial stability in Kenya. Specifically this chapter seeks to;

i) Determine the effect of micro prudential regulation on financial stability.
ii) Examine the effect of macro prudential regulation on financial stability.
iii) Investigate the trade-offs and complementarities between micro and macro prudential regulation.

3.1.3 Significance of the Study

This chapter contributes to the empirical literature on bank regulations and financial stability in several ways. First, by examining how prudential regulations affects financial stability in Kenya, this study complements empirical evidence on the importance of bank regulations by examining the trade-offs and complementarities of micro and macro prudential regulations in ensuring financial stability. Previous cross-country studies centered on macro prudential regulations ignoring the importance of micro prudential regulation (Claessens et al., 2013; Cerruti et al., 2015). Evidently, micro prudential regulation is significant because it guarantees stability of individual banks while macro prudential regulations ensure stability of the financial system. Kenyan economy is bank dominated with a thin illiquid capital market. Therefore, any shock in the banking sector will affect the entire financial system. It is therefore important to establish the trade-offs and complementarities between the two prudential regulations.

Second, prudential regulations protect consumers from making poor financial choices that include borrowing excessively, misinterpreting investment risks and selecting irrelevant financial products. These poor choices are because of exploitation tendencies by banks and lack of financial knowledge by customers, which leads to increased credit risks. Third, this study pioneers the use of structural equation model (SEM) estimation technique, in examining how prudential regulations affect financial stability in Kenya. This allows us solve the problem of approximating measurement errors, using both latent constructs and indicator constructs. Further, it allows covariance between

different latent constructs to explain the interaction between macro and micro prudential regulation in ensuring financial stability in Kenya. Finally, prudential regulations ensure there is equal distribution of credit for investment, which is an important element for economic growth and development. These are pre-requisites for a stable financial system in a country.

3.2 Literature Review

This section is divided in to three key areas. The first part reviews the existing theoretical literature that is relevant to this chapter with an aim of laying a background on how prudential regulation is linked to financial stability. The second part looks at related empirical literature on the relationship between our variables of interest. The final section summarizes and provides a critique of the empirical findings to identify areas that need further research.

3.2.1 Theoretical Literature

There are several theories that explain the effect of bank regulation on stability of the financial sector. These theories centre on the following hypotheses.

Theory of Public Interest

Pigou (1932) who asserted that the state is an invisible but benign social welfare maximizer that aims at correcting failures in the market introduced this theory. He argues that regulation is due to public demand for the modification of market tendencies to ensure efficiency in service delivery. Instances of market failure are experienced when price fails to dictate demand and supply of commodities necessitating intervention by the state. The regulator represents the interest of society as whole and not individual investors. Public interest theory was borrowed from Bentley (1908) who emphasized that regulatory authorities are seized and directed by groups to promote their concern. The major causes of market failures are externality costs and existence of natural monopolies. Externalities occur when firms do not internalize the costs or benefits of production in price of a commodity (Allen and Gale, 2000c; Acharya, 2009). Natural monopolies exist where fixed costs of production are too expensive to warrant production by only one firm, which in turn controls prices instead of leaving the forces of supply and demand to dictate price (Stigler, 1971). Pigou (1932) argues that where there is market failure the laissez faire argument of Adam Smith (1776) does not hold.

This theory was criticized because it does not consider competing notions of a public good, its ignorance about the ability of organized groups with the same goal and its inability to explain why regulation always fails to achieve its objectives (Baldwin and Cave, 1999).

Monopoly Control and Capture Theory

Theory of public interest started being questioned in the early 1970s by researchers like Stigler (1971), Posner (1974) and Peltzman (1976). It was apparent that government regulatory authorities favoured private investors who preferred to be regulated so as to increase their profits. Investors wanted to earn more returns instead of working for the public interest. Further, it was argued that private well-organized firms or business groups controlled regulatory authorities. In each sector a specific firm or business association dictated business. This ensured that firms in a given sectors concentrate on their own business without interfering with business in other sectors of the economy or their regulatory agencies.

It was also asserted that the public is excluded from the course of economic regulation because the effect of regulation to an individual is minor compared to a firm and that the procedures involved in regulation are complicated and complex for individuals. These studies argue that specific interests in one sector do not hinder regulatory performance in the other sector. Therefore, there is no rivalry over control of public policy among economic agents. Put simply, it is believed that regulation exists because firms in a given sector want it. This theory pioneers the underpinnings of 'iron triangle' concept, which provides the relationship between the regulator, the sector under the regulator and the responsible committees (Stigler, 1971).

This theory emanated from public choice theory where economics was introduced to non-market decision (Allen and Gale, 2000; Mueller, 2003). Stigler portrays regulation as a common good utilized by the whole society whose distribution is determined by the law of private goods (see Posner, 1974). He argues that the business sector has more information than the government and consumers. Regulation is demanded by the business sector and supplied by the state. Therefore, the process of regulation through political course explains the reason for economic regulation. Further, regulation exists to promote the interest of a group of politicians rather than to correct market failures.

Mood Swing Paradigm and Liquidity Preference Theory

Keynes (1936) introduced the animal spirit behaviour explained by the mood swing paradigm. He asserted that the animal spirit within managers in financial institutions influences their decisions. During boom managers have excess optimism and tend to lend more as compared to recess period where they cut their risk appetite by lending less. Due to this behaviour, pricing signals may not be effective in detecting systemic risks leading to likelihood of systematic trouble. Therefore, the task of a regulatory authority is justified to forecast potential threats and uncertainties. The regulator uses micro and macro prudential regulations to moderate uncertainties and alerts other sectors on the possibilities of financial risks during boom.

Further, in his theory of liquidity preference, Keynes (1936) argued that individuals demand money for three motives: precautionary motive, transaction motive and speculative reason. This theory supports the intermediation function of commercial banks. Banks pay for their liabilities and are rewarded for their investments or assets. This theory supports the payment of interest that is the cost of borrowing or lending from commercial banks. When bankers invest or lend on risky ventures they charge higher interest rates to cushion themselves against such risks hence the rewards are higher. However, banks can take advantage and exploit its customers by charging higher lending rates. This necessitates the intervention of a regulatory authority to supervise the behaviour of banks in the market. Thus, prudential regulations are meant to control the overall behaviour of banks in terms of their lending and borrowing activities to ensure smooth running of the system.

Principal-Agent Theory

Kareken and Walace (1978) explain the significance of principal-agent paradigm in explaining the importance of bank regulations. Shareholders who are the principals of a firm entrust managers who are the agents to manage and safeguard their interest. However, because of separation of ownership agent's interest may differ from the principal's interest. Agents may try their level best to promote their selfish interest to maintain their position and get compensation at the expense of their principals. Owners of banks adversely select bank managers who work in their best interest without regards to owners of the bank. It is difficult for the shareholders to evaluate and monitor the bank managers. Hence, regulators will establish guidelines that provide incentives for managers to act in the best interest of depositors, shareholders and society (see Alexander, 2006; VanHoose, 2007). This theory is further pinned on the fact that as banks hold liabilities like capital and deposits in trust, it is expensive for a depositor to monitor how his or her deposits are invested by the bank.

Therefore, a bank may invest in a risky investment without the knowledge of the depositor. Incase of losses, the depositor will bear the greatest portion despite him not being able to monitor the activities of the bank. Ciancanelli et al. (2000) and Santos (2001) in their review of bank regulation literature argue that banks hold liabilities like capital and deposits in trust.

Diamond and Dybvig (1983) explain the occurrence of bank runs, which necessitate closer supervision, and regulation of banks. They argue that banks aim at ensuring liquidity in the economy. The model considers an optimum insurance contract where agents venture in risky behavior knowing that they are insured leading to instability in an individual bank. Instability in one financial institution causes panic by depositors in the entire system who rushes to withdraw their deposits in respective banks due to fear of losing their savings. This leads to what is known as bank runs that eventually lead to a financial crisis through its contagion effects. To avoid susceptibility of the financial system, existing debates supported the need to supervise and regulate financial institutions.

3.2.2 Empirical Literature

Macro Prudential Regulation and Financial Stability

After the GFC of 2007-2009, many developed and developing countries realized the importance of macro prudential policies in alleviating systematic financial risks. Macro prudential regulations are utilized more pre dominantly in developed economies than developing economies. Further, policies that target borrowers like loan-to-value (LTV) and debt to income ratios (DTI) are utilized frequently in developed economies. Every country has a policy to prevent systemic risk emanating from the interconnectedness of the banking system or exposure of the entire financial system (Cerutti et al., 2015). In their study of how macro prudential policies prevent financial system vulnerability, Claessens et al. (2013) use panel data regression of 2,800 banks in 48 countries while controlling for endogeneity. They conclude that regulations that target borrowers such as LTV, DTI, and regulations that target financial institutions viz. foreign currency borrowing, counter cyclical buffers and ceilings on credit growth are significant in diminishing asset growth.

In line with the ex-ante behaviour of macro prudential tools, countercyclical buffers have minimal impact during business cycle and some regulations are even counterproductive during recessions, worsening the decline. Consequently, macro prudential policies and non-interest rate policy stabilize housing credit and house prizes. To confirm this conjecture Kuttner and Shim (2013)

conclude that adjustments in highest debt-service-to-income ratio (DSTI) and counter cyclical buffer requirements is statistically significant in influencing housing credit growth conditional on mean group and panel data event approach.

Macro prudential policies like LTV and DTI are connected to real property cycle and therefore they are more appropriate in mitigating housing credit booms and instability in the financial system. Crowe et al., (2011) posit that a detailed focus of LTV and other measures like leverage ratio, sectoral requirements and credit provisioning that aim at stabilizing the banking sector would still assist in accommodating a bust despite their failure to stop a boom. Glowker and Towbin (2012a) echoes these sentiments in their cross country analysis on efficiency of changes in policies to output growth, credit growth, housing credit, house prices and capital inflows. They confirm that reserve requirement and capital adequacy ratios are statistically meaningful in affecting growth of credit. Nevertheless, maximum LTV and capital adequacy ratios, do not affect reserve requirement. They accept the hypothesis that, policies affect these variables symmetrically and not asymmetrically. These findings are consistent with that of Lim et al (2011).

Specific macro prudential regulations also assist in managing capital flows. Studies conducted in Pacific-Asia countries by Zhang and Zoli (2014) and Bruno et al. (2014) use house prices, LTV caps and sectoral requirement to capture macro prudential regulation. These studies found that loan loss reserve to total loans ratio, growth of credit, leverage ratio, policies that manage the banking sector and bond market and forex related policies have a significant effect in reducing increases in housing prices, growth of credit, bank's leverage growth, equity flow, bank and bond inflows. Bruno et al., (2014) further established that macro prudential regulation become more effective when they interlink with other policies especially monetary policy than when they both work independently. Macro prudential regulation can also reduce possibilities of credit booms and mitigates the possibility that booms may lead to financial crisis. Moreover, forex limits, interest caps and credit are statistically significant in mitigating systemic risks and protecting the financial system (Dell' Ariccia et al., 2012).

Macro prudential regulations and monetary policy complement each other in ensuring financial and macroeconomic stability (Adrian and Liang, 2014). In their study on how interlinkages between macro prudential and monetary policies affect stability of the financial system in four Asia-Pacific countries, Kim and Mehrotra (2017) apply structural panel vector regression and establish that, interactions between the two policies have analogous impact on credit, output and the price level.

These results are analogous with the findings of Jan and Rongrong (2017).They conclude that macro prudential regulations have a long-term effect on credit cycle but no meaningful effect on output. Further, they support monetary policy in mitigating financial system vulnerabilities. In the same vein, Zdzienicka et al., (2015) and Elliot et al., (2013) explore time series data to examine the effect of macro prudential and monetary policy action on stability of the financial system. These studies exploit the distributed lag (DL) model. Their findings suggest that both policies have a statistically significant role in determining credit growth. However, the impact of monetary policy was found to be sluggish but more effective in the long run than that of macro prudential policy which is fast but effective in the short run (Aikman, 2016).

Forward looking loan loss provisioning where provisions are increased during peak period and reduced during recessions can be beneficial in ensuring discipline in borrowing cycles despite not being sufficient in ending a boom (see Jimenez et al., 2012; Saurina, 2009). Using sectoral requirement, LTV and DTI as proxies for macro prudential policy Igan and Kang (2012) conclude that macro prudential policy assists in controlling credit growth in Korea. This echoes Wong et al., (2011) findings that macro prudential policies tend to lessen cycles in the real estate sector in Hong Kong. In Africa Oduor et al., (2017) exploit data of 167 banks in 37 African countries to assess the impactx of capital requirement and bank competition on financial stability utilizing unbalanced bank specific panel data. They conclude that improved regulatory capital requirement is statistically significant in reducing stability of the financial system in Africa (apart from big banks). In the same vein, Hakenes and Schnabel (2010) asserts that stringent capital requirements leads to higher borrowers risks and may increase default risks by individual banks resulting to vulnerabilities in the banking system.

Capital regulations can also lead to reduced portfolio risks, efficient in preventing risk taking, decreasing banks' vulnerabilities to systematic shocks and default risks, lessens the probability of bank crises and ensures proper forecasting (see Agoraki et al., 2009; Miles et al., 2011). In Kenya, Gudmundsson et al., (2013) examines the role of capital requirement on bank competition and stability using data from 36 banks for the period 2000 to 2011. The study uses multivariate panel data regression and found out that capital regulation plays a significant role in fostering competition, which in turn leads to financial system stability.

Contrastingly, Wang and Sun (2013) find mixed results in their empirical study of the number of macro prudential regulations and monetary policies using panel data estimation to analyze their

effect on financial system stability in China. They find that the effect of required reserve ratio on growth of credit is insignificant for all banks but significant in sections of large banks. This was possibly attributed to lack of cautious identification.

Micro Prudential regulation and financial stability

Micro prudential policy is a necessary condition for ensuring stability in the financial system. Therefore, a financial system cannot be stable if individual institutions are exposed to financial risks (Goodhart, 2015). Osinki et al. (2013) confirm that in some instances macro prudential policies are not so much effective in alleviating systemic risks and therefore it is reinforced by micro prudential policies. Complementarities exist between micro and macro prudential policies because they may not utilize their common instruments with similar level of intensity (Blahova, 2015). For instance, counter cyclical capital buffers are relaxed during recession in the whole banking system. This may still allow financially unsound banks to exist in the industry leading to decreased returns for sound banks or consequent uncertainties that would curtail borrowing on the interbank market. Micro prudential policies would assist in identifying such unsound banks and provide financial solutions to ensure stability in the system (Hansen, 2012).

Further, macro prudential regulations are exposed to communal moral hazard problem. If banks predict and expect that during recessions counter cyclical capital buffers will be relaxed, they will have an incentive to invest in risky ventures compelling macro prudential policies to implement these regulations ex post. Therefore accommodating such communal moral hazard will necessitate frequent alteration of capital buffers leading to inefficiencies. To address this problem, micro prudential policies that constrict requirements on individual banks according to their risk levels are implemented (Farhi and Tirole, 2012).

To prevent hasty liquidation of banks because of bank runs and to ensure public confidence, regulatory authorities under their micro prudential policy mandate establish deposit insurance scheme to enhance financial stability (Andrew, 2013). Chernykh and Cole (2011) found that better intermediation processes in the banking sector in Russia are linked to insurance deposit schemes. Contrastingly, vast empirical literature has established that insurance deposit scheme intensifies the moral hazard problem. This leads to systemic risks in the banking sector (Ioannidou and Penas, 2010). Deniz et al., (2013) examines how deposit insurance affects financial system stability using a cross-country analysis of 96 countries between 2007-2009 and 2004-2006. To measure risk they

use bank's Z-score, stock return volatility and the marginal expected shortfall borrowed from Archya et al., (2012). They conclude that insurance deposits increase bank risks and minimize systematic stability during boom periods.

Nevertheless, bank threats are lesser and systematic stability is better during financial crisis. These findings are consistent with Karas et al. (2013) who assert that deposit insurance tends to foster instability in the banking system. Further, its effect is adverse in instances where depositors are fully insured or when the government manages the insurance scheme. Chu (2011) using contingency table analysis approach in 52 countries further confirmed that full insurance deposit coverage leads to severe banking crisis. In spite of these mixed results, the impact of bank runs and contagion effect in the entire economy necessitates the establishment of a deposit insurance scheme. Policy makers should therefore introduce measures that reduce moral hazard when designing a deposit insurance scheme (Deniz et al., 2013). Among the features proposed include: premiums based on expected risks, coinsurance, amounts to be covered by the scheme and market etiquette.

Capital adequacy is vital in mitigating vulnerabilities of banking institutions that originate from market risks, credit risks and operational risks (Osinki and Hoogduin, 2013; Dang, 2011). Most studies use capital to asset ratios, total book equity to total assets ratios and total capital to risk weighted ratio to measure capital adequacy of a financial institution (see Tsenova, 2016; Camara et al., 2013; Berger and Bouwman, 2013). Tsenova (2016) in her empirical study of Bulgarian banks analyzes the importance of capital adequacy in ensuring financial system stability. The study employs general equilibrium model using financial intermediation, heterogeneity and default risk for stress testing and policy evaluation. They found that capital adequacy influences financial stability by guaranteeing stability of individual financial institutions. Camara et al. (2013) who analyzed the effect of changes in capital on the risk taking conduct of European banks in the period 1992-2006 echoes this finding. Using generalized methods of moment (GMM), they argue that capital adequacy ratios have a significantly positive consequence on bank's risk exposure (Berger and Bouwman, 2013).

Floquet and Biekpe (2008) further point out that the relationship between capital adequacy ratios and risk exposure ratios of bank levels is statistically meaningful in explaining stability of the financial system. Banks with high capital adequacy ratios also have the ability to withstand economic shocks (Demirguc-Kunt et al., 2010). In their study of capital regulation and bank risk

taking behavior in Pakistan, Ashraf et al. (2016) used a panel data set of 21 listed commercial banks of Pakistan for the period 2005 to 2012. Purely regulatory measures of bank capital, capital adequacy ratio, bank asset portfolio risk and risk weighted assets to total assets ratio were used for estimation. This study further utilized system GMM and least squares dummy variable method. They found out that commercial banks reduced asset portfolio risk in response to strict risk based capital requirements. Further, banks that have risk based capital ratios either lower or higher than the regulatory required limits, decreased their portfolio risk in response to stringent risk based capital requirement.

In Africa, similar studies have been conducted with the same capital adequacy indicators and they further reinforce the importance of capital adequacy in preventing risk exposure of individual banks and ensuring stability of the system (Oduor et al., 2017). The most commonly used indicators were total capital (Tier 1 + Tier 2) to total asset ratio. In Kenya the significance of capital adequacy in ensuring stability and reducing risk exposure has been documented by Mwega (2014) Gudmundsson (2013). These empirical studies used same variables and found that capital adequacy significantly influences stability of the banking system and the financial system as a whole.

Assets quality affects both financial soundness and operational soundness of individual banks as well as the entire financial system (Alhassan et al, 2014). The most common determinants of asset quality include balance sheet, off balance sheet vulnerabilities, banks credit risk control, and loans portfolio value including non-performing assets (Michael, 2010; Ekpu, 2016). According to Ombaba (2013), a higher ratio of non-performingx loans (NPLs) to total assets leads to lower asset quality (Abata, 2014; Dang, 2011). The 2007-2009 global financial crises indicated that banking institutions would not be capable to avail credit to the economy if they have difficulties with profitability and poor asset quality (Swamy, 2013).

Using panel data estimation, Festic et al., (2011) analyzes the macroeconomic determinants of systemic risks in the banking sector of five European Union members. They found out that NPLs are significantly affected by foreign direct investment intermediation that affects the financial system stability with time. Consequently, Vlastimir and Ivana (2013) in their comparative study of Serbia with other emerging economies assert that NPLs are the main cause of systemic risks not only in emerging economies but also in developed economies. Similarly, Beck et al. (2013) point out in their empirical study of 75 countries using panel data regression that GDP is significant in determining NPLs that affects stability of the banking system. Consequently, Dimitrios et al.,

(2011) utilize dynamic panel data estimation and conclude that apart from GDP, lending rates, unemployment rates, public debt and wages also play a significant role in affecting NPLs (Carlos and Olaya, 2012).

In Africa Ouhibi et al., (2017) examine the impact of nonperforming loans on systematic risk of Tunisia and Morocco banks using OLS. They conclude that NPLs significantly affects lending rates, inflation, GDP, gross capital formation and unemployment rate in Tunisia. Conversely, in Morocco it is only the forex rate and GDP that significantly affect NPLs. Likewise, in Kenya several studies have linked bank failures to poor asset quality (see Waweru and Kalani, 2009; Olweny and Shipho, 2011; Mwega, 2014). Waweru and Kalani (2009) in their study of commercial banking crisis in Kenya argue that financial institutions that crumpled in the mid 1980s were due to increased non-performing loans. Therefore, these studies reached a consensus on the importance of asset quality on influencing systemic risks in the economy.

Management efficiency examines the ability of managers to mobilize resources, make sound financial decisions that would cushion financial institutions against financial risks and forecastng business cycles as they occur (Christopoulos, 2011). There seems to be a consensus on the positive effect of high quality management on banking institutions' stability and the financial system in general. Podpiera and Weill (2010) for instance used dynamic GMM panel regression on Czech banks for the period 1994-2008 and found out that bad management worsens cost efficiency in financial institutions paving way to increased credit risk. Bichangi and Karani (2012) further point out that solvency of a financial institution is determined by management quality represented by how revenue is generated and how expenses are controlled in Kenya. Furthermore, Mwaniki and Okibo (2014) found that management quality proxied by total operating expense to total operating income significantly affects financial performance, process and supplier relationship of the bank in Kenya. They further establish that there is a positive relationship between customer relations and financial performance. Therefore, quality of management plays a significant role in ensuring banks' profitability.

Earnings centers on the capability of a financial institution to supplement capital to ensure smooth running of the institution as well as assessment of the level, pattern and sources of earnings (Ekpu, 2016). Studies that link quality of earning and probability of bank failures tend to establish a negative association between the two variables (Flamini et al., 2009; Kheechee, 2011; Erina and Lace, 2013). Using regression analysis and correlation approach to examine the impact of internal

and external factors of bank performance variables of commercial banks in Latvia over 2006-2011 periods, Erina and Lace (2013) established that profitability has a significantly positive impact on portfolio selection, operational competence and management quality. Furthermore, they argue that bank performance has a significantly negative impact on liquidity and credit risks estimated in terms of returns on equity (ROE) and return on assets (ROA).

Management strategies to smoothen earnings are also significant in reducing systemic risks and guaranteeing a stable financial system (Bloom et al., 2009). To ensure easy forecasting of future profitability in the capital market, managers are always motivated to manage their earnings. Therefore, during boom periods banks tend to increase their loan loss provision to mitigate against earnings volatility and during recession banks tend to decrease their loan loss provisions for the same purpose (Gebhardt and Novotny, 2011; Ahmed et al., 2014; Clement et al., 2017).

Gebhardt and Novotny (2011) found out that strict loan loss provision rules in International Financial Reporting Standards (IFRS) plays a major role in decreasing discretionary behaviour. Moreover, they conclude that financial institutions deliberately deferred recognition of loan losses and then reported loan loss provisions after accumulating the losses; this interferes with the streaming of earnings. Equally, Ahmed et al. (2014) also asserted that Nigerian and Malaysian banks utilized loan loss provisions to control reported earnings before implementing IFRS but noticed a decreased adoption of loan loss provision to manage earnings after introduction of IFRS. Clement et al. (2017) further established that IFRS has increased audit complexities but improved financial reporting quality in Nigeria. Therefore, earnings play an important role in ensuring stability of banks.

Liquidity indicates a firm’s capability of managing present and future flow of funds that is essential in maintaining its businesses and meeting financial obligations (Ekpu, 2016). Banks with high liquidity receive higher rating because they are able to withstand systematic shocks in the financial system over a period of time (Ratnovski, 2013; Cornett et al., 2011). Liquidity permits management to decide which combination of liquidity portfolio and equity funds are sufficient to make a bank stable when it is exposed to bank runs emanating from concealed information about its liquidity (Ennis and Keister 2006; Vives, 2014; Santos and Suarez, 2015). Using a Diamond Dybvig (1983) model, Vives (2014) confirmed that liquid assets and equity capital have divergent ways of dealing with liquidation and insolvency. For instance, if customers were more conventional they would

advocate for increased liquidity, which increases liquid portfolio but decreases earnings. Further, when bank runs occur liquidity holdings permit banks to evaluate their assets and decide if they are enough to prevent a run (Santos and Suarez, 2015).

Empirical literature using partial equilibrium model established that liquidity requirement is more desirable than capital requirement because constricting liquidity decreases the probability of systemic risk without affecting consumption growth (Ratnovski, 2009; Perotti and Suarez, 2011). Ratnovski (2009) found that liquidity regulations could prevent moral hazards because banks are expected to deposit money with the central bank as a lender of last resort. On the contrary, Perotti and Suarez (2011) conclude that pigovian taxes are less distortionary than liquidity requirement in controlling systemic risks. Saayman (2003) used total assets to total deposits, loan to liability ratio, liquid asset to liability ratio and volatility dependency ratio to proxy bank's liquidity position. The study established that liquidity plays an important role in ensuring stability of banks. Similar empirical studies in Africa use same liquidity ratios in measuring liquidity of financial institutions. Their findings are almost the same as those of previous studies (See Odunayo and Oluwafeyisayo, 2015; Mminele, 2016). Fan et al., (2018) analyze systemic risk in the Kenyan banking system for the period 2009-2015 using a theoretical framework, which combines asset estimation algorithm, minimum density approach, maximum entropy estimation method, obligation clearing algorithm and minimum density approach. They point out that occurrence of contagious default was due to liquidity risks and default risks. Consistent with the findings, Muriithi and Waweru (2017) further demonstrate that there is a negative association between performance of the banking sector and liquidity risk. It is therefore prudent for banks to manage liquidity to improve their stability.

Sensitivity to market risks is defined as vulnerability of a bank's balance sheet to changes in commodity prices, forex rates, credit spreads, equity prices and other indicators that are measured in the market (Ekpu, 2016). Efficiency with which the management can identify and assess market risks is critical in appraising earnings and capital, which influence stability of the financial system. Using imbalance analysis, duration analysis, simulation model and Value at Risk (VaR) model Milanova (2010) established that market risk is positively related to changes in prices in four most significant financial markets that include stock market, currency market, product market and market of debt securities. Komarkova et al. (2011) further emphasize on the importance of liquidity risk and market risk evaluation in determining financial stability of Czech banking system using macro-stress testing model. Baral (2015) also posits that financial institutions that are highly sensitive to

market risks tend to be easily exposed to risk than those that are less sensitive. Therefore, if banks are unable to manage risks they will be exposed to systemic risks in the financial system (Christopoulos et al., 2011). Muriithi et al. (2016) also found out that market risks (changes in interest rates, changes in commodity prices and changes in forex) considerably affects financial soundness of banks in Kenya. The study employed panel data technique and General Method of Moments (GMM) and proposed that domestically owned banks should look for ways to mitigate financial risks using financial derivatives so as to reduce foreign currency risk exposure and interest rate risks (see also Ngalawa and Ngare, 2013; Gachua, 2011). Table 3.2 summarizes the reviewed empirical literature.

Table 3.2: Summary of the findings

Author	Methodology	Findings
Macro prudential regulation and financial stability		
Cerutti et al. (2015)	GMM	Macro prudential regulations used more pre dominantly in developed economies than developing economies
Claessens et al. (2013)	Panel data regression	Macro prudential regulations are valuable in reducing asset growth
Kuttner and Shim (2013)	Panel data regression	Debt service to income ratio play a major role in affecting housing credit growth.
Vandenbussche et al. (2012)	Unbalanced panel data regression	Non standard liquidity measures and minimum capital requirements had an effect on credit and housing boom.
Crowe et al. (2011)	Dynamic stochastic general equilibrium model (DSGE)	Macro prudential policies controls real estate price booms.
Lim et al. (2011)	Panel data regression	Macro prudential regulations have an impact on systemic risks.
Zhang and Zoli (2014)	Panel data regression	Macro prudential policies and capital flow measures have led to financial stability.
Bruno et al. (2015)	GMM and panel data regression	Macro prudential policies are more successful when complemented by monetary policy in ensuring financial stability.
Jan and Rongrong (2017)	Vector auto regression (VAR)	Macro prudential regulation significantly safeguards stability of the financial system.
Elliot et al. (2013)	Vector auto regression (VAR)	Tight macro prudential policies reduce consumers' debts.
Micro prudential regulation and financial stability		
Demirguc-Kunt et al. (2008)	Panel data regression	Insurance deposits aresignificant in ensuring financial system stability.
Chernykh and Cole (2011)	Panel data regression	Banks that insure their deposits increase their level of retail deposits which improves their stability.
Le (2013)	Panel data regression	Insurance deposit scheme adoption encourages too much risk taking by banks leading to instability in the system.

Tsenova (2016)	General equilibrium model	Capital adequacy guarantees banking system stability.
Camara et al. (2013)	GMM	Capital adequacy significantly effects bank risk exposure in the financial system
Hancock and Passmore	Vector auto regression (VAR)	Minimum regulatory capital to asset ratio ensures banking system stability.
Mejra et al. (2011)	Panel data regression	Asset quality affects systemic risk which propagates financial instability.
Dimitrios et al. (2011)	Dynamic panel data regression	NPL measuring quality of assets affects stability of banks
Ouhibi et al. (2017)	Ordinary Least Square	NPL affects lending rates, GDP and gross capital formation
Podpiera and Weil (2007)	System GMM	Bad management worsens stability of the banking system and eposes banks to systemic risks.
Perez et al. (2008)	Panel data regression	Earning smoothing is significant in ensuring bank system stability and the entire financial system.
Erina and Lace (2013)	Linear regression analysis	Profitability has a significantly positive impact on portfolio selection and stability of banks
Santos and Suarez (2015)	Panel data regression	Liquidity helps decide which combination of liquidity portfolio is sufficient to make bank stability.
Milanova (2010)	Using imbalance analysis, duration analysis, simulation model and Value at risk model	Sensitivity to market risks has a positive influence on price changes of financial markets which in turn affects stability of financial system.
Capelle-Blanchard and Chauveau (2004)	Data envelope analysis (DEA)	Sensitivity to market risks plays an important role in identifying insolvent banks.
Gathigia et al. (2016)	Panel data regression and system GMM	Market risks considerably affect financial soundness of banks in Kenya.

3.2.3 Overview of the Literature

Reviewed empirical literature suggests diverse interlinkages between prudential regulation and financial stability. This diversity is in terms of a positive effect (Chernykh and Cole, 2011; Zhang and Zoli, 2014; Bruno et al., 2015) or negative effect (Lim et al., 2011; Le, 2013; Camara et al., 2013) of prudential regulation on financial stability. Complementarities and trade-offs between macro and micro prudential regulation in a regional context such as Sub-Saharan Africa region and more specifically in Kenyan banking industry is still unexplored. In addition, researches conducted on how prudential regulation affects stability of the financial system are at cross-country level (see Demirguc-Kunt et al., 2008; Erina and Lace, 2013; Bruno et al., 2015). Cross-country data has challenges in terms of consistency and quality, country's specific characteristics, the selection process of countries to be evaluated and issues with the research objective.

In all the studies reviewed, none of them considered applying a multivariate analysis to establish the interaction between macro and micro prudential regulation in ensuring financial stability. CBK implements both micro and macro prudential regulation concurrently. Therefore, while implementing bank regulations it has to consider both endogenous and exogenous risks. We use SEM approach to capture the interaction between prudential regulations and financial stability. There is no study in Kenya that examines how micro and macro prudential regulation affect financial stability using a multivariate approach to the best of our knowledge. This study seeks to fill this gap.

3.3 Methodology

3.3.1 Theoretical Framework

Our conceptual framework follows Peltzman (1976), Allen and Gale (2000), Acharya (2009) and later Osinki et al., (2013). This framework combines both the normative features, which includes drawing the most efficient regulation to protect the financial system against systemic risks and positive features, which takes into account the failure of the financial system due to combined risks in the banking sector stemming from correlation of investment returns in the balance sheet of banks. Specifically the framework gives a comprehensive explanation of an equilibrium systemic risk and the most efficient nature of prudential regulation that caters for both individual and joint failure risks of commercial banks.

Consider a representative banking group with total assets $q(t)$ financed by equity $k(t)$ and private deposits $d(t)$ such that $q(t) = k(t) + d(t) + b(t)$. Utilizing the performance model based on the return to total assets and the following notations: $D(t)$ is net income, m is return on assets, a is investment coefficient and $\emptyset(t)$ is information set at time t. The net income can be represented as a function of $m, q(t), a$ and the expected change in net income:

$$D(t) = mq(t) + ma\frac{E[dD(t)/\emptyset(t)]}{dt} \quad \ldots\ldots (1)$$

Where E is the expectation operator. The expected change in net income, $\frac{E[dD(t)/\emptyset(t)]}{dt}$, is endogeneous confidence term conditioned in the information set at time t. Equation (1) implies that net income is equal to the return on assets multiplied by total assets $(mq(t))$, plus the return on assets m multiplied by increase in assets a induced by the expected increament in net income $\frac{E[dD(t)/\emptyset(t)]}{dt}$. Rearranging equation (1) gives:

$\frac{E[dD(t)/\emptyset(t)]}{dt} - \frac{1}{ma}D(t) = -\frac{1}{a}q(t)$ .....(2)

Intergrating equation (2) with respect to $d(t)$ gives:

$D(t) = \frac{1}{a}\int_t^{\infty} e^{\frac{-(s-t)}{ma}} E[q(s)/\emptyset(t)]ds$ .....(3)

Equation (3) shows that the indicator that drive net income is the expected size of the representative bank's assets and that regulating the bank system encompasses regulating the expected size of the representative bank's asset. In practice guideline typically centers on the structure of the bank's balance sheet rather than its size per se. Nevertheless, the individual intermediation procedures, such as risk linked capital requirements and liquidity ratios, ultimately define the size of the bank system's balance sheet. We focus on the effect of regulatory policy on the size of the balance sheet rather than on the details of regulation policy itself. The variable that is the object of the authority's policy intermediation is the rate of change of the banks's total asset. Let:

$f(t) = \frac{dq(t)}{d(t)}$ ..... (4)

Suppose in the lack of regulatory intervention, $f(t)$ following a process of arithmetic Brownian motion:

$df(t) = \alpha dt + \sigma dz(t)$ ..... (5)

Where α is the drift parameter, v is the standard deviation of $df(t)$, and z is a Weiner process with $E[dz(t)] = 0$ and $E[(dz(t))^2 = dt$. The parameter σ can be construed as the intristic instability of the banking system. We the intergrate equation (4) and take expectations:

$E[q(T)] = q(t) + \int_t^T E[f(s)]ds$ ..... (6)

Put equation (6) into equation (3):

$d(T) = \frac{1}{a}\int_t^T e^{\frac{-(s-t)}{ma}} [q(t) + \int_t^T E[f(u)]\,du]ds$ ..... (7)

The intergral in the bracket follows a Brownian motion so it can be written as a function:

$h[f(t)] = \frac{1}{a}\int_t^{\infty} e^{\frac{-(s-t)}{ma}} d(s) \int_t^T E[f(u)]d(u)$ ..... (8)

the other part of the intergral reduces to $mq(t)$ so that equation (7) becomes:

$D(t) = mq(t) + h[f(t)]$ ..... (9)

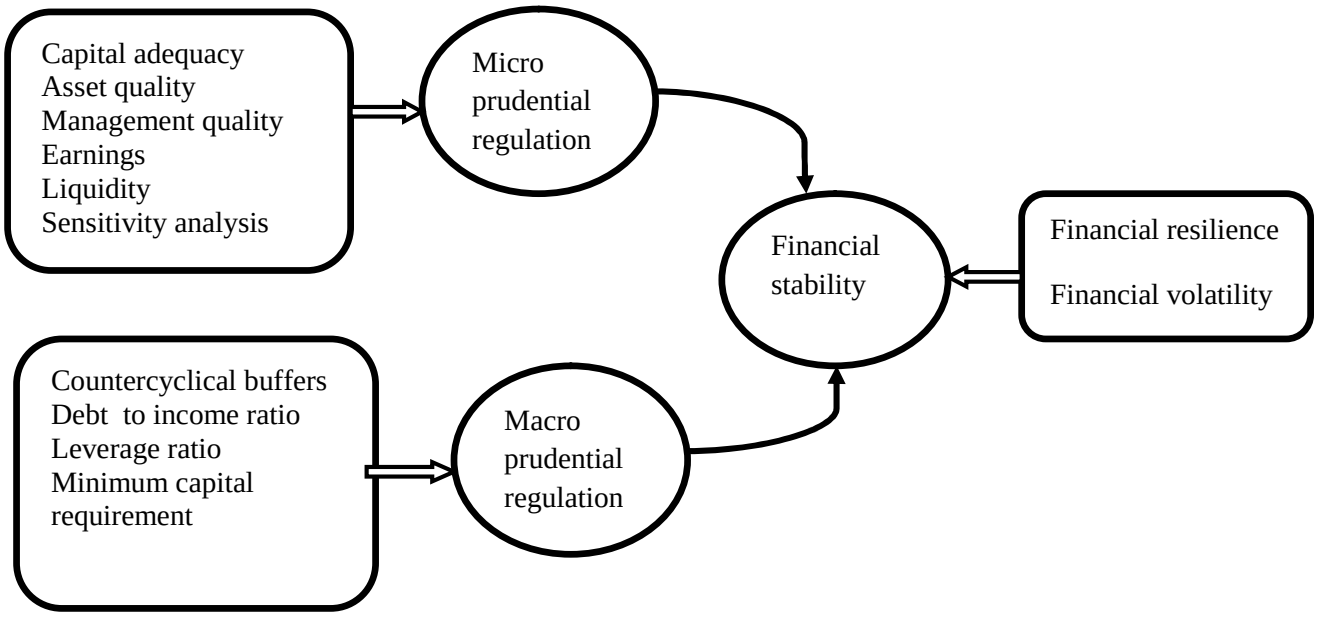
When we differentiate equation (9) and apply Ito's Lemma we get:

$D(t) = mq(t) + m^2a^2\alpha + A_1e^{\gamma_1 f(t)} + A_2e^{\gamma_2 f(t)}$ ..... (10)

Where $\gamma_1 > 0 \; and \; \gamma_2 < 0$. The first three terms signify the normal drive of net income without regulation intervention and the last two expressions signify deviations from the market path due to intervention. The growth of $f(t)$ becomes regulated Brownian motion and the smooth and continuous nature of the intervention suggests perfect and timely policy implementation.

We further develop a conceptual framework to analyze the effect of different micro prudential and macro prudential indicators on stability of the financial system following a framework developed by Osinki et al (2013). Figure 3.3 shows how financial resilience and volatility (proxy for financial stability) is influenced by bank's micro prudential regulation (as measured by capital adequacy, asset quality, management efficiency, earnings, liquidity and sensitivity analysis) and macro prudential regulation (represented by counter cyclical buffers, debt service to income ratio, leverage ratio and reserve requirement).

Figure 3.3: Conceptual Framework



3.3.2 Empirical Model

We need to specify a model that links banks' prudential regulations and stability of the financial system. Since there is no consensus on what explains financial stability and the overlapping roles of micro and macro prudential regulations, the suitable model in our case is structural equation model (Li, 2016). We explore the link between latent variables (prudential regulations and financial stability) by means of covariance between the monitored causes and indicators. Latent constructs are variables that cannot be observed directly. They are explained through observable variables that

can be calculated directly. SEM comprises of the structural model and the measurement model. The structural model is specified as follows:

$$\boldsymbol{\mu} = \mathbf{H}\boldsymbol{\mu} + \mathbf{\Pi x} + \boldsymbol{\zeta} \quad \text{..... (11)}$$

Where each $x_i, i = 1, \ldots, q$ in vector $\mathbf{x}' = (x_1, x_2, \ldots, x_q)$ is a likely cause of one of the latent variables contained in vector $\boldsymbol{\mu}$. The coefficients $\delta' = (\delta_1, \delta_2, \ldots, \delta_q)$ in matrix $\mathbf{\Pi}$ explains the association between the latent variables and their causes. Exogenous causes determine each set of latent variables. The residual part of the model is represented by $\boldsymbol{\zeta}$, and the covariance matrix $(q \times q)$ is represented by $\mathbf{\Upsilon}$. The bi-directional relationship between the latent variables (micro and macro prudential regulation and financial stability) is shown by the coefficient matrix $\mathbf{H}$.

Therefore, it is presumed that latent constructs determine their own indicators. The measurement model explicitly explains relationships between the latent construct and its multiple observable indicator variables as shown in equation (12).

$$\boldsymbol{y} = \mathbf{\Theta}\boldsymbol{\mu} + \boldsymbol{\varsigma} \quad \text{..... (12)}$$

Where $\boldsymbol{y}' = (y_1, y_2, \ldots, y_n)$ represent the vector of indicators for micro and macro prudential regulation. It further, represents stability of the financial system. $\mathbf{\Theta}$ proxy the coefficients matrix while $\boldsymbol{\varsigma}$ represents the error term. Further the covariance matrix is given by $\boldsymbol{\vartheta}_{\boldsymbol{\varsigma}}$. The variance and covariancex matrix of the observed variables after regression explain the model's parameters. Therefore, the main purpose of estimating the observed variables is to find the covariance and value of parameters whose regression results for SEM model's covariance matrix closely matches a sample covariance matrix of the practically observed causes and indicators. To test for identification of matrix $\mathbf{H}$ and $\boldsymbol{\vartheta}_{\boldsymbol{\varsigma}}$ we check for multicollinearlity by evaluating the rank of the covariance matrix of the predictors. The relationship between prudential regulations and financial stability can then be analyzed after testing the hypotheses about the theoretical relationships among the latent constructs. There should be a bidirectional relationship between $\mathbf{x}$ (micro and macro prudential regulations) and $\boldsymbol{\mu}$ (financial stability) because the regulator complements micro and macro prudential regulation to ensure financial stability.The matrix of SEM model is presented as:

$$\begin{bmatrix}\mu_1\\ \mu_2\\ \mu_3\end{bmatrix}=\begin{bmatrix}0 & \alpha_{12} & \alpha_{13}\\ \alpha_{21} & 0 & \alpha_{23}\\ \alpha_{31} & \alpha_{32} & 0\end{bmatrix}.\begin{bmatrix}\mu_1\\ \mu_2\\ \mu_3\end{bmatrix}+\begin{bmatrix}\delta_1 & \delta_2 & 0\ 0\ 0\ \dots\ o\\ 0 & 0 & \delta_3\delta_4\ 0\ \dots\ 0\\ 0 & 0 & 0\ 0\ \delta_5\ \dots\delta_q\end{bmatrix}.\begin{bmatrix}x_1\\ x_2\\ \vdots\\ \cdot\\ x_q\end{bmatrix}+\begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\end{bmatrix} \quad \text{..... (13)}$$

The measurement model is presented in equation (14) as follows:

$$\begin{bmatrix}y_1\\ y_2\\ y_3\\ \vdots\\ y_n\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ \lambda_1 & 0 & 0\\ \lambda_2 & \lambda_3 & 0\\ \vdots & \vdots & \vdots\\ 0 & 0 & \lambda_n\end{bmatrix}.\begin{bmatrix}\mu_1\\ \mu_2\\ \mu_3\end{bmatrix}+\begin{bmatrix}\varsigma_1\\ \varsigma_2\\ \cdot\\ \cdot\\ \varsigma_n\end{bmatrix} \quad \text{..... (14)}$$

Where μ_1, μ_2 and μ_3 are latent constructs for micro and macro prudential regulation and financial stability respectively. The regression coefficients $\alpha_{12}, \alpha_{21}, \alpha_{31}, \alpha_{23}$ and α_{32} explains the link between the latent variables μ_1, μ_2 and μ_3. Indicator variables for financial stability which is the endogenous latent construct in our model is measured along two dimensions that include financial resilience and financial volatility. Financial resilience is measured by banks' Z-score (ZS) and ratio of credit provisioning to bank deposit (CB) while volatility of the financial system is proxied by standard deviation of bank deposit rate growth (DR), standard deviation of bank lending rate growth (BL) and loan loss reserve to total loan loss (LLR) (Cihak et al., 2016). Indicator variables that proxy latent exogenous variables are divided into two categories. First, micro prudential variables which comprises of *(CAMELS)*: capital adequacy (CA) corresponding to ratio of total capital to total risk weighted assets, asset quality (AQ) which is proxied by the ratio of gross nonperforming loans to gross loans, management efficiency (ME) represented by total operating expenses to total operating income, earnings proxied by return on assets (ROA) which is the ratio of net income to total assets. Further, liquidity risk (LQ) is the ratio of net liquid assets to total deposits, while sensitivity to risk analysis (SR) is proxied by changes in net interest margins which captures price risks that changes the fair value of a financial instrument over time. Second, macro prudential regulation variables include: counter cyclical buffers (CRD) which is represented by private sector credit to GDP ratio, leverage ratio (LR) which is proxied by total capital to total assets ratio, debt service to income (DI) which is the ratio of total debt to total operating income and minimum capital requirement (CR).Table 3.3 shows the definition and measurement of variables of interest, expected signs, according to theory and previous empirical studies.

Table 3.3: Definition and Measurement of Variables

Variable	Notation	Definition and measurement	Sign predicted by theory	Sign from previous studies
Dependent Variables				
Banks' Z-score	ZS	Return on asset (ROA) plus equity to asset ratio divided by standard deviation of ROA. Measures insolvency risk.		
Ratio of credit provision to bank deposit	CB	We compute annual credit provisions then divide it by annual bank deposit. Measures liquidity risk exposure		
Standard deviation of banks' lending rate	BL	We compute year on year growth in lending rate then standard deviation of the growth rate. Measures volatility in cost and provision of credit.		
Standard deviation of banks deposit rate growth	DR	We compute year on year growth in deposit rate then standard deviation of the growth rate. Measures volatility in cost and volume of funding.		
Loan loss reserve to total loans ratio	LLR	We compute annual Loan loss reserve and divide it by annual total loans. Measures Bank's Risk		
Independent Variables				
Capital adequacy	CA	Ratio of total capital to total risk weighted assets. It measures the ability of banks to absorb shocks.	Positive	Positive
Asset quality	AQ	Ratio of gross nonperforming loans to gross total loans. Evaluates credit risks of the financial system.	Negative	Negative
Management efficiency	ME	Total operating expense to total operating income ratio. Examines the effectiveness of managing risks.	Negative	Negative
Earnings	ROA	Ratio of net income to total assets. Evaluates a guarantee of profits and sustainable solvency.	Positive	Indeterminate
Liquidity	LQ	Ratio of net liquid assets to total deposits. Measures bank's ability to meet its obligations as they fall due	Negative	Indeterminate
Sensitivity to risk	SR	Changes in bank interest margins. Measures price risk.	Negative	Negative
Counter cyclical buffers	CRD	Private sector credit to GDP ratio. Measures the ability of banks to mitigate against systemic risks	Negative	Negative
Leverage ratio	LR	Total capital to total assets ratio.	Negative	Negative

		Measures the extent in which banks depend on debt financing.		
Debt to income ratio of banking sector	DI	Total debts to total operating income ratio. Measures the ability of financial system to service its debts	Negative	Negative
Minimum capital requirement	CR	Percentage change in core capital. Measures solvency of banks.	Positive	Positive

3.3.3 Estimation and Testing

We utilized Maximum likelihood estimation (MLE) regression approach to establish the relationship between the latent variables and the indicator variables. To measure how best our data fits the model, we used goodness of fit criteria that includes Chi square statistics (CUMIN/DF), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Root Means Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (RMSR). The five goodness of fit models were used to test the viability of our model. Multivariate normality and pair wise correlation of the model was also assessed. Higher divergence from multivariate normality may lead to type 1 error (Powell and Schafer, 2001). This may result to subjective standard errors due to inaccurate measures of goodness of fit.

If correlation between two variables exceeds 0.70 then there is a problem of multicollinearity (Gujarati, 2003). To address the problem of multicollinearity we remove one or more of the affected manifest variable or merge the affected variables. To ensure that our measurement model is well identified one of the factor loadings is fixed to one. This factor loading is known as a marker variable. However, the main consideration in ensuring that our measurement model is identified is to ensure that there are at least two measurement variables per latent construct and that error of these measurement variables are uncorrelated. To address the identification problem in a structural model, we let $d = n(n-1)/2$. The minimum condition for identification is that d must be larger than or equivalent to q where $q$is the same as the number of paths and number of correlations between exogenous variables that are not caused by any other variables.

3.3.4 Data Sources

We obtain annual data for the period 1990 to 2017 of different variables from Central Bank of Kenya, Thomson Reuters database and World Bank's Global Financial Development Database

(GFDD). Choice of data period was informed by some of the significant changes in macro prudential regulation that includes the adoption of Basel II and Basel III in ensuring stability of the financial system. There were also significant changes in the micro-prudential regulation over this period as explained in section 3.1.

3.4 Empirical Findings

3.4.1 Descriptive Statistics

The study used skewness, kurtosis and Jarque-Bera (JB) test to confirm if the data was normally distributed. JB test uses a sum of skewness and kurtosis statistics based on their coefficients. The null hypothesis for JB test asserts that the data is normally distributed while the alternative hypothesis asserts that the data is not normally distributed. If a sample is normally distributed, we expect the skewness to be zero while the kurtosis should be equivalent to three. Any divergence from this inflates the JB statistics. Our study further evaluated the average of all variables and how the sample data is dispersed from the mean. Table 3.4 reports the mean, standard deviation, minimum and maximum values, kurtosis, skewness and JB statistics of our data.

Table 3.4: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Skewness	kurtosis	Pr(JB-stat)
Capital adequacy (CA)	28	0.38	0.26	0.11	0.88	0.53	1.8	2.78[0.30]
Asset Quality (AQ)	28	0.44	0.22	0.15	0.80	0.58	1.83	1.89[0.39]
Management Efficiency (ME)	28	0.87	0.22	0.64	1.34	0.71	2.14	4.28[0.12]
Earnings (ROA)	28	0.28	0.22	0.07	0.87	1.13	3.36	2.46[0.29]
Liquidity (LQ)	28	0.37	0.19	0.12	0.78	0.68	2.48	3.06[0.22]
Sensitivity to Risk (SR)	28	6.97	1.75	3.53	10.51	-0.21	2.50	0.36[0.84]
Countercyclical Buffer (CRD)	28	0.37	0.24	0.11	0.88	1.08	2.65	5.23 [0.08]
Leverage ratio (LR)	28	0.34	0.27	0.01	0.89	0.79	2.05	5.08 [0.10]
Debt to Income Ratio (DI)	28	0.51	0.22	0.15	0.87	-0.02	1.55	1.79 [0.41]
Capital requirement (CR)	28	0.35	0.23	0.13	0.86	0.89	2.71	4.56 [0.10]
Z- score (ZS)	28	12.55	2.14	9.12	16.3	0.18	1.94	3.21 [0.20]
Ratio of Credit Provision to Bank Deposit (CB)	28	0.97	0.23	0.43	0.30	-0.15	1.25	2.11 [0.34]
Standard Deviation of Banks' Lending Rate (BL)	28	0.32	0.26	0.01	1.12	1.75	6.91	3.26 [0.20]
Standard Deviation of								

Banks Deposit Rate (DR)	28	0.55	0.41	0.11	2.04	1.80	3.56	1.37 [0.48]
Loan loss reserve to total loans ratio (LLR)	28	0.41	0.17	0.10	0.70	0.08	2.06	1.88 [0.39]

The highest expected value is that of the Z-score at 12.55 while the lowest mean is represented by return on assets at 0.28. The standard deviation of each variable was low implying a small dispersion from the mean. Kurtosis of each variable was positive signifying a comparatively pointed distribution, especially that of standard deviation of banks' deposit rate (DR) and management efficiency (ME). The probabilities of Jarque-Bera statistics for all variables depicted p-values greater than 0.05 as shown by values in parenthesis. Therefore, wexdo not reject the null hypothesis of normality.

3.4.2 Correlation Analysis

We conduct a correlation test to establish whether there is perfect interdependence among the variables of interest. Most variables of interest show a significant relationship amongst each other. Nevertheless, our main concern is whether correlation among these variables is high to warrant dropping or merging of some explanatory variables in our regression. Multicollinearlity is a problem only if pair wise correlation coefficient is above 0.70 (Gujarati, 2003). It should however be noted that correlation is a sufficient but not a necessary condition for multicollinearlity. Further, SEM eliminates the measurement error problem and increases the R^2, thus reducing multicollinearlity among variables (Bollen, 1989). Table 3.5 shows the correlation statistics of the estimated variables.

Table 3.5: Correlation Matrix

	CA	AQ	ME	ROA	LQ	SR	CRD	LR	DI	CR	ZS	CB	DR	BL	LLR
CA	1.00														
AQ	0.35	1.00													
ME	-0.45	-0.47	1.00												
ROA	0.21	0.38	-0.31	1.00											
LQ	0.14	-0.05	-0.41	-0.14	1.00										
SR	-0.06	-0.29	-0.12	0.18	0.20	1.00									
CRD	0.46	0.34	-0.26	0.31	-0.33	-0.07	1.00								
LR	0.28	0.49	-0.25	0.30	-0.04	0.02	0.81	1.00							
DI	0.11	0.27	-0.31	0.20	0.31	-0.03	0.01	0.23	1.00						
CR	0.20	0.19	-0.31	0.23	-0.08	-0.03	0.32	0.35	0.27	1.00					
ZS	0.34	0.22	-0.20	0.46	0.04	0.09	0.34	0.24	0.30	0.25	1.00				
CB	-0.22	-0.30	0.37	-0.28	-0.25	0.05	0.42	-0.22	-0.33	-0.15	-0.07	1.00			
DR	-0.08	-0.15	0.35	0.21	0.27	0.16	0.07	-0.06	-0.01	-0.15	0.07	0.04	1.00		
BL	0.13	0.08	-0.02	0.21	0.38	-0.17	0.31	0.29	0.06	0.10	0.06	-0.12	0.27	1.00	
LLR	0.35	0.39	0.23	0.35	0.23	-0.44	0.25	0.27	0.34	0.43	0.29	-0.38	-0.23	-0.34	1.00

Both macro and micro prudential regulation except management efficiency (ME) are significantly positively correlated to the Z-score (ZS) which proxy financial stability. Further, loan loss reserve to total loan loss ratio (LLR) is significantly correlated to micro and macro prudential regulation except sensitivity to risk (SR) which is inversely correlated to loan loss reserve to total loan loss ratio. This implies that micro and macro prudential regulation plays an important role in ensuring financial stability. Other variables that represent financial stability also show a mixed but significant relationship with our independent variables.

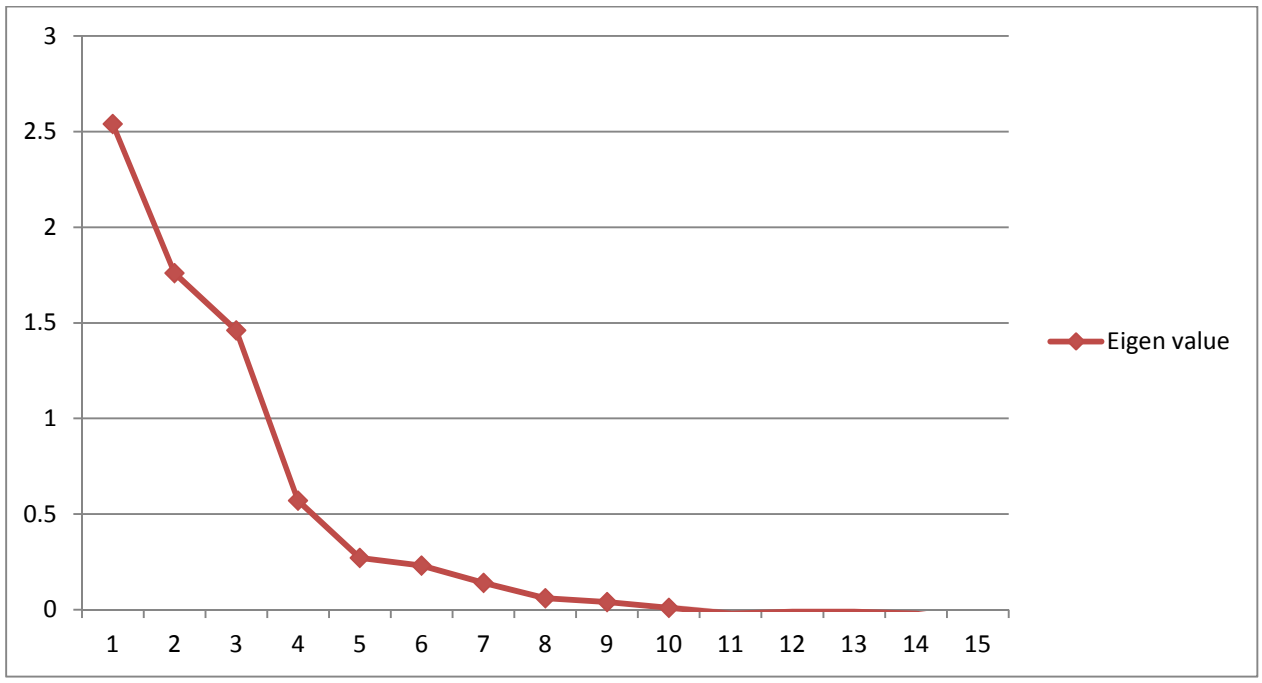
3.4.3 Exploratory Factor Analysis (EFA)

We use EFA to decrease the number of variables that influence our latent variables of interest with the aim of choosing the best factors that have a significant impact in our model (Henson and Roberts, 2006). We extracted three factors with Eigen values greater than one from our EFA, which explained 91% of variation in our sample. The first factor explained 68%, the second factor explained 12, while the third factor explained 10%. Table 3.6 shows the first round of the factor analysis. To determine whether the three factors had the most impact in our regression model we constructed a scree plot as shown in Figure 3.4.

Table 3.6: Factor Loadings

Factor	Eigen value	Proportion	Cumulative
1	2.54	0.68	0.68
2	1.76	0.12	0.81
3	1.46	0.10	0.91
4	0.57	0.04	0.95
5	0.27	0.02	0.97
6	0.23	0.02	0.99
7	0.14	0.01	1.00
8	0.06	0.00	1.00
9	0.04	0.00	1.00
10	0.01	0.00	1.00
11	-0.02	-0.00	1.00
12	-0.01	-0.00	1.00
13	-0.01	-0.00	1.00
14	-0.02	-0.00	1.00
15	-0.06	-0.00	1.00

Figure 3.4: Scree Plot of Eigen Values



From the scree plot, we conduct a rotation of three factors to explain the correlation between the factors and the original measurement variables. In order to establish composition of the scale factor we applied an orthogonal matrix rotation known as varimax rotation. Four variables with factor loadings less than 0.5 were dropped after varimax rotation and they included: liquidity (LQ), sensitivity to risk (SR), Banks' Z-score (ZS), and Ratio of credit provision to bank deposit (CB). Table 3.7 presents the variables that load on the three extracted factors.

Table 3.7: Factor Rotation Matrix using Varimax

Variable	Factor 1	Factor 2	Factor 3	Uniqueness
CA		0.92		0.06
AQ		0.81		0.13
ME		0.80		0.17
ROA		0.83		0.14
CRD	0.80			0.18
LR	0.92			0.11
DI	0.89			0.02
CR	0.90			0.10
DR			0.85	0.19
BL			0.92	0.14
LLR			0.89	0.16

The first factor comprised of four variables that focused on macro prudential regulation which include counter cyclical buffer (CRD), leverage ratio (LR), debt to income ratio (DI) and Capital requirement (CR). The second factor also included four variables that proxied micro prudential regulation viz. capital adequacy (CA), asset quality (AQ), management efficiency (ME) and earnings (ROA). The third factor comprised of financial stability variables, which included standard deviation of bank's deposit (DR), standard deviation of lending rate (BL) and Loan loss reserve to total loans ratio (LLR). Uniqueness explains the residual of the original measurement variables not described by the common factors. The highest unique value in our data was standard deviation of bank's deposit (DR) which stood at 0.19. This implied that 19% of the residual term of standard deviation of bank's deposit was not explained by the third factor.

3.4.4 Reliability and Adequacy Test

To test the internal consistency and validity of our data we use the Cronbach's Alpha (CA) reliability test. CA is calculated by comparing the score of each scale variable with the overall score of every observation and then evaluating the result with the variance of all individual variable score. The resulting alpha (α) coefficient lies between zero and one. When $\alpha = 0$ this implies that the variables of interest are independent of each other while when α tends to one then our variables are correlated. Our variables could also be sharing the same covariance. A score greater than 0.7 is usually acceptable but some studies propose higher values of 0.9 and above (Tavakol and Dennick, 2011). Table 3.8 shows the reliability results. The scale of standardized variables picked from our sample shows that all the variables appear to be statistically significant since the estimated correlation between the scale reliability coefficient and the basic factor it measures using the square root of alpha ($\sqrt{0.92}$) is roughly 0.95. All the variables are fit in the scale as illustrated by the item-test and item-rest correlations with a Cronbach's alpha of 0.33 and average interim correlation of 0.02. These results suggest that all variables of interest are internally consistent and reliable to explain the relationship between bank regulations and financial stability.

Table 3.8: Cronbach's Alpha Reliability Test

Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average Interim correlation	Alpha
CA	28	+	0.87	0.84	0.03	0.91
AQ	28	+	0.75	0.70	0.03	0.91
ME	28	-	0.87	0.84	0.03	0.91
ROA	28	+	0.88	0.86	0.03	0.91
CRD	28	+	0.90	0.88	0.03	0.90
LR	28	+	0.90	0.85	0.03	0.90
DI	28	+	0.88	0.82	0.03	0.91

CR	28	+	0.85	0.81	0.03	0.91
DR	28	+	0.54	0.44	0.04	0.92
BL	28	+	0.59	0.44	0.04	0.94
LLR	28	+	0.76	0.74	0.04	0.93
TEST SCALE						0.92

To check if our data is reliable for factor analysis we used Kaiser-Meyer-Olkin (KMO) test which measures sampling adequacy for single variables and the entire model. Higher values of KMO signify that our model is reliable for factor analysis. KMO is estimated in a range of 0 to1. Higher values of above 0.7 shows that variables are correlated and can warrant factor analysis (Kline, 2011). Table 3.9 shows the outcome of individual item KMO and the entire model. KMO of our data is 0.82 and is above 0.7 which suggest that we can perform a factor analysis.

Table 3.9: Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Variable	**KMO**
CA	0.82
AQ	0.81
ME	0.76
ROA	0.94
CRD	0.82
LR	0.80
DI	0.77
CR	0.90
DR	0.76
BL	0.87
LLR	0.72
Overall	0.82

3.4.5 Confirmatory Factor Analysis (CFA)

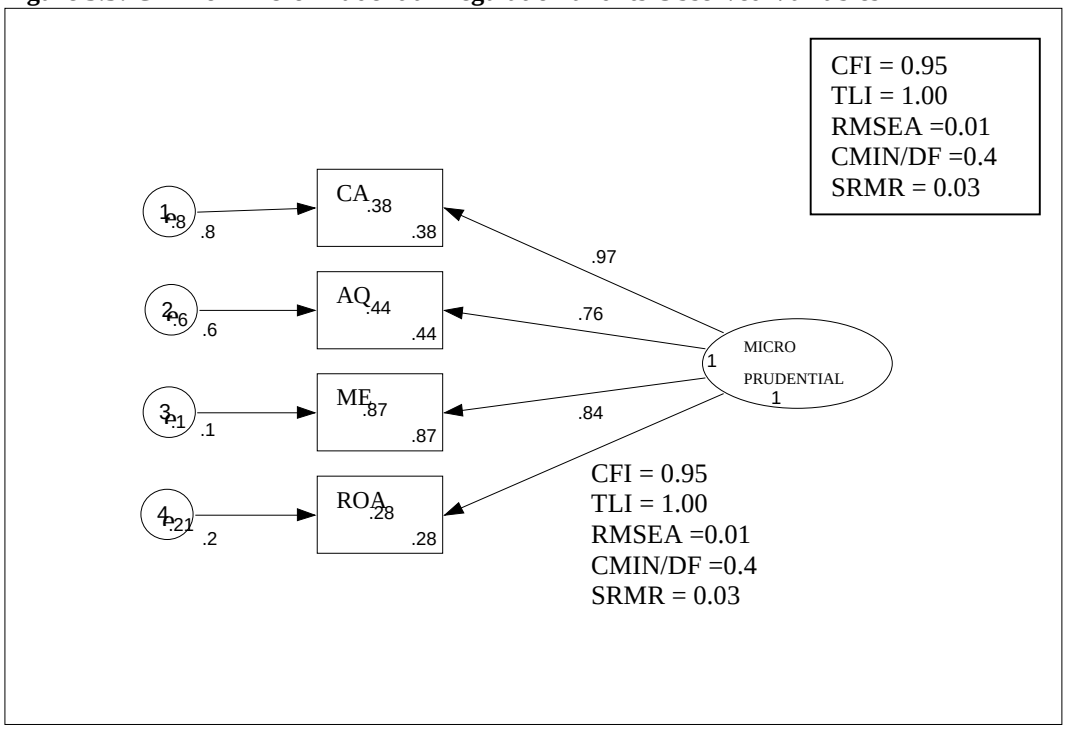
CFA is exploited to analyze the hypothesized association between the observed measured variable and the latent construct. CFA assists in determining both convergent and discriminant validity of hypothetical constructs which are adjusted for measurement errors. The main purpose of CFA is to attain approximates for each measured variable in the model and recognize all estimation errors clearly before performing SEM. We begin by ensuring that the model has been identified by attaining distinctive set of regression parameters whose values are not known. To ensure that the model is identified we start by setting a scale of measurement for the unobserved latent variables by fixing the variance of the latent variables to 1.00. This is based on the fact that we are estimating a model that is standardized (Brown, 2006).

Consequently, to permit estimation of parameters in CFA we determine whether to accept or reject the goodness of fitxof our model. If we accept the goodness of fit we then proceed and infer the

coefficients path in the model. There are different ways to measure goodness of fit and which method is desirable still remains debatable among researchers (Hu and Bentler, 1999; Schrieber et al., 2008; Garson, 2010; Kline, 2011). This study utilized the most commonly used goodness of fit measures which include: Comparative Fit Index (CFI), Tucker Lewis Index (TLI), relative Chi-square (CMIN/DF), Standardized Root Mean Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA). For the model to be a good fit: CFI and TLI should be greater or equal to 0.90 (Garson, 2010; Hu and Bentler, 1999); CMIN/DF should be four or less, but not less than one (Kline, 2011); RMSEA and SRMR should be less or equal to 0.05 (Schrieber et al., 2008).

We began by performing a CFA on micro prudential regulation as a latent construct and its measurement variables which include: capital adequacy (CA), asset quality (AQ), Management efficiency (ME) and earnings (ROA). These were permitted to independently correlate with each other but their residuals were not correlated (Bryne, 2001). Figure 3.5 presents the path and outcome of the CFA.

Figure 3.5: CFA for Micro Prudential Regulation and its Observed Variables



Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

The regression weights of micro prudential regulation (latent construct) in predicting all the measurement variables (Capital adequacy (CA), asset quality (AQ), management efficiency (ME) and earnings (ROA) were statistically significant at P-value less than 0.05. The measurement

weight of micro prudential regulation in forecasting capital adequacy (CA) was estimated at 0.97. Theoretically, this implies that when micro prudential regulation improves by one unit then capital adequacy (CA) improves by 0.97 units. This outcome is consistent with Floquet and Biekpe (2008), Camara et al. (2013) and Tsenova (2016). Further, the regression weight of micro prudential regulation in predicting asset quality (AQ) was approximately calculated at 0.76. This suggests that when micro prudential regulation improves by one unit then asset quality improves by 0.76 units.

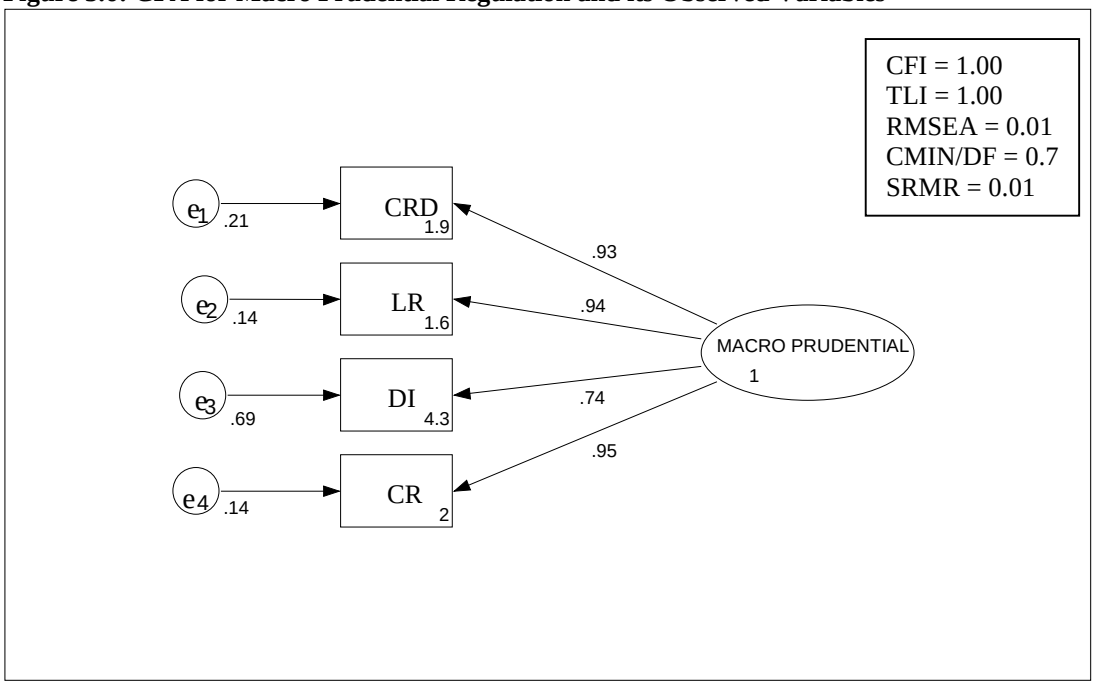
Ombaba (2013) and Beck et al. (2013) argue that micro prudential regulation plays a significant role in reducing the amount of non-performing loans in commercial banks. This in turn helps in managing credit risks over time. The regression weight of our latent construct (micro prudential regulation) in forecasting the path coefficient of management efficiency is 0.84. This implies that when micro prudential regulation improves by one unit then we expect management efficiency to improve by 0.84 units (Baral, 2005; Popdiera and Weil, 2007; Christopoulos, 2011). Finally, our path coefficient of the regression weight of micro prudential regulation in calculating earnings, proxied by return on assets (ROA) is estimated at 0.81. Which suggests that as micro prudential regulation improves by one unit commercial banks earnings increase by 0.81 units (Erina and Lace, 2013; Kheechee, 2011; Flamini et al., 2009).

To ensure that the measurement variables adequately represent the latent construct a goodness of fit measure was undertaken. All the goodness of fit indices were significant as follows: CFI = 0.95; TLI = 1.00; RMSEA = 0.01; CMIN/DF = 0.4 and SRMR = 0.03. Therefore, capital adequacy (CA), asset quality (AQ), management efficiency (ME) and earnings (RA) had acceptable factor loadings to represent micro prudential regulation.

We further conduct a CFA on the measurement variables of macro prudential regulation. Counter cyclical buffer (CRD), leverage ratio (LR), debt to income ratio (DI) and capital requirement (CR), measures the latent construct (macro prudential regulation). Figure 3.6 presents the results of CFA. It is evident that the regression weights of macro prudential regulation on predicting its measurement variables is positive and statistically significant at p-value less than 0.05. This implies that a unit increase in macro prudential regulation leads to an improvement of counter cyclical buffer (CRD), leverage ratio (LR), debt to income ratio (DI) and capital requirement (CR) by 0.93, 0.94, 0.74 and 0.95 respectively. These results suggest that the measurement variables have

significant factor loadings that would proxy macro prudential regulation, which is consistent with Crowe et al. (2011) and Claessens et al. (2013).

Figure 3.6: CFA for Macro Prudential Regulation and its Observed Variables

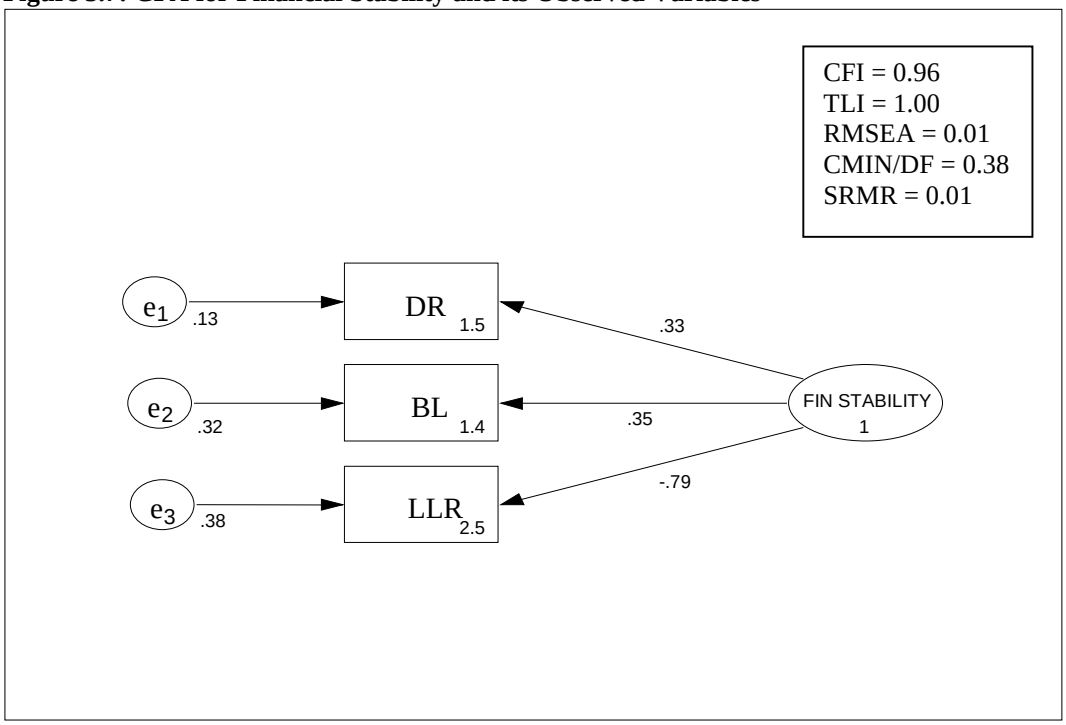


The goodness of fit of our CFA on macro prudential regulation suggests that our measurement variables have successful factor loadings. The goodness of fit results is as follows: CFI =1.00, TLI 1.00, RMSEA = 0.01, CMIN/DF= 0.7 and SRMR = 0.01. Variance estimates of macro prudential regulation measurement variables shows that they were all statistically significant. This meant that these variables had reasonable path loadings.

The third CFA was conducted on financial stability as the latent construct and its measurement variables viz. Standard deviation of banks' lending rate (BL), standard deviation of banks' deposit rate (DR) and loan loss reserve to total loans ratio (LLR). The estimation weight of financial stability in predicting its measurement variables was found to be statistically significant with mixed signs at P-value less than 0.05. This implies that an improvement of financial stability by one unit leads to standard deviation of banks' lending rate (BL) and standard deviation of banks' deposit rate (DR) by 0.35 and 0.33 respectively. This leads to stability of the financial system because banks' lending and deposit rates do not deviate significantly to cause uncertainty in the financial market. This robustness enables banks to forecast their earnings and mobilize deposits. Further, financial stability regression weight on predicting loan loss reserve to total loans ratio was estimated at -0.79. This implies that a unit improvement in financial stability leads to a reduction of

loan loss reserve to total loan by 0.79. This result is consistent with that of Bruno et al., (2014) and Dell'Ariccia et al., (2012). Figure 3.7 shows the CFA results of financial stability as a latent construct.

Figure 3.7: CFA for Financial Stability and its Observed Variables



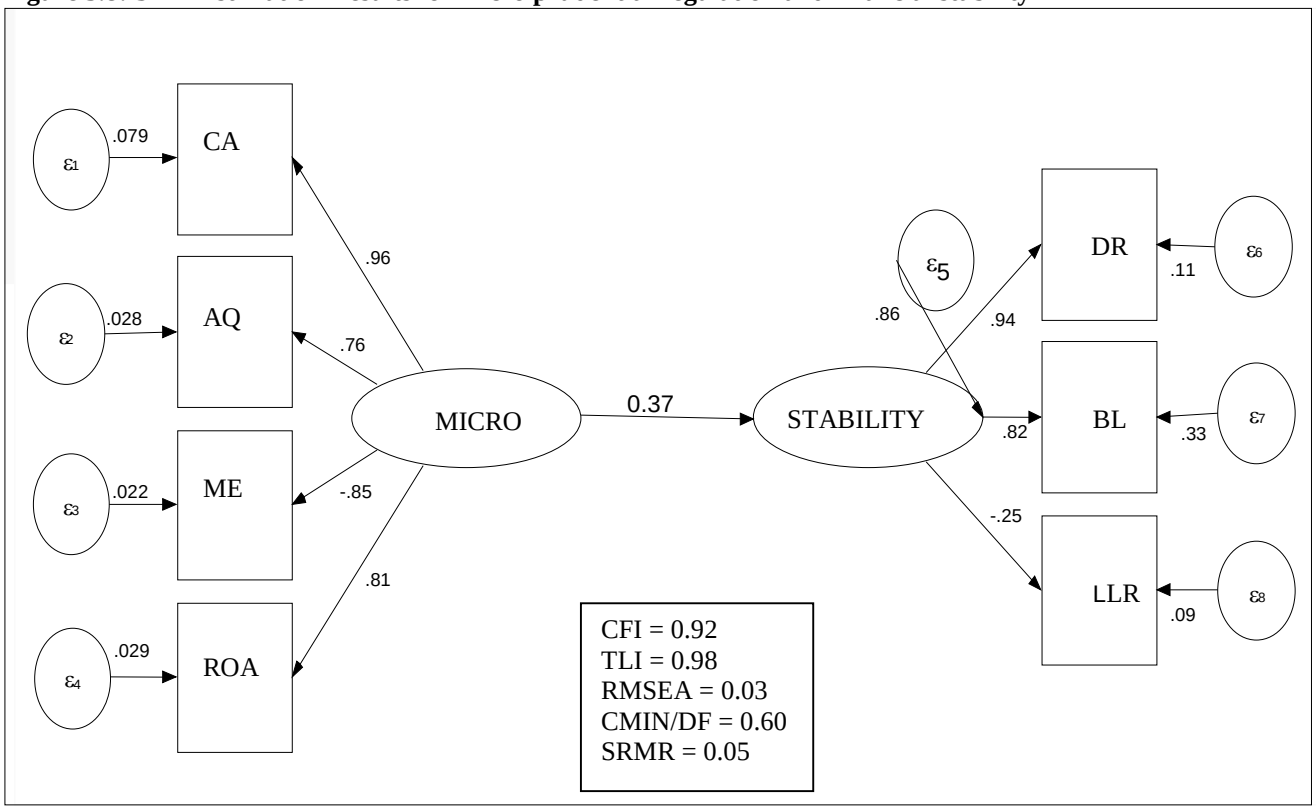
The goodness of fit results suggested that the three-measurement variables adequately explain our latent construct (financial stability). Our model fit results were as follows: CFI = 0.96, TLI = 1.00, RMSEA = 0.01, CMIN/DF = 0.38, SRMR = 0.01. Further, the variance of measurement variables were statistically significant implying successful factor loadings of these variables.

3.4.6 Structural Equation Model (SEM) Results

The path diagram for SEM that shows the relationship between the three latent constructs namely macro and micro prudential regulation and financial stability are presented in Figures 3.8 and 3.9. SEM analysis enables us to confirm or reject the anticipated association between the latent constructs in the proposed model. We estimate a standardized recursive model with two exogenous latent construct (micro and macro prudential regulation) and one endogenous latent construct (financial stability). SEM utilizes control function approach to address the problem of endogeneity. It models the correlation between the latent constructs. This association is between the endogenous variable equation and the outcome equation.

Capital adequacy (CA), asset quality (AQ), management efficiency (ME) and earnings (ROA) are exogenous measurement variables that proxy micro prudential exogenous latent construct. Further, counter cyclical buffer (CRD), leverage ratio (LR), debt to income ratio (DI) and capital requirement (CR) are exogenous measurement variables that represent macro prudential latent construct while Standard deviation of banks' lending rate (BL), standard deviation of banks' deposit rate (DR) and loan loss reserve to total loans ratio (LLR) are endogenous measurement variables that correspond to financial stability which is an endogenous latent construct. Figure 3.8 illustrates the outcome of SEM analysis between micro prudential regulation and financial stability.

Figure 3.8: SEM Estimation Results for micro prudential regulation and financial stability



Note: MICRO is micro prudential regulation and STABILITY is financial stability.

The estimation weight of micro prudential regulation in forecasting financial stability is statistically significant with a P-value less than 0.05. This suggests that an improvement in micro prudential regulation by a unit positively improves financial stability by 0.37 units. This outcome shows a positive correlation between micro prudential regulation and financial stability that is robust in the entire model specification. Therefore, when the central bank improves micro prudential regulations and enhance supervision in the banking sector, banks comply by improving their capital adequacy

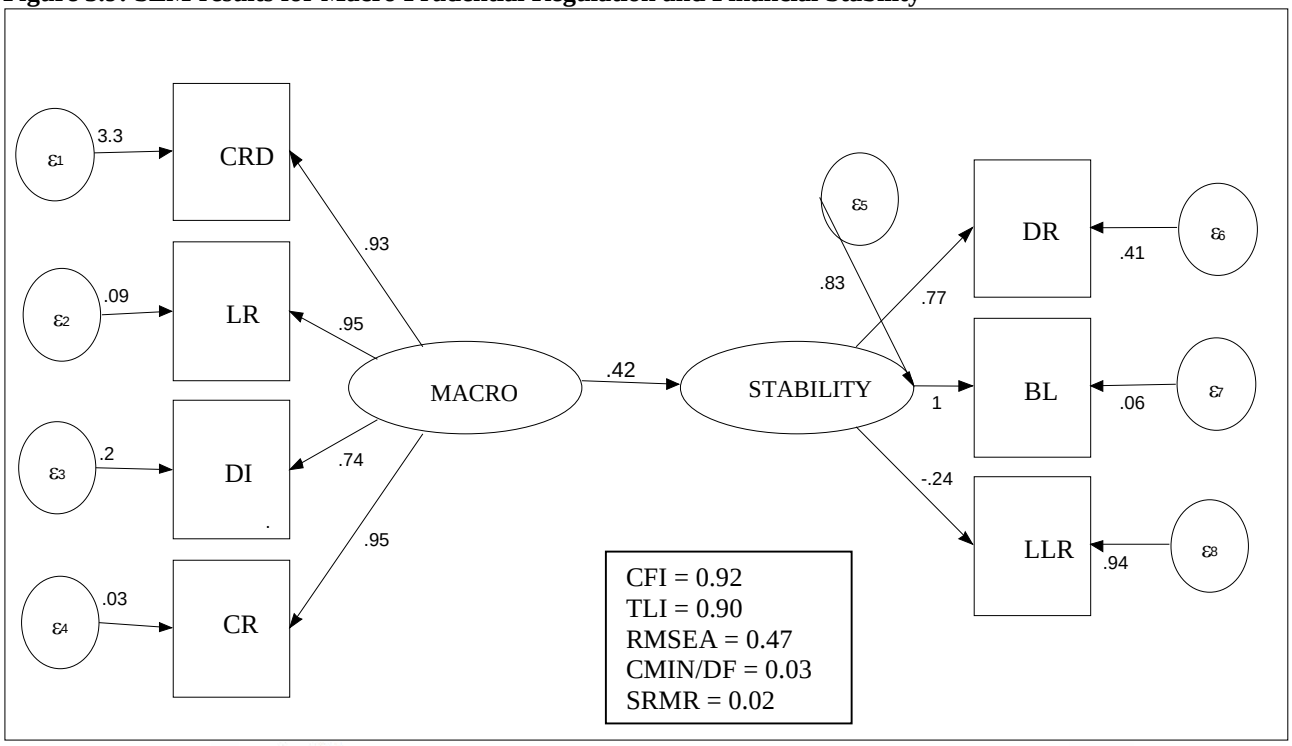
measures, asset quality, management efficiency and earnings. Efficient managers are able to invest in profitable ventures which increase earnings of the bank.

Further, they are able to predict and cushion themselves against credit risks that lead to a reduction in asset quality. This finding is in line with Waweru and Kalani (2009), Erina and Lace (2013), Abata (2014), Mwaniki and Okibo (2014), andTsenova (2016).The error terms $\varepsilon_1 to\ \varepsilon_4$ represent residuals of exogenous measurement variables, ε_5 is the error term of the whole regression model while ε_6 to ε_8 represent residuals of the endogenous measurement constructs. With the exception of relative chi-square, the goodness of fit indices met the expected standards for a good model and as a result, they were satisfactory. Our model fit results were as follows: CFI = 0.92; TLI = 0.98, RMSEA = 0.03; CMIN/DF = 0.60 and SRMR = 0.05.

Figure 3.9 shows the SEM result of macro prudential regulation and financial stability. The results of our analysis converge with the established link between micro prudential regulation and financial stability.

We find that the regression weight of macro prudential regulation in predicting financial stability is also statistically significant with a P-value of less than 0.05. As anticipated from theory, enhancing macro prudential regulation by one unit positively improves stability of the financial system by 0.42 units. Thus, macro prudential regulation enhances financial system stability (Ekpu, 2016). This is evidenced by the introduction of Basel I, Basel II and Basel III by BCBS with an aim of strengthening the financial system, forecasting eminent risks to a financial system and absorbing financial shocks to avoid global financial crisis as experienced in 2008-2009. Our regression outcome is consistent with Claessens et al. (2013), Elliot et al. (2013), Cerutti et al., (2015) and Jan and Rongrong (2017).

Figure 3.9: SEM results for Macro Prudential Regulation and Financial Stability

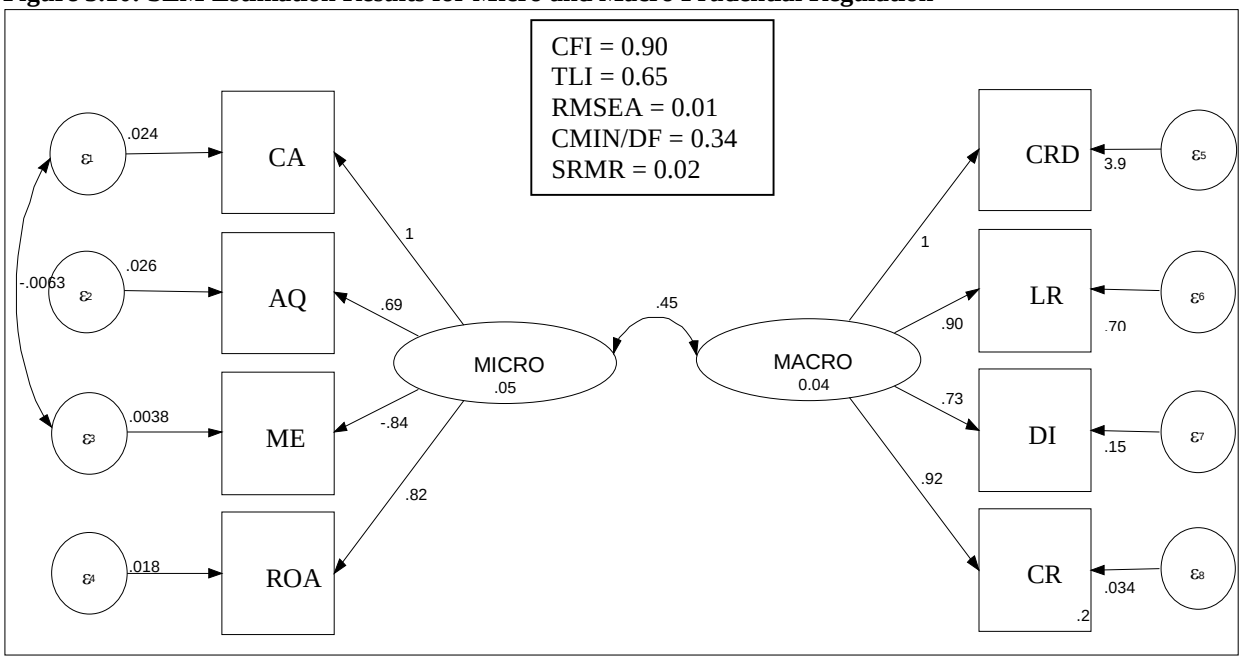


Note: MACRO is macro prudential regulation and STABILITY is financial stability.

The error terms $\varepsilon_1 to\ \varepsilon_4$ symbolize residuals of exogenous measurement variables, ε_5 is the residual of the whole regression model while ε_6 to ε_8 signify residuals of the endogenous measurement constructs. For post estimation statistics, we assess the goodness of fit of our SEM model to verify whether our model fits the hypothesized theory. Our model fit statistics is as follows: CFI = 0.92; TLI = 0.90; RMSEA = 0.47; CUMIN/DF = 0.03 and SRMR = 0.02. With the exception of chi square test, our model met the expected threshold of a good model.

We further tested the complementarities or otherwise between micro prudential and macro prudential regulation. We further look at how they complement each other. Figure 3.10 shows SEM outcome of the covariance between micro and macro prudential regulation.

Figure 3.10: SEM Estimation Results for Micro and Macro Prudential Regulation



Note: MICRO is micro prudential regulation and MACRO is macro prudential regulation.

Further, we observe a significant relationship between macro prudential regulation and micro prudential regulation in our SEM regression with a P-value of less than 0.05. This implies that macro and micro prudential regulations complement each other in ensuring financial system stability. A one-unit increase in micro prudential regulation reinforces macro prudential regulation by 0.45 units other factors kept constant. Financial institutions regulatory authorities are charged with the mandate of not only guaranteeing the soundness of individual institutions, but also ensuring stability of the entire financial system (Blahova, 2015; Ekpu, 2016). To strengthen complementarities between micro and macro prudential regulation, CBK should share information and jointly evaluate systemic risks. Consequently, modification indices suggest a correlation between the residual of capital adequacy and management efficiency.

The variance estimates of all the residuals were statistically significant and less than one implying that the variation of variables from their residuals was ideal in our regression. The goodness of fit indices apart from TLI and the relative chi-square met the expected standards for a good model and as a result, they were satisfactory. Our model fit results were as follows: CFI = 0.90; TLI = 0.65, RMSEA = 0.01; CMIN/DF = 0.34 and SRMR = 0.02.

3.5 Conclusion and Policy Implications

This chapter sought to investigate the relationship between bank regulation and stability of the financial system in Kenya. An exploratory factor analysis and confirmatory factor analysis was conducted to establish the factor loadings of each measurement variable that was used in our regression analysis. Further, to confirm or reject the relationship between the two exogenous latent constructs (Macro and micro prudential regulations) and the endogenous construct (financial stability) a standardized structural equation model (SEM) analysis was estimated.

The SEM analysis result confirms the existing theoretical underpinnings regarding the effect of macro and micro prudential regulation on stability of the financial system in Kenya. Therefore, enhanced bank regulation (both macro and micro prudential regulation) fosters financial stability in the domestic market. This is supported by a positive and statistically significant coefficient for both macro and micro prudential regulation on financial system stability. Based on these findings government should therefore improve bank regulations targeting both macro and micro prudential regulations to ensure financial stability. Nevertheless, it should also be noted that tighter regulations, poor evaluation of systemic risks, poor communication and inadequate information sharing might lead to financial system instability.

The study also established a positive and significant correlation coefficient between micro and macro prudential regulation in Kenya. This shows how important it is for the regulatory authority to identify the complementarities and trade-offs between the dual policy objectives of bank regulation that would ensure stability of the financial system. Macro prudential regulations such as counter cyclical buffer, leverage ratio, debt to income ratio and capital requirement should be complemented by micro prudential regulations that target capital adequacy, asset quality, management efficiency and earnings of commercial banks to ensure stability of the financial system in Kenya. So far, CBK has adopted the Basel III that targets the macro prudential variables in ensuring financial system stability. However, clear objectives should be drawn to ensure synergies between both macro and micro prudential regulation in ensuring stability of the financial system in Kenya.

Relative to the existing literature we found that complementing macro and micro prudential regulation is more effective and efficient in ensuring stability of the financial system other than letting the two policy objectives operate independently. Regulatory authorities in Kenya should

therefore introduce prudential regulations that would encourage innovations in the banking sector to ensure financial stability.

Based on the key findings and policy implications we can therefore conclude that micro and macro prudential regulations that target banks' capital adequacy, asset quality, management efficiency, return on assets, counter cyclical buffers, debt to income ratio, leverage ratio and capital requirement positively affects financial stability in Kenya.

Bank regulations were found to be significant for financial stability. However, the financial system consists of other NBFIs. Future research could be carried out on the effect of NBFIs regulations that include micro finance institutions, insurance companies, capital markets and Savings and Credit Cooperative Organizations (SACCO) on financial system stability. Since NBFIs are also part of the financial system in Kenya and just like commercial banks they play a significant intermediators role on financial mobilization and investments.

CHAPTER FOUR

BANK CONCENTRATION AND FINANCIAL STABILITY IN KENYA

4.0 Introduction

The 2007-2009 global financial crises (GFC) also raised questions on the role of bank concentration in terms of how bank equity capital ensures survival of commercial banks during a crisis (Mirzaei et al., 2013). Post GFC suggests that a concentrated banking system has a high chance of survival during a crisis due to high efficiency and innovation of financial products (Berger and Bouwman, 2013, Claessens and Levine, 2004). Certainly, bankers analyze their performance in the market in terms of the market share they hold. Banks with large market share are more vulnerable (Berger and Bouwman, 2013). This is because of 'too big to fail' notion in the financial system. However, De Haan and Poghosyan (2012a) established that when small banks compete insistently and carelessly to capture a bigger market niche, they may become vulnerable to financial crisis and collectively may fail.

Bank concentration is the extent to which the banking sector is controlled by few larger banks in terms of their market share (Beck et al., 2003). Banks play a significant role in mobilizing and allocating resources on productive ventures in the economy. This has a substantial effect on industrial expansion, employment, economic growth and development in the long run (Levine et al., 2000b; Berger et al., 2003). Further, higher bank concentration in a competitive market is associated with greater financial inclusion which fosters financial development and stability (Owen and Pereira, 2018). Economies with higher bank market power tend to influence other industrial sectors of the economy which affects economic growth and stability (Petersen and Rajan, 1995).

Banking sector plays a significant role in ensuring stability of the financial system (Dell'Ariccia et al., 2008). After the GFC the banking sector globally was negatively affected compelling banks to mobilize more capital. Regulatory authorities were also forced to restructure and liberalize the financial system to be able to withstand future risks leading to changes in market share of banks (Kasman and Kasman, 2015). This limitation is of particular interest to the fragmented Kenyan banking system which was able to withstand the risks during GFC.

We extend the previous two chapters by examining the role of bank concentration and competition on financial stability in Kenya. According to Cetorelli and Gambera (2001), bank regulations that favour concentration in the banking sector increases the possibility of firms to access finance over time. Further Owen and Pereira (2016) found out that economies in which bank regulations permit banks to compete and diversify their services are associated with wider financial inclusion. On the contrary, Beck et al. (2003) established that tight bank regulations that encourage greater bank concentration may become a stumbling block to firms' that want to access finance because banks may be stricter on their lending policies.

4.1 Bank Concentration in Kenya

Bank concentration is defined as the share of assets that largest banks command in the industry. It is measured by Herfindahl Hirschman Index (HHI) or concentration ratio, which is the ratio of share of assets of three or five largest banks to total assets of all banks (Beck et al., 2006; De Haan and Poghosyan, 2012a). There were 49 commercial banks as at the end of December 2000. Out of these banks, the government of Kenya owned five while four banks were locally incorporated foreign owned banks. The remaining 40 banks were privately owned domestically, with three banks having subsidiaries outside Kenya (CBK, 2000). The number of locally owned private commercial banks marginally declined to 28 as at the end of 2012 while foreign owned banks increased to 13. Out of the 13 foreign owned banks, 9 were local subsidiaries while 4 were branches of foreign banks. Further, the government had majority shares in three privately owned commercial banks (CBK, 2012).

By thex end of December 2017, the Kenyan banking sector had 43 commercial banks. The number of domestic privately owned banks decreased from 28 in 2012 to 24 by 2017 while the number of foreign owned banks increased by one to 14 over the same period. Out of the fourteen foreign owned banks, 11 had subsidiaries while three had branches in Kenya. The Kenyan government had a majority public shareholding in three commercial banks, namely National Bank of Kenya, Kenya Commercial Bank and Consolidated Bank of Kenya. This trend shows that despite the reduction in the number of locally owned commercial banks, they still dominate the Kenyan banking sector (CBK, 2017).

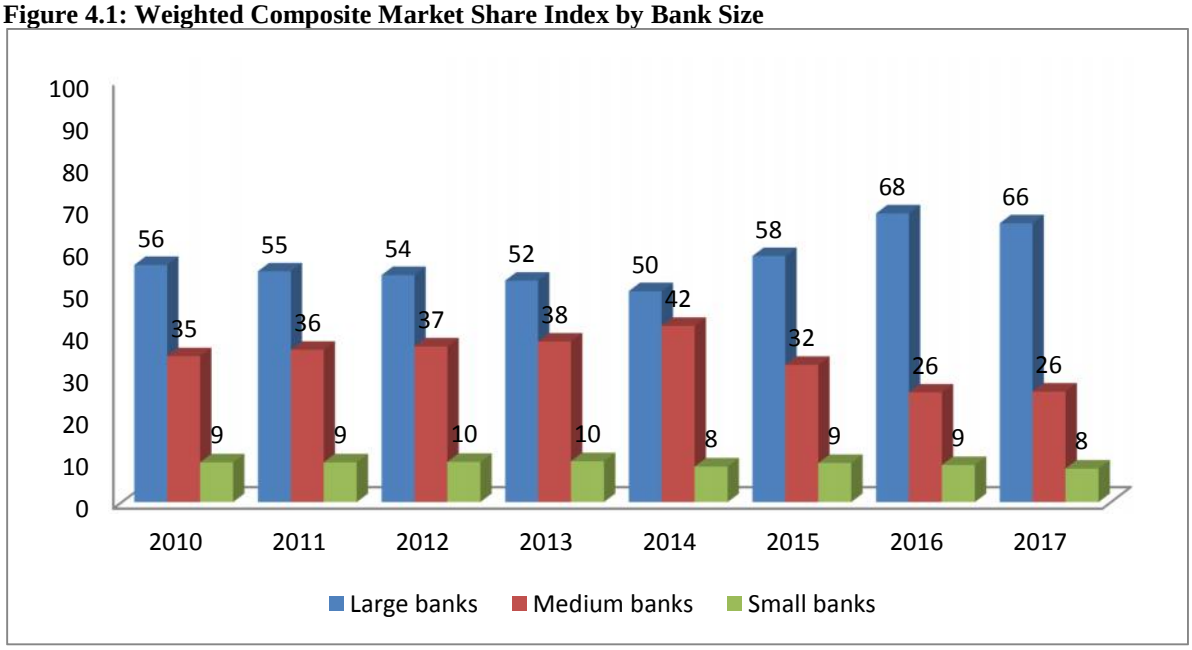
The CBK decided to review the grouping criteria of banks based on their sizes at the end of 2005. This led to the introduction of three tiers that included: large, medium and small banks. A bank was

categorized as large if its asset base surpassed Ksh.15 billion; the medium category comprised of total assets between Ksh.15 billion and Ksh.5 billion while small banks consisted of an asset base of less than Ksh.5 billion respectively (CBK, 2006). By the end of 2009 the banking sector consisted of 19 large banks which controlled more than 80 percent of the market share in terms of assets, deposits and net advances (CBK, 2009). The remaining 14 medium and 12 small banks controlled 20 percent of the market share. This implies that the large peer group controlled the largest market share over the four year period.

The classification of banks into large, medium and small categories saw over 50% of banks falling under the large peer group which necessitated the need for revision of bank classification. In 2010 CBK decided to categorize banks in terms of weighted composite market share index (WCMSI) which consisted of deposit accounts, loan accounts, capital size and asset base (CBK, 2010). Based on these criteria, a bank is considered large if it has a WCMSI greater than 5%; medium banks have WCMSI from 1% to 5% while small banks have a WCMSI less than 1%. Figure 4.1 shows the trend of changes in market share based on WCMSI among the three peer categories for the period 2010 to 2017.

The WCMSI of large sized banks remained steady high between 2010 and 2017. However, it continuously reduced from 56% in 2010 to a record low of 50% in 2014 but later increased to 66% as at the end of 2017. The reduction was attributed to increased competition which saw the market share of medium banks steadily increasing to 35% in 2014 up from 7% in 2006. Further, continuous innovations in the banking sector led to increased deposit base of banks which led to three medium banks moving to the large peer group as at December 2017, increasing the WCMSI of large banks to 66%.

Figure 4.1: Weighted Composite Market Share Index by Bank Size



Source: Bank Supervision Report, (*Various Issues*)

Figure 4.1 also reveals that the WCMSI of small banks gradually decreased from 9.4% in 2010 to 8.4% in 2014 but later rose again to a marginal 8.8% in 2016. This indicates that despite small banks being the majority in the industry, they pose a small threat in terms of competition to larger banks. This can be attributed to the less than 10% market share they have been controlling from 2010 to 2017. Despite the banking sector in Kenya being concentrated with few large banks between 2010 and 2017, the medium sized banks have gained market share of about 8% from other peer groups.

By the end of 2017, five large banks commanded a market share of 66% up from 65% in 2016. This was due to improved deposit mobilization that increased by 16.3%. Further, 11 medium sized banks increased their market share from 26% in 2016 to 26.10% in 2017. Combined market share of small peer group reduced from 9% in 2016 to 8% in 2017. The main reason for this decline was the acquisition of three small peer group banks by large and a medium sized bank in 2017[5].

By December 2018, five banks in the large peer group commanded a market share of 68% up from 66% in the previous year. These are Kenya Commercial Bank with an asset base of Kshs. 555 billion, Equity Bank with an asset base of Kshs. 525 billion, Co-operative Bank with an asset base of Kshs. 387 billion, Standard Chartered Bank with an asset base of 288 billion and Barclays Bank

[5] Fidelity commercial bank was acquired by State bank of Mauritius, Habib commercial bank was acquired by Diamond Trust bank and Giro commercial bank was acquired by I&M commercial bank

with an asset base of Kshs. 269 billion. There were 12 medium sized banks based on their asset size in 2018 with a market share of 28% up from 26.10% in 2017. The number of small peer group banks appeared to decrease because of the exclusion of two banks, which were under receivership, and one bank, which had been, liquidated (CBK, 2018). These changes were attributed to a further increase in deposit mobilization by 18% in 2018 and increase in total assets from Kshs. 542 billion to Kshs. 577 billion. Table 4.1 shows trends in bank concentration and financial stability variables for the period 2000 to 2017.

Table 4.1: Bank concentration and financial stability 2000-2017

Years	5 bank concentration ratio	Herfindahl -Hirschman Index	Gross non-performing loans
2000	77.01	0.83	12.66
2001	75.59	0.82	10.89
2002	74.32	0.78	11.76
2003	70.10	0.75	11.33
2004	64.58	0.71	12.58
2005	62.63	0.69	12.97
2006	65.47	0.63	13.61
2007	65.77	0.58	12.99
2008	62.93	0.51	13.88
2009	62.18	0.45	16.30
2010	59.27	0.46	14.33
2011	53.93	0.43	15.54
2012	54.44	0.40	16.12
2013	49.20	0.39	15.18
2014	48.02	0.38	14.12
2015	48.05	0.44	13.52
2016	50.25	0.48	13.15
2017	51.45	0.49	13.67

Source: World bank GFDD database

Table 4.1 shows that as the market share of five largest banks in Kenya reduced (depicted by the concentration ratio and Herfindahl-Hirschman index); the ratio of gross non-performing loans to gross loans reduced . This may be attributed to financial liberalization in the economy that led to increase in competition. This further led to efficiency in provision of services as banks compete for customers. Competition has also led to increased innovation in terms of information technology by introduction of mobile banking and agency banking in the year 2007 and 2010 respectively. It further facilitated the introduction of customized lending services to rural areas which significantly reduced the level of non-performing loans.

4.1.1 Statement of the Problem

From the basic economic theory, it is assumed that less concentration encourages competition which in turn reduces prices and enhances efficiency. However, this might not be the case in the banking industry. Increased competition in the banking sector may lead to systemic risks that may result to financial instability. This is because competition drives profits to zero in the long run. In a bid to increase profitability banks accumulate risky assets which undermine their stability (see Beck et al., 2013; Cifter, 2015; Huljak, 2015; Kick and Prieto, 2015; Leroy and Lucotte, 2016). Empirical evidence on the link between bank concentration, competition and financial stability has been inconclusive. Theoretical propositions also remain ambiguous (De Nicolo, 2005; Fernandez et al., 2010; Soedarmono et al. 2013; Feldman, 2015; Cifter, 2015).

Advocates of "concentration-stability" hypothesis argue that few banks are easy to control and can be able to diversify efficiently hence earn high profits which act as a buffer during financial crises (Hellman et al., 2000; Beck et al., 2003). On the contrary, "concentration-fragility" hypothesis argue that fewer banks are large and complex in nature. This makes them difficult to monitor and hence they exploit customers by charging high interests, which induces customers to invest in risky ventures (Boyd and De Nicolo, 2005). Furthermore, bank concentration encourages moral hazard behaviour based on the notion of 'too big to fail' policies (Mishkin,1999). Much of the previous evidence have been undertaken in the developed economies with conflicting findings (Vives, 2010; Berger and Bouwman, 2013; Soedarmono et al. 2013; Feldman, 2015). Evidence on emerging economies such as Kenya which are characterized by: shorter banking history, frequent changes in bank ownership and occasional political interference is clearly lacking.

The Kenyan banking sector has experienced significant reforms in terms of its structure, regulation and status for the period 2000-2018. Among these reforms include, launching of financial sector regulatory framework and regulations that allowed financial innovation and establishment of credit registries. Figure 5.1 and 5.2 reveals that large banks have been controlling the largest market share from the year 2000 to 2017 (CBK, 2017). However, despite large banks controlling the banking sector there has been episodes of financial instability in Kenya.

While large banks still control more than 50% of the market share (CBK, 2016), the debate on how bank concentration and competition affects stability of the financial system is still not clear. Previous, studies in the Kenyan banking sector have investigated the dynamics of concentration and

competition among commercial banks with regards to performance, changes in technology and consolidation leaving the aspect of financial stability (see Kamau et al., 2004; Gudmundsson et al., 2013; Sahile et al., 2015; Mdoe et al., 2016). This study seeks to fill this research gap. Understanding how concentration affects financial stability may help in policy formulation. Further, it may answer the question as to whether bank concentration is an important determinant of financial stability in Kenya. Therefore, consistent with this research gap, two critical questions should be given more attention: What is the effect of bank concentration on financial stability in Kenya? Does the banking system support the concentration-stability or the concentration-fragility theory?

4.1.2 Objectives of the Study

The main objective of this chapter is to investigate the effect of bank concentration on financial stability in Kenya. Specifically we seek to investigate whether 'concentration-stability' or 'concentration-fragility' hypothesis holds in the Kenyan banking sector.

4.1.3 Significance of the Study

This study contributes to existing literature in several ways. First, few studies in Kenya to the best of our knowledge have empirically examined how bank concentration and competition affects stability of the financial system both before and after the GFC. Therefore, the outcome of this study may shed more light on how concentration affects financial stability over time. It is important to analyze this issue because the banking sector plays an important role in mobilizing and availing funds to economic agents that may be susceptible to financial instability (Shijaku, 2016).

Second, Kenya being a developing economy provides a good case to analyze whether 'concentration-stability' or 'concentration-fragility' hypothesis holds. This is because the country has had significant structural reforms and technological innovations since 1990 which has led to changes in bank concentration and financial system stability over time. Third, we also test both the direct and indirect effect of concentration on financial stability by including competition as our mediating variable. We test whether our economy supports 'competition stability' or 'competition fragility' hypothesis. Finally, this paper pioneers the use of structural equation model (SEM) technique in analyzing both the direct and indirect effect of bank concentration on financial stability in Kenya. SEM allows us to tackle the problem of approximating measurement errors.

4.2 Literature Review

The main focus of this section is to review the theoretical link in our variables of interest. We also review empirical studies that touch on bank concentration and financial stability which are parameters that can be measured and monitored. The final section provides an overview of the empirical literature review with an aim of identifying the study gap.

4.2.1 Theoretical Literature

There are two strands in the theoretical literature that explain the link between bank concentration, competition and stability. In the sub-section that follows, we discuss each in turn.

Structure-Conduct-Performance Theory

Traditional theories that linked concentration, competition and financial stability paid much attention on the market structure and the extent of easy of entry and exit of firms in a given market. The structure-conduct-performance (SCP) paradigm that dominated in the early 1950s to 1970s emphasized how structure shapes the demeanour of firms in terms of how they are concentrated in the market. Further, it explained how conduct determines the behaviour of firms in different dimensions and how performance affects efficiency and stability of the financial system.

This hypothesis dominated the financial sector between 1950s and 1970s. It was introduced by Mason (1939) and later modified by Bain (1959) who explored the relationship between structure and performance. Market structure determined how concentrated the market is. The behaviour of firms in different dimensions (competition in pricing, research and development, choice of technology, etc) in the market explained the conduct. Performance represented the degree of competition that showed the level of efficiency in the market. The structure-conduct-performance (SCP) hypothesis suggests that banks are able to earn more returns in a concentrated market. This was attributed to the power of collusion and oligopolistic behaviour in such a market. They postulated that there is a positive relationship between bank concentration and bank's performance. The validity of this theory was tested and confirmed by Phillips (1967) and Brucker (1970).

However, the SCP has its own drawbacks. First the market structure can be affected by bank's behaviour and performance therefore structure is not essentially exogenous per se. Another problem with SCP is that the banking sector has fast inventions, innovations and more imaginative destructions leading to more concentration and market dominance, but this does not signify reduced social welfare. It is meant to recompense banks for their innovation and ventures.

Efficient Structure Theory

Demsetz (1973) argued that more efficient banks relative to its rivals will be induced to reduce prices of its products to maximize profits and hence capture more customers in the market. Therefore, the market share of banks is determined endogenously implying that efficient banks would naturally lead to higher concentration in the banking sector (Rhoades, 1985; Shepherd, 1986). The efficiency structure (ES) hypothesis incorporates two important hypotheses which include: the X-efficiency hypothesis which posits that management efficiency and control in banks lead to more profitability due to best cost control practices. Consequently, the scale-efficiency hypothesis, which suggests that banks with well organized scale of operation, will lower their recurrent costs resulting to higher profits and growth (Berger, 1995).

More measures of efficiency namely, scale efficiency, allocative efficiency and technical efficiency were introduced in measuring the efficient structure hypothesis. The ES theory was linked with the random walk assumption which argued that changes in prices over time show random deviations from previous prices (Fiordelisi, 2004). This suggests that if there is symmetric information in the market, today's prices will never determine tomorrow's prices. This implies that prices in the financial market were mutually exclusive.

Critics of efficiency market theory posit that history has proven that there are some instances where market prices were not set by rational investors but instead psychological thinking could have contributed to setting the price (Miller, 1991).

4.2.2 Empirical Literature

A debate ensued as to whether researchers can use variables that proxy bank concentration to represent market competition and vice versa. A study conducted by Gutierrez (2007) concluded that there is a converse association between market concentration and competition. Nevertheless, in our study we will identify different variables to represent the two variables. As discussed in the previous sections there are two conflicting views that discuss the relationship between bank concentration, competition and financial stability. These views include: "concentration-stability" and "concentration-fragility" hypothesis. In line with these hypotheses we also examined some empirical literature that link competition with financial stability to determine if competition plays a role in stability of the financial system and the link between concentration and completion.

Bank Concentration and Financial Stability/Fragility

The "concentration-stability" hypothesis suggests that there is a positive correlation between bank concentration and stability of the financial system through profitability channel, diversification channel, efficiency channel and easy supervision (see Freixas and Rochet, 2008; Berger et al., 2009; Vives, 2010; Berger and Bouwman, 2013; Evrensel, 2008; Fernandez et al., 2010; Cifter, 2015). Chang et al. (2008) used the structural matrix approach on Brazilian data between 2000 and 2005 to study the effect of bank concentration on non-performing loans. The study also exploited the Hirschman-Herfindahl index to proxy bank concentration. They found out that a concentrated banking system is less vulnerable to financial crisis. Further, Vives (2010) found that few banks in a concentrated market earn greater profits that act as a buffer during financial crises. This finding is consistent with that of Freixas and Rochet (2008). Consequently, Evrensel (2008) used survival time analysis to show that bank concentration improves the survival time of banks during a crisis using 79 countries between 1980 and 1997. It is therefore apparent that bank concentration significantly reduces banks' fragility during a crisis.

Diversification also plays an important role inensuring financial system stability. A concentrated banking system is able to diversify its portfolio to earn more profits. For instance, using a simulation approach to examine the impact of asset portfolio diversification on financial stability in Austria, Frey and Hledik (2018) conclude that diversification at individual bank level improves financial stability. Furthermore, Fernandez et al. (2010) in their study of 84 countries over the period 1980-2004 established that bank size matters when it comes to easy access of information and prevention of adverse selection problems. In addition to these channels, a more concentrated banking system makes it easier for the regulatory authority to monitor and supervise banking activities. This ensures that there is efficient prediction and mitigation of a financial crisis. Contagion risks are also prevented before they occur (Demirguc-Kunt et al., 2010). Therefore, concentration ensures easy regulation of banks.

Ali et al. (2015) analyzes the effect of bank concentration on financial stability in developed and developing countries over the period 1980 to 2011. Using a Logit model, the authors conclude that concentration has a stabilizing effect on financial stability in developing countries. Further, Bara et al. (2017) examine how bank concentration affects financial development and stability of South African Development Community (SADC) between 1985 and 2014. Using panel dynamic fixed

and random effect models they found that expansion and diversification of banking system may improve financial development which in turn may lead stability in the financial system.

Proponents of "competition-stability" hypothesis stem from the seminal work by Mishkin (1999). This hypothesis posits that increased competition reduces the possibility that a country will be exposed to a financial crisis. Additionally, Hu and Xie, (2016) analyze how competition, innovation and risk taking affects profitability of Chinese banks using structural equation model approach. They found that competition is positively correlated to profitability and this leads to financial system stability. Further, Kumankoma et al. (2018) analyze how freedom and competition affects profitability of 139 commercial banks in 11 Sub-Saharan Africa (SSA) countries using system GMM for the period 2006-2012. They found that higher market power is significant in determining banks' profitability but efficiency plays a more important role in determining profitability. Profitability would then lead to bank stability in the long run. Further, using data of 978 banks of 55 developing economies over the period 2000 to 2007, Amidu and Wolfe (2013) examine the outcome of diversification on competition and stability. The study used three stage least square regression and H-statistics (a non-structural methodology) to estimate competition. They found out that competition also increases diversification in both non-interest revenue and interest revenue of banks. Consistent with this finding is that of Sanya and Wolfe (2011).

On the contrary, "concentration-fragility" hypothesis argues that too much concentration may lead to higher lending rates and risk of default, difficulty in monitoring banks and moral hazard problem due to the notion of "too big to fail" policies (Berger et al., 2009; Soedarmono et al. 2013; Feldman, 2015). Large banks encourage investment in more risky ventures, which have an impact on stability of the financial system. This situation is evident when large banks look for ways to minimize monitoring costs by over lending in one sector of the economy. As a result, there will be reduced diversification of loan portfolios and banks become more vulnerable. Soedarmono et al. (2013) found that despite banks holding high capital in a concentrated market, the amount of assets they own is not large enough to mitigate the effect of non-payment risks associated with higher risk taking business organizations. Berger et al. (2009) reveals that larger banks tend to increase their lending rates, which in turn lead to adverse selection that attracts risky bank customers. Accumulation of risky assets increases fragility of banks. Further, Shijaku (2017) analyzed the effect of concentration on bank stability in Albania over the period 2008 to 2015 using a balanced

panel dynamic two-step General Method of Moments (GMM) regression. He found that macroeconomic variables play an important rolex in determining stability of the financial system, and that bank specific variables also significantly affects bank stability. His results confirmed the "concentration-fragility" hypothesis.

Literature on competition and financial stability seems to be consistent with competition-fragility hypothesis (Agoraki et al., 2011; Beck et al., 2013; Cifter, 2015; Huljak, 2015; Kick and Prieto, 2015; Leroy and Lucotte, 2016). When there is perfect competition in the banking sector each bank mobilizes few customers as reflected by little sum of deposit in their till. Therefore, no bank has an effect in determining interest to be charged in the market. However, firms will be induced to expandx their business and take more risks as long as they earn positive returns. This increased competition may lead to investments in risky ventures that would trigger systemic risks (Agoraki et al., 2011). Berger et al. (2008) analyzes the effect of competition on financial stability by employing GMM regression with robust standard errors of 8,235 banks in 23 developing countries. They established that competition reduces the ability of banks to control prices of their products and at the same time acts as an incentive for banks to invest in more risky ventures, which are a threat to financial stability.

In the same vein, Agoraki et al. (2011) employ static panel data instrumental variable regression on Eastern and Central European banks over the period 1998 to 2005. They found that lower bank concentration encourages competition, which in turn increases credit risk and higher likelihood of default. Further, Leroy and Lucotte (2016) examine the trade-off between competition and financial system stability of 54 European banks using Stochastic Frontier Analysis (SFA) between 2004 and 2013. Using Lerner index to proxy competition and bank Z-score for financial stability the study confirms competition-fragility hypothesis. This finding is consistent with Cifter (2015).

Consequently, Kick and Prieto (2015) established that competition that reduces regulation does not automatically improve financial stability or their pliability to shocks emanating from monetary policies. Using a sample data of 415 banks in Central and Eastern European Countries (CEEC) between 1997 and 2012 and a fixed effect panel regression, Huljak (2015) established that bank competition increased instability of the financial sector over time. This finding supports Berger et al. (2009) and Jimenez and Saurina (2013). Table 4.2 shows a summary of previous evidence.

Table 4.2: Summary of the findings

Author	Methodology	Findings
Studies showing bank concentration and financial stability/fragility		
Chang et al. (2008)	Structural matrix approach	Higher Bank concentration reduces the level of non-performing loans
Evrensel (2008)	Survival time analysis	Higher bank concentration increases bank survival during financial instability
Beck et al. (2005)	Logit probability model	Higher Bank concentration improves financial stability through diversification
Matutes and Vives (2000)	Standard product differentiation model	Higher Bank concentration increases management efficiency leading to financial stability.
Fernandez et al. (2010)	Ordinary Least Square	Higher bank concentration improves stability of the financial sector
Ali et al. (2012)	Logit model	High concentration has a positive impact on financial stability
Bara et al. (2017)	Panel dynamic fixed and random model	High concentration has a positive effect on financial stability in developing countries
Boyd et al. (2006)	Panel data	Higher concentration leads to higher capital ratios, bankruptcy and higher earnings instability
Shijaku (2017)	GMM	He confirmed concentration-fragility hypothesis
Feldman (2015)	2 stage least square regression model	Higher concentration leads to unemployment in developing countries
Studies showing bank competition and financial stability/fragility		
Caminal and Matutes (2002)	Panel data	Lesser competition leads to financial instability
Schaeck et al. (2006)	Logit model	More competition reduces financial system risk vulnerability
Hu and Xie, (2016)	SEM	Bank competition leads to profitability of banks which enhances financial stability
Amidu and Wolfe (2012)	3 stage least square regression	Banks competition enhances financial stability
Berger et al. (2008)	GMM	Competition in the banking sector increases probability of financial crisis
Agoraki et al. (2011)	Static panel data instrumental variable regression	Competition in banks increases credit risk and higher likelihood of default
Leroy and Lucotte (2016)	Stochastic Frontier Analysis (SFA)	Bank competition increases probability financial crisis
Huljak (2015)	Fixed effect panel regression	Bank competition leads to financial instability in CEEC

Source: Author's computation

4.2.3 Overview of the Literature

Reviewed empirical literature suggests different directions on the interlinkages between concentration, competition and financial stability. The difference is either unidirectional or bidirectional from country to country depending on the methodologies used. Looking at the empirical literature we discern two conflicting views that discuss the relationship between bank concentration, competition and financial stability. These views include: "concentration-stability" and "concentration-fragility" hypothesis. Proponents argue that high concentration and high competition may lead to financial stability (Berger et al., 2009; Vives, 2010; Berger and Bouwman, 2013. On the contrary, opponents of concentration and competition-stability hypothesis argue that high concentration and competition may enhance financial crisis leading to financial instability (Prieto, 2015; Soedarmono et al. 2013; Feldman, 2015).

Overall, we find out that existing literature fails to evaluate how bank concentration and competition affects financial stability in a multivariate level. Essentially, multivariate analysis assists to find patterns and interlinkages between several variables simultaneously. It allows us to forecast how the effect of one variable that proxy concentration or competition affects several variables that represent financial stability. This provides a more realistic picture of how concentration and competition affects financial stability with high significance levels. Our study uses SEM approach, a multivariate analysis to establish the link between our variables of interest.

Further, research on how bank concentration affects stability remains unexplored in Sub-Saharan African (SSA) region and more specifically in Kenya. To the best of our understanding, there is no empirical literature that assesses how concentration and competition affects financial system stability in Kenya. It is therefore paramount to identify variables that proxy bank concentration and bank competition and determine how they influence financial stability over time. This study seeks to fill this knowledge gap.

4.3 Methodology

4.3.1 Theoretical Framework

We follow the efficient structure hypothesis advanced by Demsetz (1973) and later extended by Catena (2000). This hypothesis looks at a partial equilibrium model in a perfectly competitive market with heterogeneous banking industry. The model assumes there are many banks in the market that are able to perform their intermediary role efficiently. Efficiency in the market is due to competition in mobilizing deposits and improved operations which in turn helps in diversification of investments. This ensures there is a long run bank stability which contributes in ensuring financial system stability. Despite any bank being able to provide services $b \in [0,1]$ in the market, there is only one subset $N \subseteq [0,1]$ in all equilibrium, which competes specified as follows;

$$N = \{b \in [0,1]\, q(b) > 0\} \quad \text{..... (1)}$$

Where $q(b)$ represents the production function of bank b.

A customer maximizes his consumption of bank products and services given his budget constraint;

$$\max_{d(b)} \int_0^1 d(b)db \quad \text{..... (2)}$$

Subject to;

$$Y = \int_0^1 p(b)d(b)db \quad \text{..... (3)}$$

Where bank products and services provided by bank b is supplied at price $p(b)$ and the quantity demanded is $d(b)$. A customer spends his total income Y to purchase bank's products and services. Since banks operate in a perfectly competitive market they all sell their products and services at the same price as follows.

$$d(b) > 0 \Longrightarrow p(b) = p \text{ for all } b \quad \text{..... (4)}$$

All banks in the market have different total cost function and therefore they are heterogonous. Bank b supplies quantity $q(b)$ of its products and services at a total cost $TC[b, q(b)]$. We present the total cost of bank b as follows.

$$TC[b, q(b)] = \omega(b) + VC[\theta(b), q(b)] \quad \text{..... (5)}$$

Where $\omega(\cdot)$ represents total fixed costs, while $VC[\cdot]$ denotes bank's variable costs. X-inefficiency of bank b is measured by $\theta(b)$. We differentiate efficiency and cost of entry concerns by assuming that $\omega(\cdot)$ depends on bank b but not on $\theta(b)$. Variable costs are presented in $[\theta(b), q] = \theta(b) \cdot k(q)$. Where $k(q)$ is the same in all banks while $k(q)/q$ represents the average variable costs curve, which is a U shaped curve. It is further assumed that $\omega(b)$ and $\theta(b)$ are step functions. We model our supply structure by a vector-valued function as follows;

$$V(b) = \begin{bmatrix} \omega^V(b) \\ \theta^V(b) \end{bmatrix} \quad \text{..... (6)}$$

Bank b assumes that the prices of its rival products are constant and maximizes its profit as follows;

$$\pi(b) = \max\left\{\max_{q(b)} pq(b) - TC(b, q(b), 0\right\} \quad \text{..... (7)}$$

In a perfect competitive market, each bank is assumed to be a price taker. However, each bank can decide not to produce. This is represented by the outer $\max(\cdot)$ function. Equation (4) states that each bank charges the same price. Therefore for all banks $h(b) > 0$. Therefore, price becomes;

$$p = MC[b, q(b)] = \theta(b)k'(q(b)) \quad \text{..... (8)}$$

Where MC is the marginal cost of a given bank b. At equilibrium, we expect the supply of bank products and services to be equal to demand by the consumers.

$$d(b) = q(b) \text{ for all } b \in N \quad \text{..... (9)}$$

We then integrate equation (9) for all b to arrive at;

$$D(p) = \int_0^N d(b)db = Q(p) = \int_0^N q(b)db \quad \text{..... (10)}$$

Equation (10) implies that the aggregate demand $D(p)$ is equal to aggregate supply $Q(p)$ of bank products and services. Further, combining the budget constraint in equation (3) and the aggregate demand curve in equation (10) with all banks charging the same price, we obtain a negative sloping demand curve in the form: $D(p) = 1/p$. We describe the minimum average cost of bank b as follows;

$$AC^*(b) = \min_q \frac{k(q)\theta(b)+\omega(b)}{q} \quad \text{..... (11)}$$

At equilibrium price p the minimum average cost is given by $\min_b AC^*(b) < p$. If the equilibrium condition holds, then when price (p) is equal to the minimum average cost $[\min_b AC^*(b)]$ bank b will be undecided on whether to produce or not. Bank b will only produce when price (p) is higher than the minimum average cost $[\min_b AC^*(b)]$. This implies that the production function and profitability for any bank (b) in the market is strictly increasing in price (p). Therefore, at an equilibrium price (p) the set of competing banks is represented by $N(p) = [0, max\, \vartheta(p)]$. Where $\vartheta(p)$ is a non-decreasing function apart from some finite amount of prices. With competition in the banking sector, mobilization of deposit will be possible and banks will be able to diversify their deposits to cushion themselves against financial system shocks.

4.3.2 Empirical Model

There is no consensus on how concentration affects financial stability and there are no specific variables that explain this indicator. The appropriate model to explore this relationship is structural equation model (Hu and Xie, 2016; Li, 2016). A detailed explanation of SEM can be found in Kline (2011). In our SEM model concentration is theorized to have a single direct effect and one indirect effect on financial stability. The indirect outcome is intervened by competition and the indirect path

is concentration-competition-stability respectively. SEM encompasses two models that include the measurement and structural model. The measurement model is specified as:

$$Z = \Phi_z \Omega + \Lambda, \quad \text{..... (12)}$$

Where Z is a vector of exogenous variables that can be observed z; Ω represents a vector of exogenous latent indicator ρ. The matrix of factor loading Φ_z is represented by φ_z. When we link z to ρ then we have Λ as a vector of measurement errors ε. Therefore, our exogenous variable is defined as;

$$\begin{bmatrix} z_1 \\ z_2 \\ \vdots \\ z_n \end{bmatrix} = \begin{bmatrix} \varphi_{z1} \\ \varphi_{z2} \\ \vdots \\ \varphi_{zn} \end{bmatrix} \rho + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix} \quad \text{..... (13)}$$

In our study, bank concentration is defined as ρ and measured by observable variables $z_1, z_2, \ldots . z_n$. The coefficients of bank concentration (ρ) are represented by $\varphi_{z1}, \varphi_{z2}, \ldots, \varphi_{zn}$ while $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_n$ denotes the error term. Likewise, we present the measurement model of the endogenous indicators as;

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ \lambda_{1\gamma} & 0 & 0 \\ \lambda_2 & \lambda_3 & 0 \\ \vdots & \vdots & \vdots \\ 0 & 0 & \lambda_n \end{bmatrix} \begin{bmatrix} \gamma_1 \\ \gamma_2 \end{bmatrix} + \begin{bmatrix} \vartheta_1 \\ \vartheta_2 \\ \cdot \\ \cdot \\ \vartheta_n \end{bmatrix}, \quad \text{..... (14)}$$

Where $y_1, y_2, y_3 \ldots . , y_n$ are variables that proxy the endogenous variables, which include competition γ_1 and financial stability γ_2. However, it should be noted that not all measurement variables have been included to proxy our endogenous variables. For instance, we know that macroeconomic condition, bank regulations and the level of financial inclusivity also affects bank competition and financial stability but are not used as measurement variables. An endogenous variable mutually represents a cause or effect of an outcome. In our case competition can be regarded as both the cause of financial stability and an effect of bank concentration. Further, $\vartheta_1, \vartheta_2, \ldots . , \vartheta_n$ represents the residual terms of the estimated model.

Our structural equation model therefore merges the measurement and the path model taking residuals of measurement observable variables into consideration as follows;

$N = AN + \Omega\Psi + Y$, ……..... (15)

Where N represents a matrix of path coefficients η, which explains the link between endogenous latent construct. Further, Ω is the path matrix of coefficient τ that explains the direct effects of exogenous measurement variable on endogenous measurement indicators. Finally, Y is a vector of estimation residuals υ. The SEM model is presented as follows:

$$\begin{bmatrix}\gamma_1\\ \gamma_2\\ \gamma_3\end{bmatrix} = \begin{bmatrix}0 & 0 & 0\\ \eta_{21} & 0 & 0\\ 0 & \eta_{32} & \eta_{33}\end{bmatrix}\begin{bmatrix}\gamma_1\\ \gamma_2\\ \gamma_3\end{bmatrix} + \begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\end{bmatrix}\rho + \begin{bmatrix}\upsilon_1\\ \upsilon_2\\ \upsilon_3\end{bmatrix}, \quad \text{..... (16)}$$

4.3.3 Definition and Measurement of Variables

Existing empirical literature have used different concentration ratios to measure market share of firms in the financial sector. These ratios include: Herfindahl-Hirschman Index (HH), Hannah and Kay Index (HKI), Bank Concentration Ratio (CR_n), Rosenbluth Index (RI), U-Index (U), Hause Index (HI), Entropy estimations, Hall and Tideman Index (HTI) and Comprehensive Industrial Concentration Index (CICI) (Bikker and Haaf, 2002). However, HH is the most commonly used measure of concentration in existing literature and always acts as a yard stick for the assessment of other concentration measures (Bikker and Haaf, 2002). HH highlights the significance of larger banks by assigning them bigger weights than smaller banks. Consequently, it includes each individual bank, such that random disconnections and insensitivity in market share allocation is mitigated (Ciapanna and Rondinelli, 2011). HH is measured as the sum of squares of the market share of loans, assets, or deposits of each individual bank in the banking sector. The ratio is defined as:

$$HHI = \sum_{i=1}^{n}\left(\frac{x_i}{X}\right)^2 \qquad 1 \geq HHI \geq \frac{1}{n}, \quad \text{..... (17)}$$

Where X is the joint assets of all commercial banks in a country, x_i is the total asset of bank i in a given period and there are n banks in the country. The HHI varies between 1 and $\frac{1}{n}$. A value of 1 signifies monopoly market and the lowest value of $\frac{1}{n}$, imply all banks are equal in size. According to Galetic and Obravodic (2018) bank concentration is high if the value is more than 0.18, medium if it ranges between 0.1 and 0.18 and small if it is below 0.1. Therefore, Davies (1979) posits that the

HHI becomes less responsive to alterations in the number of banks when the number of banks increases. We compute the HHI of the banks in Kenya and use it as one of the measures of bank concentration.

Another commonly used measure of bank's market share is the banks' concentration ratio (CR_n) which measures the sum of assets held by n largest banks divided by the total assets held by the banks sector computed as follows;

$$CR_n = \sum_{i=1}^{n} \frac{x_i}{X}, \quad \text{..... (18)}$$

This ratio is often utilized by policy makers when measuring the market composition and formulating bank regulations (Berger et al., 2004; Beck et al., 2005, Ali et al., 2012). Regulators may utilize concentration ratios by focusing on how size; number of banks and distribution affects competition. Our study employs the share of assets held by the five largest banks in Kenya.

Studies conducted on competition and stability make a distinction between two methods; the structural measures emanating from the SCP hypothesis (see Mason, 1939; Bain, 1959) and the non-structural estimates originating from the New Empirical Industrial Organization Framework (NEIO) (Lerner, 1934; Panzar and Rosse, 1987; Boone, 2008). The most commonly used structural measure is the market share while non-structural competitive measures are the Lerner Index developed by Lerner (1934); H-statistics introduced by Panzar and Rosse (1987) and Boone Indicator by Boone (2008). Non-structural measures of competition are preferred to structural measures because they provide a more practical setting to measure bank competition and that they have a micro-economic foundation (Bikker and Haaf, 2002; Claessens and Laeven, 2004; Carboet al, 2004). Based on existing literature (see Schaeck et al., 2006; Maundos and Guevara, 2007; Liu et al., 2010; Park, 2013; Amidu and Wolfe, 2013) and reliability of the measures, our study adopts the non-structural measures, specifically the Lerner Index, H-Statistics and the Boone Indicator to proxy competition.

Lerner index (LI) is defined as the variation between price and marginal cost as a fraction of price. It is the converse proxy for competition and can be estimated as;

$$LI_{it} = \frac{p_{it} - mc_{it}}{p_{it}}, \quad \text{..... (19)}$$

Where p_{it} proxies price of bank $i's$ output at time t and mc_{it} is the marginal cost of bank i at time t. The LI measured for each bank represents its pricing influence in the market. Where services provided by a given bank are equal to its total asset, p_{it} is estimated by dividing the total income with total assets (Berger et al., 2009; Beck et al., 2013). LI ranges from 0 to 1. The value of 1 represents pure monopoly while zero corresponds to a perfect competitive market. LI is preferred to other measures because it can be calculated at firm level over a longer period of time (Leroy and Lucotte, 2006).

H-statistics (HS) introduced by Panzar and Rosse in 1987 (Elzinga and Mills, 2011). Is the summation of elasticities of the reduced form incomes with respect to factor prices. The H-statistics is also referred to as the Panzar and rose Statistics. This measure varies between $-\infty < H \leq 1$. When the H-statistics value is less than zero, the market is a pure monopoly ($-\infty < H \leq 0$). On the other hand, when the H-statistics lies between zero and one then we have a monopolistic or an oligopolistic market rivalry($0 < H < 1$). When the H-statistics value is equivalent to one ($H = 1$), then we have a perfectly competitive market. The interlinkages between the Lerner Index, the hypothetical elasticities and the H-statistics were well explained by Shaffer (1983). H-statistics is computed as follows:

$$H = \sum_{k-1}^{m} \left(\partial R_i^* / \partial w_{k_i}\right)\left(w_{k_i} / R_i^*\right), \quad \text{..... (20)}$$

Where * represent variables that are in equilibrium. Market dominance is estimated by the degree to which an alteration in factor input cost (∂w_{k_i}) is replicated in the equilibrium income (∂R_i^*) received by bank i.

Boone indicator (BO) estimates the differences in efficiency of firms in a given sector. Banks compete in the market to achieve high performance. Therefore, for a bank to perform better than its rivals in the market it has to increase its efficiency. This implies that more efficient banks significantly improve their performance compared to less efficient banks. Boone indicator links performance with different levels of efficiency (Boone, 2008). The revenue elasticity index known as the Boone index is estimated as follows;

$$\pi_{it} = \delta + \theta \ln(MC_{it}), \quad \text{..... (21)}$$

Where i represents an individual bank, while t stands for a sample year. π_{it} symbolizes performance in terms of profit and MC_{it} is the marginal cost of an individual bank at a given year. Efficient firms with less marginal cost have a higher market command, reduced prices, higher revenues and higher price-cost margins (Aghion et al., 2005). It should be noted that some studies replace market performance with market share when measuring efficiency of banks (see Schaeck et al., 2006; Tabak et al., 2011). Profit in the banking sector is estimated by deducting bank operating expenses from bank operating income. Further, due to difficulties in measuring the marginal cost we use the average cost by dividing bank operating expense by the revenue. θ is a proxy for the Boone indicator and it is always negative because it is a decreasing function of revenue as a result of bank's inefficiencies. Higher values of θ in absolute terms signify tougher competition.

Further, we include bank regulation indicator as a control variable in our estimation. We use capital adequacy (CA) and asset quality (AQ) to proxy micro prudential regulation while minimum capital requirement (MC) and debt to income ratio (DI) is used to represent macro prudential ratio. To ensure stability in the financial system regulatory authorities have to complement macro and micro prudential regulation. This ensures that both idiosyncratic and systemic risks are mitigated in the system(Borio, 2003). Different empirical studies have emphasized on the importance of prudential regulations in ensuring financial system stability (see Gudmundsson et al., 2013;Shim, 2013; Vandenbussche et al., 2012; Claessens et al., 2013; Cerutti et al., 2015). Bank regulations also affect the level of bank concentration and competition in the market (see Demirguc-Kunt, 2003).

Financial stability which is one of the endogenous latent construct in our model is estimated along two proportions that comprise of financial resilience and financial volatility. Financial resilience is measured by banks' Z-score (ZS) and ratio of credit provisioning to bank deposit (CB) (see Beck et al., 2013; Cuestas et al., 2017) while volatility of the financial system is represented by standard deviation of bank deposit rate growth (SL), standard deviation of bank lending rate growth (SB) and loan loss reserve to total loan loss (LL) ratio (see Titko et al., 2015; Cihak et al., 2016).

Table 4.3 illustrates the definition and measurement of variables of interest, expected signs according to theory and existing empirical literature.

Table 4.3: Definition and Measurement of Variables

Variable	Notation	Definition and measurement	Sign predicted by theory	Sign from previous studies
Dependent Variables				
Banks' Z-score	ZS	Return on asset (ROA) plus equity to asset ratio divided by standard deviation of ROA. Measures insolvency risk.		
Ratio of credit provision to bank deposit	CB	We compute annual credit provisions then divide it by annual bank deposit. Measures liquidity risk exposure		
Standard deviation of banks' lending rate	SL	We compute year on year growth in lending rate then standard deviation of the growth rate. Measures volatility in cost and provision of credit.		
Standard deviation of banks deposit rate growth	SB	We compute year on year growth in deposit rate then standard deviation of the growth rate. Measures volatility in cost and volume of funding.		
Loan loss reserve to total loans ratio	LL	We compute annual Loan loss reserve and divide it by annual total loans. Measures Bank's Risk		
Independent Variables				
Herfindahl-Hirschman Index	HH	Measured as the sum of squares of the market share of each individual bank.	Positive	Indeterminate
5-Banks concentration Ratio	CR	Measures the sum of assets held by 5 largest banks divided by the total assets held by all banks.	Positive	Indeterminate
Lerner Index	LI	Measures variation between price and marginal cost as a fraction of price	Negative	Indeterminate
Panzar and Rosse Statistics	HS	Ratio of net income to total assets. Evaluates a guarantee of profits and sustainable solvency.	Negative	Indeterminate
Boone Indicator	BO	Estimates the differences in efficiency of firms in a given sector	Positive	Indeterminate
Capital adequacy	CA	Ratio of total capital to total risk weighted assets. It measures the ability of banks to absorb shocks.	Positive	Positive
Asset quality	AQ	Ratio of gross nonperforming loans to gross total loans. Evaluates credit risks of the financial system.	Negative	Negative
Minimum capital requirement	MC	Percentage change in core capital. Measures solvency of banks.	Positive	Positive
Debt to income ratio of banking	DI	Total debts to total income ratio. Measures the ability of financial	Negative	Negative

sector		system to service its debts		

4.3.4 Estimation and Testing

Consistent with the previous empirical chapters, we determined the goodness of fit by employing the Chi square statistics, Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Root Means Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (RMSR). We used these three measures to evaluate the different model specifications because they provide alternatives for choosing the most preferred model. A model that has a value close to zero indicates a best fit (Blunch, 2008).

We used the Maximum likelihood estimation (MLE) approach to ascertain the link between the latent variables and the indicator variables. We further tested for multicollinearlity among these variables to ensure that there is no correlation among our variables of interest. Gujarati (2003) shows that if correlation between two variables is more than 0.70 then there is a problem of multicollinearity. To address this problem we dropped one of the variables..

4.3.5 Data Sources

Yearly data of our variables of interest for the period 1990-2017 was obtained from World Bank's Global Financial Development Database (GFDD), Thomson Reuter's database and the Central Bank of Kenya (CBK). Our selection of data period was guided by some important changes in bank concentration, competition and financial stability in Kenya. For example since 2004 to 2016 medium sized banks improved their efficiency hence enhancing competition with large sized banks over time.

4.4 Empirical Findings

4.4.1 Descriptive Statistics

We tested normality of our data using the Jarque-Bera (JB), skewness and kurtosis. The JB test combines both skewness and kurtosis following their coefficients with two degrees of freedom. The null hypothesis in this test follows a normal distribution while the alternative hypothesis suggests otherwise. A normally distributed data is expected to have zero skewness with a kurtosis being equal to three. Any deviation from these values increases the JB statistics. Further, we calculated the standard deviation, mean, maximum and minimum of the data. Table 4.4 presents the summary statistics.

Table 4.4: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Skewness	kurtosis	Pr(JB-stat)
Herfindahl-Hirschman Index (HH)	28	0.10	0.05	0.03	0.19	-0.08	2.38	2.89[0.24]
5 Bank Concentration (CR)	28	0.70	0.30	0.49	0.70	-0.40	2.40	4.12[0.13]
Boone Indicator (BO)	28	0.09	0.06	0.01	0.26	0.22	2.38	0.19[0.91]
Panzar-Rosse H-Statistics (HS)	28	0.52	0.11	0.34	0.72	-0.95	3.77	1.09[0.65]
Lerner Index (LI)	28	0.41	0.07	0.28	0.54	-0.55	2.37	0.72[0.70]
Capital adequacy (CA)	28	0.38	0.26	0.11	0.88	-0.65	2.89	0.30[0.18]
Asset quality (AQ)	28	0.44	0.21	0.15	0.80	-0.32	2.15	4.95[0.08]
Minimum capital requirement (MC)	28	0.47	0.21	0.10	0.89	-0.43	2.50	4.79[0.09]
Debt to operating income ratio of banks (DI)	28	0.49	0.25	0.11	0.87	-0.75	3.10	0.80[0.60]
Z-score (ZS)	28	12.26	2.35	8.50	16.3	-0.06	2.10	0.30[0.18]
Ratio of Credit Provision to Bank Deposit (CB)	28	0.33	0.19	0.02	0.63	-0.42	1.68	3.38[0.12]
Standard Dev of Banks' Lending Rate(SL)	28	0.47	0.20	0.11	0.93	0.75	2.28	2.39[0.30]
Standard Dev of Banks Deposit Rate (SB)	28	0.31	0.16	0.09	0.67	1.46	1.63	2.88[0.23]
Loan loss reserve to total loans ratio (LL)	28	0.51	0.17	0.10	0.80	-0.99	3.22	0.93[0.63]

The maximum mean value of our data is that of the Z-score at 12.26 and the minimum expected value is that of Boone indicator at 0.09. Most variables are lowly dispersed from their means as reflected by low standard deviations. The highest and lowest values in our data are depicted by the maximum and lowest values. All variables have a significantly peaked distribution as represented by positive kurtosis values. The highest peaked distributions are shown by Panzar Rosse H-statistics and loan loss reserve to total loan loss ratio. All variables were normally distributed at five percent significant level. The adjusted chi-square probability numbers outside the brackets factor in small sample distribution values that delay to converge under the JB statistics. Therefore, our data is normally distributed.

4.4.2 Correlation Analysis

We performed a correlation analysis to ascertain whether there is a strong linear association between our variables of interest. We sought to establish whether there was high level of multicollinearlity among the variables to warrant exclusion of some of the explanatory variables.

Table 4.5 shows the correlation matrix with highest value of 0.70, which is an exact cut-off point proposed by Gujarati (2003).

According to Gujarati (2003) multicollinearity is a problem when the score is higher than 0.70 to necessitate a decline in the t-statistics. This could result to immeasurable standard errors and uncertain parameter estimates. Consequently, the researcher might adopt the null hypothesis which or else was supposed to be rejected leading to a Type-2 error. Table 4.5 shows there is a comparatively low correlation among our variables of interest.

Table 4.5: Correlation Matrix

	CR	HH	BO	HS	LI	CA	AQ	MC	DI	ZS	CB	SB	SL	LL
CR	1.00													
HH	0.30	1.00												
BO	-0.42	-0.21	1.00											
HS	0.33	0.03	-0.13	1.00										
LI	0.40	0.41	-0.15	-0.31	1.00									
CA	-0.35	-0.32	0.27	0.29	0.37	1.00								
AQ	-0.48	-0.47	0.12	0.40	0.45	0.38	1.00							
MC	-0.12	-0.32	0.28	-0.31	-0.23	0.34	0.04	1.00						
DI	-0.25	-0.30	0.38	-0.26	-0.34	0.23	0.10	0.35	1.00					
ZS	-0.71	-0.47	0.33	-0.08	-0.02	0.29	0.28	0.32	0.08	1.00				
CB	-0.56	-0.48	0.10	-0.18	-0.40	0.39	0.16	0.27	0.19	0.60	1.00			
SB	-0.11	-0.41	0.05	-0.18	-0.02	0.24	0.13	0.26	0.26	0.29	0.33	1.00		
SL	-0.44	-0.37	0.42	-0.10	- 0.25	0.35	0.24	0.45	0.12	0.33	0.45	0.66	1.00	
LL	-0.02	-0.03	0.21	-0.40	- 0.33	0.42	0.19	0.23	0.16	-0.13	0.08	-0.51	-0.09	1.00

There is an inverse relationship between high level of bank concentration and financial stability in Kenya as depicted by variables that represents concentration (HH, CR) and variables that represent financial stability (ZS, CB, SB, SL, LL). This supports the 'concentration-fragility' hypothesis.

4.4.3 Exploratory factor Analysis

We conducted an exploratory factor analysis (EFA) to select the best variables that will sufficiently represent our latent variables so as to draw meaningful results from our estimation (Thompson, 1992). The results are presented in Table 4.6. We concentrated on factors that have Eigen values greater than one to explain our model (Henson and Roberts, 2006). Our EFA identified four factors

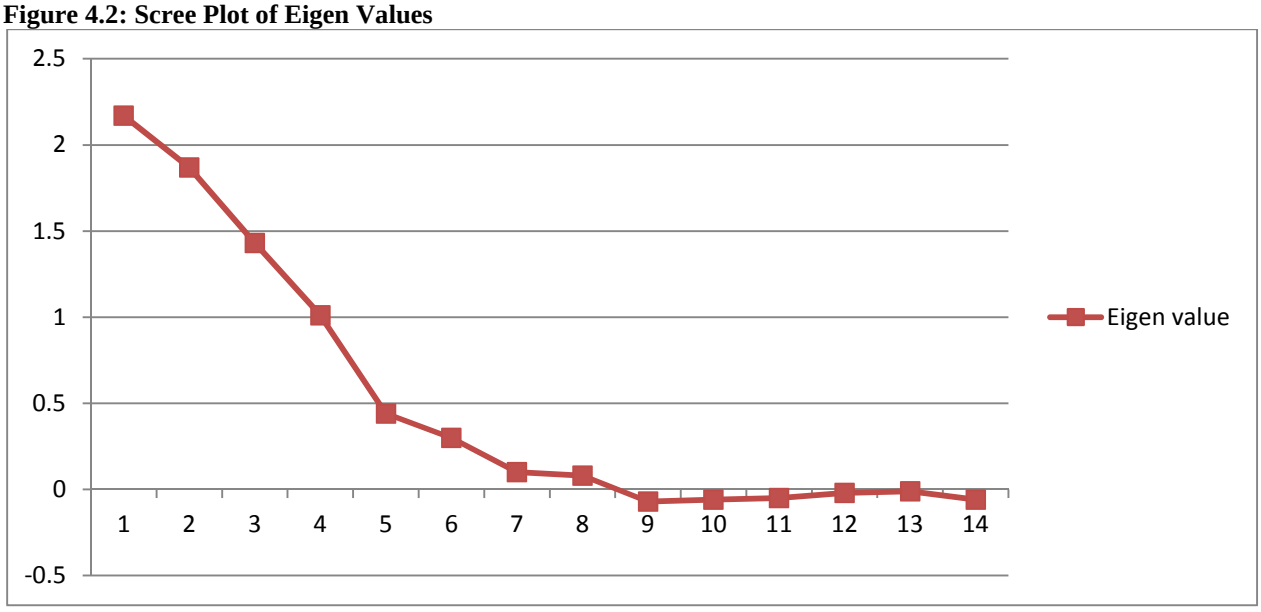
with Eigen values greater than one explaining 92% of the deviation in our sample. The first two factors explained 67% of the variation while the remaining third and fourth factors explained 15% and 10% of the variation respectively.

Table 4.6: Factor Loadings

Factor	Eigen value	Proportion	Cumulative
1	2.17	0.45	0.37
2	1.87	0.22	0.67
3	1.43	0.15	0.82
4	1.01	0.10	0.92
5	0.44	0.05	0.96
6	0.30	0.03	1.00
7	0.10	0.01	1.01
8	0.08	0.00	1.01
9	-0.07	-0.00	1.00
10	-0.06	-0.01	1.00
11	-0.05	-0.02	1.00
12	-0.02	-0.01	1.00
13	-0.01	-0.03	1.00
14	-0.06	-0.00	1.00

We further constructed a scree plot to determine the most effective factors that will significantly affect our estimation model. Figure 4.2 shows the scree plot of the Eigen values.

Figure 4.2: Scree Plot of Eigen Values



To ensure that we get reliable result to explain our four latent variables we performed a rotation on the four factors so as to establish the correlation between the factors and the original measurement variables. We further used an orthogonal matrix rotation known as varimax rotation to ascertain the composition of the scale factor. Two variables that had factor loadings of less than 0.5 were

dropped. They included: minimum capital requirement (MC) and Loan loss reserve to total loans ratio (LL). Table 4.7 shows the remaining variables and how they loaded on the three factors.

Table 4.7: Factor Rotation Matrix Using Varimax

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
CR	-0.84				0.18
HH	-0.77				0.17
BO			0.91		0.15
HS			-0.60		0.12
LI			0.88		0.18
CA				0.78	0.07
AQ				0.82	0.13
DI				0.72	0.05
ZS		0.88			0.19
CB		0.92			0.09
SB		0.89			0.19
SL		0.81			0.10

Factor 1 encompasses variables that represent bank concentration namely: 5 banks concentration ratio (CR) and Herfindahl-Hirschman Index (HH). Factor 2 consisted of variables that proxy financial stability which includes: bank Z-score (ZS), Ratio of Credit Provision to Bank Deposit (CB), standard deviation of bank's deposit rate (SB) and standard deviation of bank's lending rate (SL). The third and fourth factors constituted measurement indicators that proxied banks' competition and bank regulations viz. Boone Indicator (BO), Panzar-Rosse H-Statistics (HS) and the Lerner Index (LI), capital adequacy (CA), asset quality (AQ) and debt to operating income ratio of banks (DI). The error term of the variables that are not explained by the existing three factors is represented by the uniqueness column. The Z-score (ZS) and standard deviation of bank's lending rate (SL) have the highest unique value at 0.19. This implies that 19% of the residual of ZS and SL are not explained by the second factor.

4.4.4 Reliability and Adequacy Test

Table 4.8 shows the outcome of Cronbach's Alpha (CA) reliability test. We utilized the CA test to check for the internal reliability of our data. We estimated CA by evaluating the score of a single scale variable with the total score of all observations and then compared the outcome with the variance of each single variable score. The coefficient of alpha (α) varies between 0 and 1. When (α) = 1 the variables are dependent of each other and therefore are correlated or share the same covariance but when (α) = 0 the variables being tested are mutually exclusive. Scores higher than 0.70 meet the expected threshold. However, some studies (see e.g. Tavakol and Dennick, 2011) propose a score higher than 0.90 and above. All our variables of interest are statistically significant

since the calculated correlation between the scale validity coefficient and the square root of alpha($\sqrt{0.79}$) is slightly close to 0.90. The variables of interest are therefore constant and reliable to explain the link between bank concentration, competition, bank regulation and financial stability. This is reflected by CA of 0.79 and average interim correlation of 0.24.

Table 4.8: Cronbach's Alpha Reliability Test

Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average Interim correlation	Alpha
CR	28	-	0.82	0.78	0.26	0.77
HH	28	-	0.78	0.74	0.28	0.80
BO	28	+	0.77	0.72	0.25	0.76
HS	28	-	0.61	0.58	0.25	0.76
LI	28	-	0.80	0.76	0.23	0.89
CA	28	+	0.78	0.74	0.26	0.81
AQ	28	+	0.85	0.83	0.27	0.76
DI	28	+	0.74	0.69	0.24	0.74
ZS	28	+	0.63	0.60	0.23	0.72
CB	28	+	0.81	0.77	0.27	0.86
SB	28	+	0.61	0.58	0.21	0.70
SL	28	+	0.77	0.72	0.18	0.89
TEST SCALE					0.24	0.79

We further used the Kaiser-Meyer-Olkin (KMO) test to calculate the sampling competence for each variable and the whole model. Individual KMO results for each variable and the whole model is presented in Table 4.9. Higher KMO values imply that our model is consistent for factor analysis. KMO values vary between 0 and 1. Kline (2011) suggests that higher KMO values above 0.70 shows that the variables of interest are correlated and the use of factor analysis is justified. The outcome of our data shows a KMO of 0.86 which is higher than 0.7. This justifies the use of factor analysis.

Table 4.9: Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Variable	**KMO**
CR	0.86
HH	0.90
BO	0.88
HS	0.89
LI	0.84
CA	0.91
AQ	0.87
DI	0.82
ZS	0.85
CB	0.92
SB	0.80
SL	0.77
Overall	0.86

4.4.5 Confirmatory Factor Analysis (CFA)

We used CFA to evaluate the theorized link between the observable estimated variable and the latent construct. CFA is applicable when establishing both convergent and discriminant validity of theoretical constructs which are adjusted for estimated errors. To ensure that our data is valid, we estimated an unstandardized recursive model. The major function of CFA is to get estimates for each calculated variable in the model and identify all estimation residuals precisely before estimating SEM. We start by making sure that the model has been identified by accomplishing distinct set of estimation parameters with unknown values. We set a measurement scale of unobserved latent construct variables variance to 1.00 (see Brown, 2006). In our case we placed a factor loading of unit to 5 banks concentration ratio (CR), the Lerner Index (LI), capital adequacy (CA) and the Z-score (ZS).

Further, we checked for the validity of parameters in CFA by checking the goodness of fit of our model. If our model is fit, we continue with our analysis to explain the coefficients path in the model. There are several methods used to measure goodness of fit. However, the best measure still remains contestable (Hu and Bentler, 1999; Schrieber et al., 2008; Garson, 2010; Kline, 2011). We used the most commonly used goodness of fit methods which comprised of: Comparative Fit Index (CFI), Tucker Lewis Index (TLI), relative Chi-square (CMIN/DF), Standardized Root Mean Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA). For the model to be a good fit: CFI and TLI should be greater or equal to 0.90 (Garson, 2010; Hu and Bentler, 1999); CMIN/DF should be four or less, but not less than one (Kline, 2011); RMSEA and SRMR should be less or equal to 0.05 (Schrieber et al., 2008).

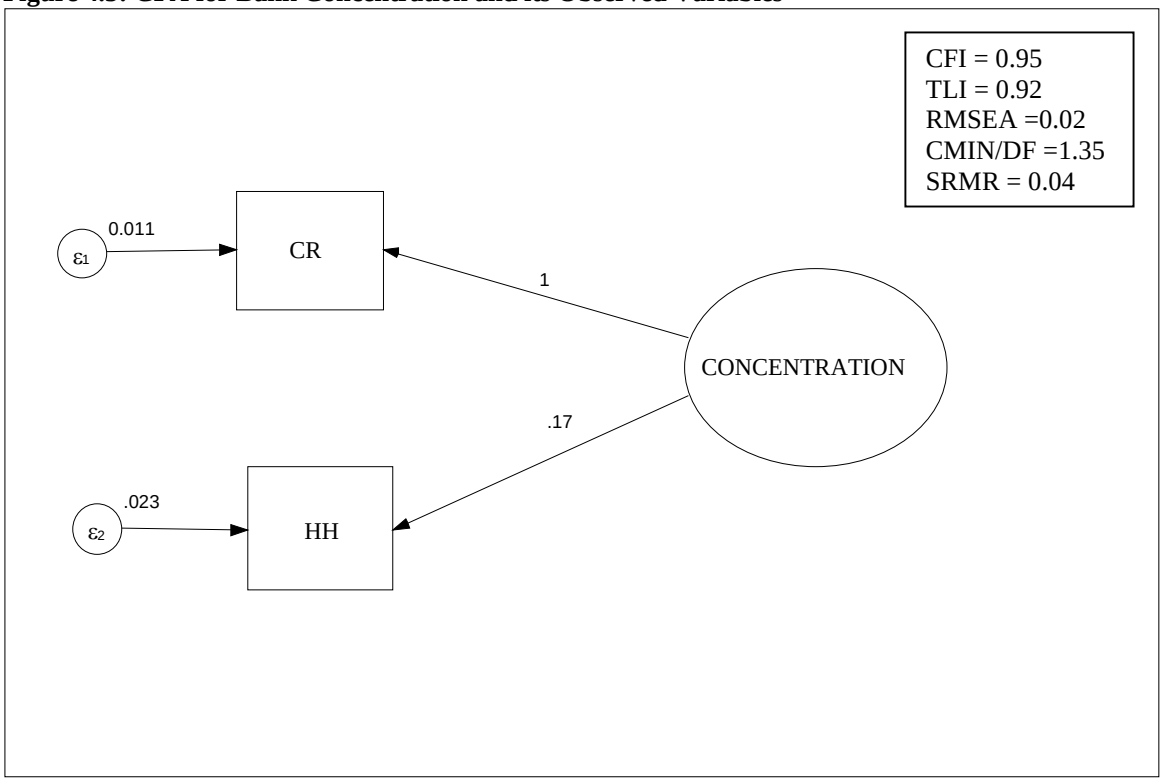
We started performing a CFA on bank concentration as a latent construct and its measurement variables which include: concentration of five banks' assets (CR) and the Herfindahl-Hirschman Index (HH). These variables were allowed to freely correlate with each other but their error terms were mutually exclusive (Bryne, 2001). Figure 4.3 shows the path analysis of the CFA results of bank concentration as the latent construct.

To ensure that our model was well identified we placed a factor loading of one on 5 banks' concentration ratio (CR). This is based on the fact that the concentrationx ratio of five largest banks is highly correlated to the banking sector as shown in our factor rotation matrix. Constraining an indicator variable allows us to determine the relationship between the latent construct and the

exogenous indicator variable in a recursive model. Our identification results showed that the measurement parameter variables well identified our model. Theory predicts that bank concentration rises with an increase in the concentration ratio of assets of the 5 largest banks (Kline, 2011). Our estimation weights of bank concentration as a latent variable in forecasting the measurement variables (concentration ratio of 5 largest banks (CR) and Herfindahl-Hirschman (HH)) was statistically meaningful at P-value smaller than 0.05. The estimation weight of bank concentration in predicting the HH was estimated at 0.17. This implies that when bank concentration increases by one unit then the banking sector experiences a medium level concentration at 0.17. This outcome is consistent with Galetic and Obravodic (2018) who suggested that bank concentration is medium if it ranges between 0.1 and 0.18.

We further conducted a goodness of fit measure on the measurement variables. The outcome of our goodness of fit indices shows that our measurement variables have significant factor loadings to represent bank concentration. Our goodness of fit outcome is also shown in Figure 4.3.

Figure 4.3: CFA for Bank Concentration and its Observed Variables



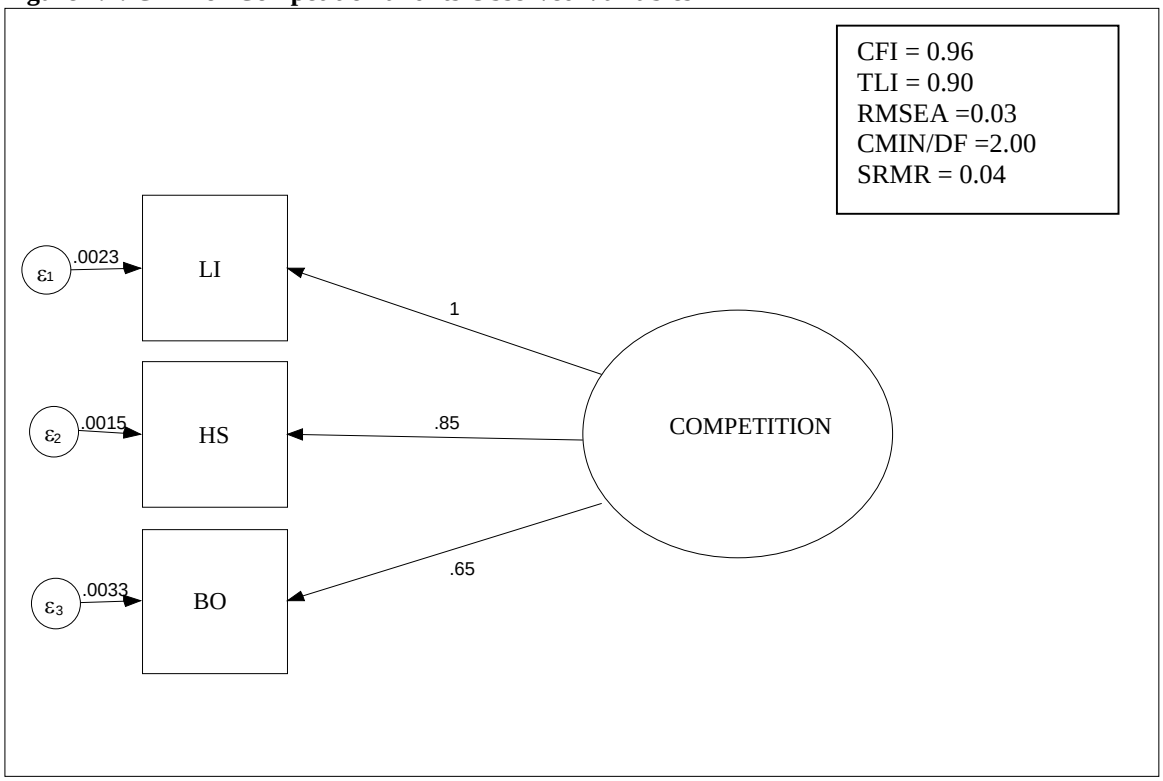
Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

We also conducted a path analysis on the measurement variables of competition as our latent construct. Table 4.4 presents the CFA results for competition and its observed variables.

Competition is estimated using the Boone Indicator (BO), the H-statistics (HS) and the Lerner Index (LI). To ensure that our latent variable is well identified we set a factor loading of unit on LI. Our evaluation weights of competition as a latent construct in forecasting the measurement variables that include: BO and HS were statistically significant at P-value less than 0.05. This suggested that when competition increases by one unit then the BO and HS would have increased in absolute terms by 0.65 and 0.85 respectively. This proves that the measurement variables of competition had a significant factor loading (Park, 2013).

We further proceeded and measured the goodness of fit of our model. The results extracted from the estimation shows that the measurement variables that represent the latent variable (competition) have a significant measure of goodness of fit as shown in Figure 4.4. Therefore, the factor loadings of the measurement variables are significant to proxy competition (latent construct).

Figure 4.4: CFA for Competition and its Observed Variables



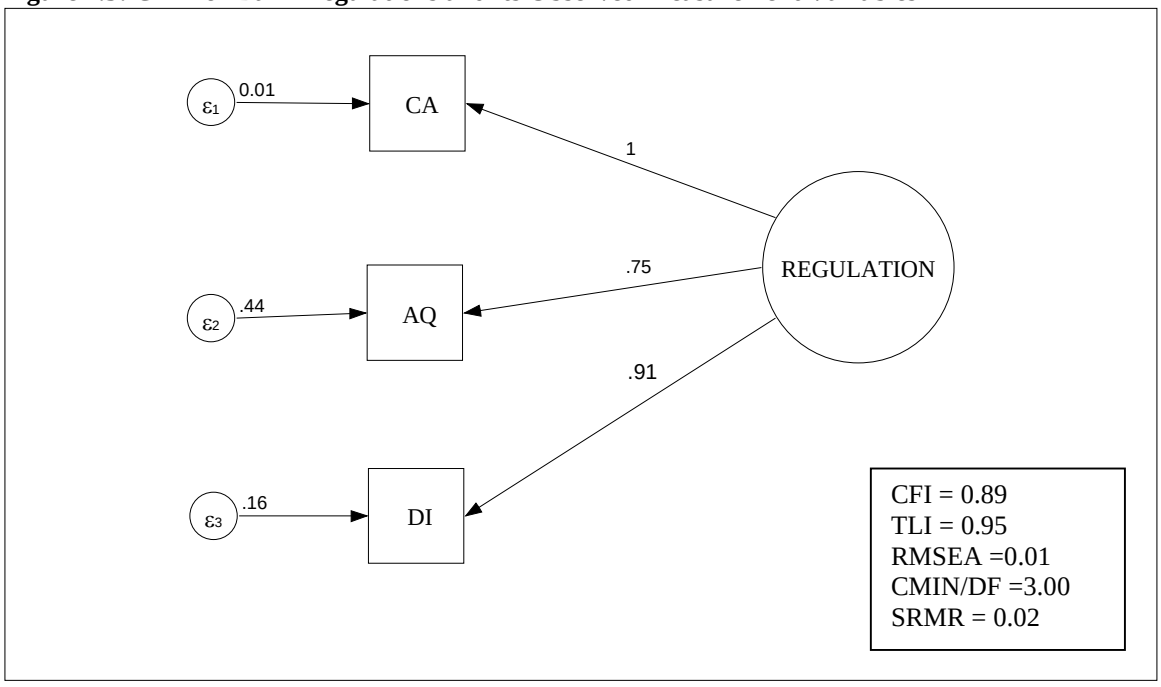
Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

We additionally performed a CFA on bank regulation as a latent exogenous variable. Measurement variables that represent our latent construct include capital adequacy (CA), asset quality (AQ) and debt to operating income ratio (DI). The regression weight of bank regulation in predicting capital

adequacy was set at 1.00 based on existing theoretical conjecture that emphasize on high values of capital adequacy ratio to represent a stable banking system. Our regression weights of bank regulations as a latent construct in estimating the measurement variables that comprise of AQ and DI were statistically significant at P-value less than 0.05. This implies that when bank regulation improves by one unit AQ and DI improves by 0.75 and 0.91 respectively. This confirms that the measurement indicators of bank regulations had a significant factor loading. This finding is consistent with that of Floquet and Biekpe (2008), Camara et al. (2013) and Bruno et al., (2014). Figure 4.5 shows CFA for bank regulation and its measurement variables.

Five goodness of fit tests showed that our model fits well. This implied that our measurement variables were well fit to explain the latent construct (bank regulation). Our goodness of fit results is shown in Figure 4.5.

Figure 4.5: CFA for Bank Regulations and its Observed Measurement Variables



Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

Finally we performed a CFA on financial stability as latent exogenous variables and its proxy for observed endogenous variables that include the Z-score (ZS), ratio of credit provision to bank deposit (CB), Standard deviation of banks' lending rate (SL) and standard deviation of banks' deposit rate (SB). The estimation weight for financial stability in forecasting the Z-score was fixed at 1.00 in line with theoretical underpinnings that implies higher value of Z-score depicts greater

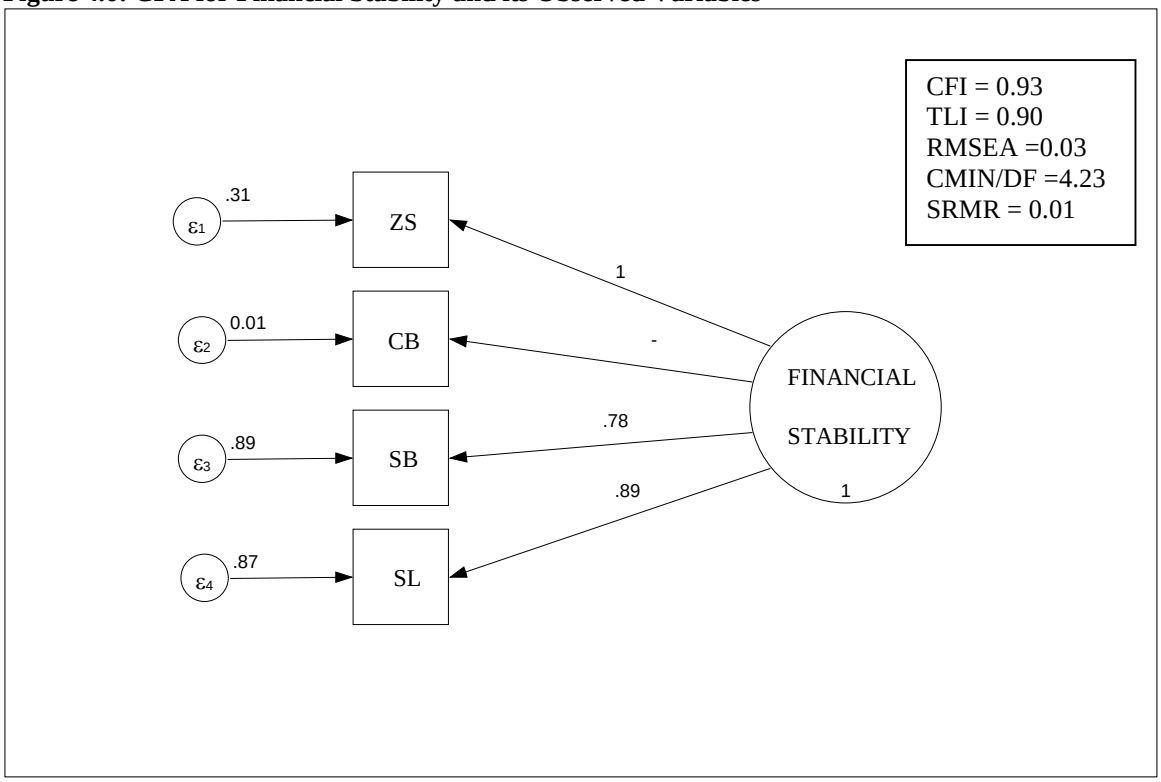
banking stability (Li et al., 2017). The estimation weight for financial stability in projecting CB, SL and SB were all statistically significant at P-value below 0.05. Regression weight of financial stability in forecasting standard deviation of banks' lending rate (SL) and standard deviation of banks' deposit rate (SB) was estimated at 0.28 and 0.36 respectively.

This suggests that when financial stability increases by a unit SL and SB changed by 0.28 and 0.36 respectively. Nevertheless, the deviation is not widely spread from zero which implies that the variation is not so large to impede growth. When the variation is small and positive banks will be able to forecast future returns from lending interest rates and at the same time attract deposits through stable deposit rates (Cihak et al., 2016).

The regression weight of financial stability in predicting ratio of credit provision to bank deposits was estimated at -0.63. This implies that when financial stability improves by one unit, CB reduces by 0.63 units ceteris paribus. There is evidence therefore that the measurement variables that proxy financial stability has significant factor loadings. Figure 4.6 shows the CFA for financial stability and its estimated variables.

We also conducted a goodness of fit test to check if the measurement variables that proxy financial stability in the model met the pre-requisite threshold. All the goodness measures apart from the Chi-Square reported a best fit as shown in Figure 4.6. Hence, we conclude that the factor loadings for the endogenous measurement variables could be relied upon to proxy financial stability.

Figure 4.6: CFA for Financial Stability and its Observed Variables



Note: CFI is Comparative fit index, TFI is Tucker Lewis Index, RMSEA is Root Mean Square Error of Approximation, CMIN/DF is Relative Chi-Square Value and SRMR is standardized root mean residual.

4.4.6 Structural Equation Model (SEM) Results

The structural link between bank concentration, competition (mediating latent construct), bank regulation (control latent construct) and financial stability is depicted in Figure 4.7. The unstandardized coefficient trail of: 5 bank assets concentration ratio (CR), the Lerner Index (LI), capital adequacy (CA) and the Z-score (ZS) were constrained to unit in line with sound theoretical underpinnings (Kline, 2004). For that reason, there was no test of significance for these three paths.

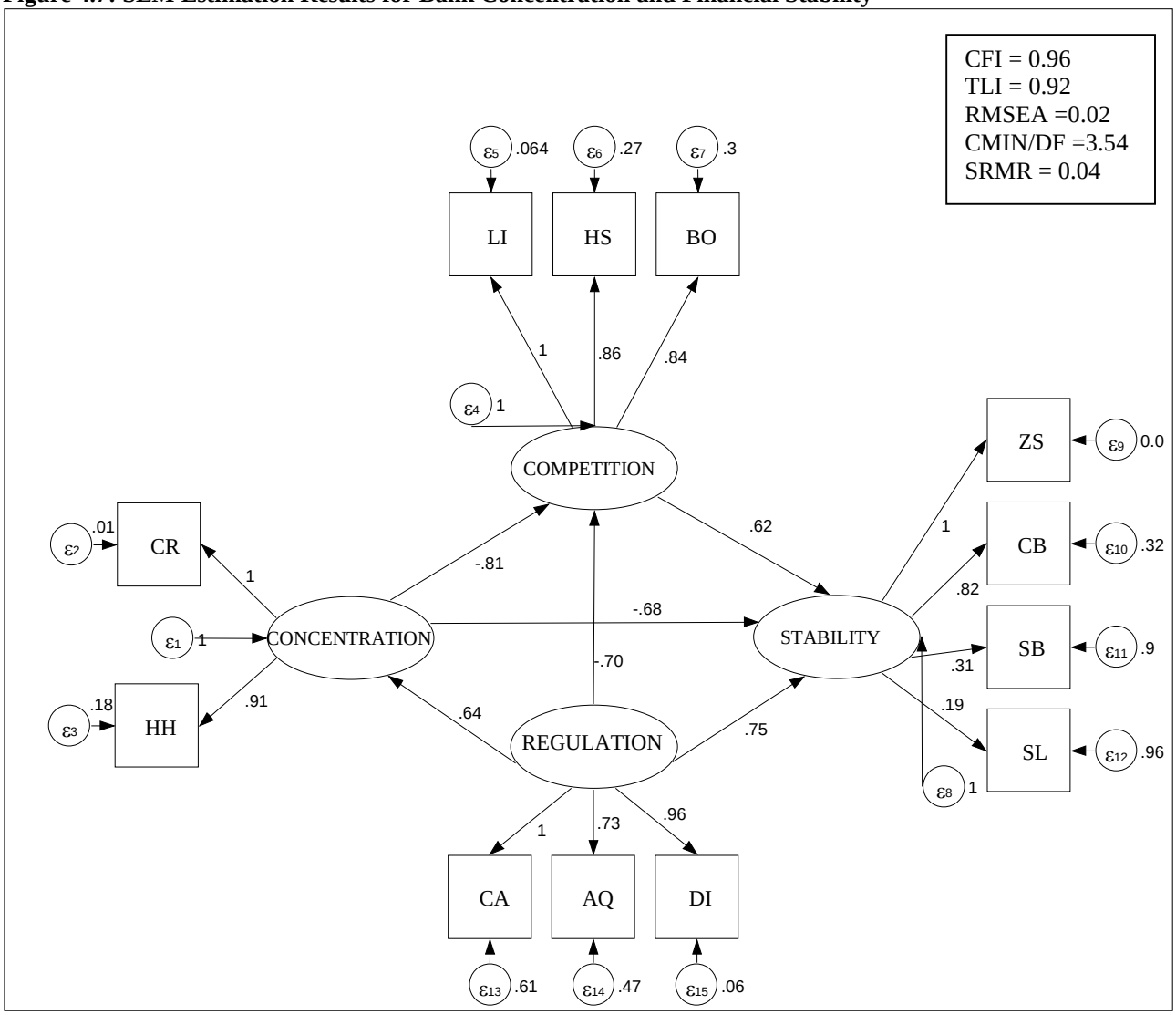
The measureable endogenous variables included: the five banks concentration ratio, Herfindahl-Hirschman Index, Boone Indicator, H-statistics, Lerner Index, capital adequacy, asset quality, debt to income ratio, Z-score, ratio of credit provision to bank deposit, standard deviation of banks' lending rate and standard deviation of banks' deposit rate. The unobserved measureable endogenous variable comprised of competition and financial stability while the unobserved exogenous measureable variable included bank concentration, bank regulations and the residual terms ε_1 to ε_{15}.

The estimation weight for bank concentration in prediction of financial stability was inversely correlated and statistically significant at p-values less than 0.05. This implies that when bank concentration increases by one unit it reduces financial stability by 0.68 units ceteris paribus. Therefore, this suggests that increase in bank concentration may induce banks to increase cost of service provision as well as interest rates. This attracts high risk borrowers, which in turn increases probability of default. High credit risks leads to a reduction in asset quality and banks being exposed to systemic risks. Higher concentration will further induce banks to undertake risky ventures leading to a moral hazard problem. This is attributed to policies that are introduced to protect big banks from failing. Our estimation result therefore supports the 'concentration-fragility' hypothesis and is consistent with existing empirical studies that include: Berger et al. (2009), Soedarmono et al. (2013) and Feldman (2015).

Variables that proxy bank competition (BO, HS, LI) portray a statistically significant positive correlation with variables that represent financial stability (ZS, CB, SB, SL) at P-value below 0.05. Our result supports the competition-stability channel. This implies that a unit increase in competition would improve financial stability by 0.62 units, all other factors held constant. Less competition provides incentive for banks to take excessive risks which renders the banks vulnerable to systemic risks. Similar findings have been documented by Amidu and Wolfe (2012) and Owen and Pereira (2016).The level of bank concentration therefore enhances bank competition leading to a stable financial system over time (see Kamau et al., 2009; Gudmundsson et al., 2013; Obere et al., 2015; Mdoe et al., 2015).

Regression results using control variable suggest that bank regulation is significant and positively correlated to financial stability and bank concentration. In addition, bank regulations are inversely correlated with competition. A unit increase in regulation leads to improvement of financial stability by 0.75 other factors held constant. Consequently, a unit increase in bank regulation increases bank concentration by 0.64 units ceteris paribus. Introducing strict bank regulations that ensure adequate capital, improved asset quality and reduced debt to operating income ratio guarantees banks' stability during a financial crisis (Alhassan et al, 2014).

Figure 4.7: SEM Estimation Results for Bank Concentration and Financial Stability



Tight bank regulations also make incompetent banks to exit the market and facilitate mergers by banks to meet the required threshold. This leads to increased concentration in the market because few competent banks remain to provide services. Our finding is consistent with that of Tsenova (2016). We also find out that a unit improvement of bank regulation reduces competition by 0.70 units. Strict bank regulations increase bank concentration and reduce competition in the banking sector.When banks are few in the market they may form cartels to control the cost of providing banking services. This reduces competition and forms a monopoly market (Jimez and Saurina, 2004).

The regression results also suggested that the variances of the measurement variables for the four latent constructs (bank concentration, competition, regulation and financial stability) were all statistically significant at P-value less than 0.05. This suggests that the variables were well spread which points to an ideal model. To check whether the fit indices are accepted or rejected a goodness of fit test was conducted. The goodness of fit results of bank concentration, competition, regulation and financial stability are reported in Figure 4.7. The results showed that the model met the acceptable threshold hence confirming that there is a significant relationship between the three latent constructs in our model.

4.5 Conclusion and Policy Implications

This chapter sought to explore the link between bank concentration and financial stability with competition as an intervening variable. We used data from GFDD and CBK for the period 2004-2016 to estimate the weights of each measurement variable; we further conducted an exploratory and confirmatory factor analysis. To validate the association between the exogenous latent construct (bank concentration) and the two endogenous latent variables (competition and financial stability) a recursive standardized SEM analysis was performed.

The study identifies a series of new findings and policy implications. SEM analysis confirms that the Kenyan banking sector follows the 'concentration-fragility' hypothesis. Further, competition plays a significant role in ensuring stability of the financial system hence supporting the 'competition-stability' hypothesis. These findings suggest that for the financial system to be stable there should be less concentration and high competition in the Kenyan banking sector.

Therefore, through constructive de-regulation and liberalization of the banking sector, policy makers should introduce policies that encourage easy entry and exit of banks in the market to reduce concentration in the Kenyan banking sector. Such policies should include easy registration of both foreign owned and domestic owned banks and also ensuring that the government owns fewer shares in existing banks to reduce its monopoly power.

Furthermore, to encourage competition in the banking sector and in line with Vision 2030 economic blue print the government should encourage merging of small banks to ensure there is efficiency and introduce an effective institutional framework that would facilitate easy supervision and regulation of the entire banking industry. Policy makers should also introduce policies that

encourage inventions and innovations in the banking sector to encourage effective delivery of services at lower cost and to ensure that efficient banks are well compensated for their services. Information sharing should also be encouraged through full disclosure of books of accounts so as to show the financial standing and market share of a given bank relative to other banks.

Based on our findings and policy implications we conclude that indeed bank concentration and competition have an effect on financial stability in Kenya. Specifically, Kenyan banking system tends to support concentration-fragility hypothesis. Further, regulation negatively affects competition while it has a positive effect on regulation and bank concentration.

Future research should explore both structural and non structural measures of bank concentration and competition that are more tailored to individual specific banks. This will assist in getting the exact level of competition and concentration in the banking sector. Finally, it would be important to consider alternative multivariate analysis to ensure that our findings are consistent with other estimation techniques.

CHAPTER FIVE

CONCLUSIONS

5.1 Introduction

This chapter winds up the thesis by summarizing the key findings, conclusions, policy implications and emerging areas for future research. While there has been a lot of debate on how inclusive finance, prudential regulation and bank concentration affects stability of the financial system, there is limited empirical evidence on what determines financial stability in Kenya.

To uncover this issue, we used data from World Bank's GFDD, IMF Financial Access Survey, Thompson Reuter data base and CBK's bank supervision reports for the period 1990 to 2018, thus providing the first evidence on the relationship between inclusive finance, bank regulation, concentration and financial stability in Kenya. We are confident that this thesis has made significant contributions to the existing empirical study on financial stability debate. First, we have utilized data of financial stability before and after GFC, which is the first of its kind in Kenya. Second, we have used SEM to tackle the problem of implicit estimates of measurement errors which has been overlooked by existing empirical literature.

The main aim of this thesis was to investigate the effect of inclusive finance, bank regulation and bank concentration on financial stability in Kenya. We started by reviewing the existing theoretical and empirical literature with an aim of addressing important questions that relate to our study. We further, organized our study on what is known and what is not known so as to identify the existing knowledge gaps that require our attention. The first chapter laid a background on the link between inclusive finance, bank regulation and financial stability. Utilizing SEM technique, chapter two investigates the effect of inclusive finance on financial system stability while using macroeconomic condition as a control variable. The study used yearly data for the period 2004 to 2017.

Using similar dataset of financial stability and incorporating data of macro and micro prudential regulation obtained from CBK and GFDD for the period 1990 to 2017, Chapter three extends the previous chapter by analyzing the effect of bank regulations on financial system stability. The essay used SEM technique by combining both the exploratory factor analysis and confirmatory factor

analysis to determine this relationship. Chapter four further established the impact of bank concentration on financial system stability using competition as a mediating variable. The study also used SEM approach to determine this relationship and yearly data for the period 1990 to 2017 obtained from CBK and World Bank GFDD data base. Chapter five provides the conclusion, main findings and policy implication of the thesis.

5.2 Summary of Key Findings

Consistent with theory we find that inclusive finance has a significant effect in ensuring financial stability. Further, greater inclusivity ensures effective transmission of monetary policy, which perhaps explains why CBK utilizes monetary policy tools to ensure stability of the financial system. We also observe that there is an inverse relationship between macroeconomic conditions (credit growth rate, real interest rate and inflation rate) and financial stability. Another interesting finding is that there is an inverse significant relationship between macro economic conditions and inclusive finance.

Our results show that both macro and micro prudential regulation are significant for financial stability. Capital adequacy, asset quality, management efficiency and liquidity of the financial system were positively related to financial stability. Turning to macro prudential regulation, our findings suggest that counter cyclical buffer, leverage ratio, Debt to income ratio and capital requirement positively influences financial stability. The choice of macro prudential regulation indicator is therefore imperative for establishing the causality between macro prudential regulation and financial stability. Another interesting finding is that there is a positive correlation between macro and micro prudential regulation. This suggests that both macro and micro prudential regulation complement each other in ensuring stability of the financial system.

Chapter four further established that highly concentrated banking sector may lead to instability of the financial system. This is likely to be the scenario with developing countries which have high levels of bank concentration. We further find that competition is significant in explaining stability of the financial system. Bank regulations also have a negative effect on bank competition but they are positively related to bank concentration and financial stability in Kenya.

5.3 Policy Implications

We have established that access and usage of financial services plays an important role in ensuring financial stability. Therefore this thesis calls for a policy that supports improved access and usage of financial services. Multiple government agencies that include both regulatory authorities and ministries should come up with a financial sector strategy that would allow commercial banks to mobilize deposits, improve information technology and ensure easy usage of financial services through internet and other platforms. However, there is concern that if policy makers focus on increasing access to credit then there are high chances of increasing financial risks, particularly when it leads to a decline in credit quality or increased expansion of the unregulated part of the financial system (see Ardic et al., 2013). Regulations should therefore be designed in a way that aids easy access and usage of financial services but at the same time reduce the informal unregulated financial sector and encourage banks to lend to creditworthy borrowers.

Our empirical evidence further confirms that both macro and micro prudential regulation complement each other to guarantee financial system stability. Regulatory authorities should therefore merge macro prudential regulations such as counter cyclical buffer, leverage ratio, debt to income ratio and capital requirement with micro prudential regulations that target capital adequacy, asset quality, management efficiency and earnings of commercial banks to guarantee stability of the financial system in Kenya. CBK has so far adopted part of Basel III accord that targets macro prudential variable. However, soundness of individual banks also plays a much more important role in ensuring stability of the whole financial system. Therefore, the regulatory authority should draw a clear policy framework that would ensure complementarities and trade-offs between macro and micro prudential regulation with an aim of predicting and mitigating future financial crises.

This thesis has further established that higher bank concentration leads to financial system fragility. We find out that financial system instability may arise due to high concentration which emanates from banks investing in risky ventures and lending to high risk borrowers. Therefore, this thesis calls for policies that promote easy entry and exit of banks in the market. These policies should encourage privatization of state owned banks to reduce monopoly and liberalization of the banking sector.

The evidence of bank competition variables on financial stability calls for introduction of pertinent regulatory policies that create a better environment for competition in the banking sector. This may

include reduction of taxes and fees it levies to commercial banks encourage opening of branches in rural areas, promote merging of small banks to ensure efficiency and introduction of effective institutional framework that would enable the regulatory authority to intervene in affairs of unsound banks. Consequently, policies that encourage invention and innovation should be implemented to promote effective delivery of bank services at lower cost and making sure that efficient banks are well remunerated for their services. Policy makers should encourage information sharing through full disclosure of books of accounts for the public for them to know the financial standing of each bank. This will provide a glimpse on the state of affairs of the bank and its market share relative to its competitors.

5.4 Conclusion

Based on our findings we comparatively found some conflicting inferences in relation to other existing studies. First, inclusive finance in terms of access and usage plays an important role in ensuring financial stability. This helped in creating an understanding of the importance of financial development in form of mobile phone banking, e-banking and bank product differentiation in Kenya for the past one decade. Second, bank regulations (both macro and micro prudential regulations) are significant in ensuring stability of the financial system. Third, the Kenyan banking sector supports 'concentration-fragility' hypothesis and that competition plays an important role in ensuring stability of the financial system. Regulation is also positively affects bank concentration and financial stability but has an inverse effect on bank competition.

5.5 Areas for Further Research

We established that inclusive finance in terms of access and usage has an impact on financial system stability. In spite of this significant finding it is necessary to factor in quality of finance as a proxy of inclusive finance. This is because inclusive finance is multidimensional since it does not necessarily mean that if an individual has access he is financially included. Inclusive finance goes beyond access and looks at how an individual uses financial services and whether it effectively meets their needs. This implies that measuring quality in addition to access and usage is vital as it provides a platform for guiding policy makers to make relevant policies that factor in all economic agents. However, this will only be possible with availability of data.

With regards to regulation and financial stability, future research could be carried out on the effect of non-bank financial institution (NBFI) regulations that include micro finance institutions,

insurance companies, capital markets and Savings and Credit Cooperative Organizations (SACCO) on financial system stability. This is because NBFIs are also part of the financial system in Kenya and just like commercial banks they play an important intermediators role on financial mobilization and investments. In addition, future research should incorporate both structural and non structural measures of bank concentration and competition that are more tailored to individual specific banks so as to get the exact level of competition and concentration in the banking sector. Finally, it would be important to consider alternative models so as to ensure that our data has been well fit over time and to consider the importance of measurable variables that have been dropped from our model.

REFERENCES

Abata, M. A. (2014). Asset Quality and Bank Performance: a Study of Commercial Banks in Nigeria. *Research Journal of Finance and Accounting*, 5(18), 39-14.

Adasme, O., Majnoni, G. & Uribe, M. (2006). Access and Risk: Friends or Foes? Lessons from Chile. *World Bank Policy Research Working Paper,* 4003. The World Bank, Washington DC, USA.

Acemoglu, D. & Zilibotti, F. (1997). Was Prometheus Unbound by Chance? Risk, Diversification, and growth. *Journal of Political Economy*, 105(1), 709-775.

Acharya, V. V. (2009). A Theory of Systematic Risk and Design of Prudential Bank Regulation. *Journal of Financial Stability*, 5(1), 224-255.

Acharya, V., Schnabl, P., & Richardson, M. (2009). How Banks Played the Leverage Game. Restoring Financial Stability: how to repair a failed System. *Journal of Financial Market Institutions and Instruments*, 18(2), 144-145.

Aduda, J., &Kalunda, E. (2012). Financial Inclusion and Financial Sector Stability with Reference to Kenya: A Review of Literature. *Journal of Applied Finance & Banking,* 2(6), 95-120.

Adrian, T., & Liang, T. (2014). Monetary Policy, Financial Conditions and Financial stability. *Federal Reserve Bank of New York Staff Report No. 690*.

Aghion, P., Dewatripont, M., & Rey, P. (1999). Competition Financial Discipline and Growth. *Review of Economic Studies*, 66(1), 825-862.

Aghion, P., Bloom, N., Blundell, R., Griffith, R., &Howitt, P. (2005): Competition and Innovation: An Inverted-U Relationship. *The Quarterly Journal of Economics*, 120(2), 701–728.

Agoraki, M., Delis, M., & Pasiouras, F. (2011). Regulations, Competition and Bank Risk-Taking in Transition Countries. *Journal of Financial Stability*, 7(2), 38-48.

Ahamed, M. M. and Mallick, S. (2017). Is Financial Inclusion Good for Banking Stability? International Evidence. *Journal of Economic Behavior and Organization*. Retrieved from https;//doi.org/10.1016/j.jebo.2017.07.027.

Ahmed, A., Mohammed, Y., & Adisa, O. A. (2014). Loan Loss Provision and Earnings Management in Nigerian Deposit Money Banks. *Mediterranean Journal of Social Sciences*, Vol. 5(17), 49-58.

Aikman, D., Andreas, L., Nellie. L., & Michele, M. (2016). Financial Vulnerabilities, Macroeconomics Dynamics, and Monetary Policy. Finance and Economics Discussion series 2016-2055. Washington: *Board of Governors of the federal system,* Retrieved from http:/dx.doi.org/10.17016/FEDS.2016.055.

Aikman, D., Bush, O., & Taylor, A. M. (2016). Monetary Versus Macro Prudential Policies: Causal Impacts of Interest Rates and Credit Controls in the Era of Radcliffe Report. *National Bureau of Economic Research,* Working Paper Series No. 22380.

Akingbade, G. K. (2011). Relationship between Financial Innovation and Commercial Banks Performance in Nigeria. *Journal of Banking and Finance*, 1(2), 277-296.

Alexander, K. (2006). Corporate Governance and Banks: The Role of Regulation in Reducing the Principal-Agent Problem. *Journal of Banking Regulation,*7(2), 17-40.

Ali, M. S., Timoumi, I., & Rami, Z. (2015). Banking Concentration and Financial Stability: Evidence from Developed and Developing Countries. *Economics Discussion Papers,* No 2015-22, Kiel Institute for the World Economy.

Alhassan, A. L., Kyereboah-Coleman, A., & Ando, C. (2014). Asset Quality in a Crisis period: An Empirical Examination of Ghanaian Banks. *Journal of Review of Development Finance,* 4 (1), 50-62.

Allen, F. (1990). The Market of Information and the Origin of Financial Intermediaries. *Journal of Financial Intermediation*, 1(3), 3-30.

Allen, F., & Gale, D, (2000c). Financial Contagion. *Journal of political Economy*, 108, 1-33.

Allen, F., & Gale, D. (2000). Comparing financial systems. *MIT Press, Cambridge, MA.*

Allen, F., & Gale, D. (2004). Competition and Financial Stability. *Journal of Money, Credit and Banking,* 36, 453-480.

Allen, F., & Elena, C. (2014). Mark-to-Market Accounting and Liquidity Pricing. *Journal of Accounting and Economics*, 45(2-3), 358-378.

Allen, F. &Gu. X. (2018). The Interplay between Regulation and Financial Stability. *Journal of Financial Services Research,* 53 (2-3), 233-248.

Alfi, A. F. (2014). Understanding Financial Stability & Macro-prudential Policy. *The Economic Journal,* 122(565), 1346-1372.

Alawode A. A.,& Al Sadek M. (2008). What is Financial Stability? *Central Bank of Bahrein,* Financial Stability Paper Series No. 1.

Amanja, D. M. (2015). Financial Inclusion, regulation and Stability: Kenyan Experience and Perspective. United Nation Conference on Trade and Development. *Multi-Year Expert Meeting on Trade, Services and Development*. Geneva, 11-13 May 2015.

Amatus, H., & Alireza, N. (2015). Financial Inclusion and Financial Stability in Sub -Saharan Africa (SSA). *The International Journal of Social Science*, 36(1), 40-49.

Amidu, M., & Wolfe, S. (2013). The Effect of Banking Market Structure on the Lending Channel: Evidence from Emerging Markets. *Review of Financial Economics*, 22, 146-157.

Andrew, G. H. (2013). Constraining Discretion in bank regulation. *Federal reserve bank of Atlanta Conference* on "Maintaining Financial Stability: Holding a Tiger by the Tail(s). Atlanta 9 April 2013.

Angelini P., & N. Cetorelli, (2003). Bank Competition and Regulatory Reform: The Case of the Italian Banking System, *Journal of Money Credit and Banking*, 35, 663-684.

Ardic, O., Mylenko, N., & Saltane, V. (2011). Small and Medium Enterprises a Cross-Country Analysis with a New Data Set, *World Bank*, Policy Research Working Paper 5538.

Arkelof, G. A. (1970). The Market For 'Lemons': Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics*, 84(3), 488-500.

Athansoglou, P., Brissimis, S. N., & Delis, M. D. (2005). Bank Specific, Industry Specific and Macroeconomic Determinant of Bank Profitability. *Journal of International Finance Markets, Institutions and Money*, 18(2), 121-136.

Bachas, P., Gertler, P., Higgins, S. & Seira, E. (2017). Banking on Trust: How Debit Cards Help the Poor to Save More. NBER Working Paper series. Cambridge MA.

Baele, L., Jonghe, O.D., and Venner, R.V. (2007). Does Stock Market Value Bank Diversification? *Journal of Banking and Finance*, 31(8),1999-2023.

Bagehot, W. *(1873).* A Description of the Money Market. Lombard Street *(1 ed.). New York: Scribner, Armstong & Co*. Retrieved 21 July 2014.

Bain, J. S. (1959). Industrial Organization. *John Wiley and Sons, New York.*

Baldwin, R., & Cave, M. (1999). Understanding Regulation: Theory Strategy and Practice. *Oxford University Press*, Chapters 2, 3(1), 9-33.

Baral, k. J. (2005). Health Check-Up of Commercial Banks in the Framework of CAMEL: A Case Study of Joint Venture Banks in Nepal. *Journal of Nepalese business Studies*, 2 (1), 41-45.

Barr, R. S., Killgo, K. A., Siems, T. F. & Zimmel, S. (2002). Evaluating the Productive Efficiency and Performance of US Commercial banks. *Journal of Managerial Finance*, 28 (8), 3-25.

Barth, J. R., Caprio, Jr., &Levine, R. (2001). The Regulation and Supervision of Banks Around the World: a New Database. In: Litan, R.E., Herring, R., (Eds.), Integrating Emerging markets into Global Financial System. Brookings-Wharton Papers in Financial Services, *Brooking-Institution Press*, 183-240.

Baumal, W. J. (1982). Contestable markets: an uprising in the theory of industry structure. *American Economic Review,* 72(1), 1-15.

Baum, C., Caglyan, M., & Ozkan, N. (2005).The Second Moments Matter: The Response of Bank Lending Behavior to Macroeconomic Uncertainties. *Boston College,* Working paper No. 521.

Bara, A., Mugano, G., &Le Roux, P. (2017). Bank Concentration, Country Income and Financial Development in SADC. *Journal of Southern African Business review*, 2(1), 23-45.

Barth, J. R., Gerard, C., & Ross, L. (2001). Banking Systems Around the Globe: Do Regulation and Ownership Affect Performance and Stability?" *In: F. Mishkin (ed.), Financial Supervision and Regulation: What Works and What Doesn't, Chicago, IL: Chicago University Press,* 31-88.

Beck, T., Demirgüç-Kunt, A.,& Levine, R. (2003). Bank Concentration and Crises. *The World Bank,* Policy Research Working Paper Series No. 3041.

Beck, T., Demirguc-Kunt, A., & Levine, R. (2006a). Bank Concentration, Competition and Crises: First results. *Journal of Banking & Finance*, 30(5), 1581–1603.

Beck, T., Demirguc-Kunt, A., & Levine, R. (2006b). Bank Concentration and Fragility: Impact and Mechanics. In*: Carey, M., Stulz, R. (eds.),* The Risks of Financial Institutions. *University of Chicago Press: Chicago*.

Beck, T.,& De la Torre, A. (2007). The Basic Analytics of Access to Financial Services. *Financial Markets, Institutions & Instruments,* 16(2), 79–117.

Beck, T. (2008). Bank Competition and Financial Stability: Friends or Foes? Policy Research. The World Bank, Working Paper Series 4656.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2010). Financial Institutions and Markets across Countries and over Time: The Updated Financial Development and Structure Database." *World Economic Review*, 24(1), 77–92.

Beck, T, Demirguc-Kunt, A. & Merrouche, Q. (2013). Islamic Versus Conventional Banking Business Model, efficiency and Stability. *Journal of Banking and Finance*, 37, 433-447.

Beltratti, A &Stulz, R. M. (2012). The Credit Crisis Around the World: Why Did Some Banks Perform Better? *Journal of Financial Economics*, 105(1), 1-7.

Bentley, A. F. (1908). The Process of Government. A study of Social Pressure. *American Journal of Sociology*, 13(5), 698-706.

Berger, A. N. (1995). The Profit-Structure Relationship in Banking – Tests of Market-Power and Efficient-Structure Hypotheses. *Journal of Money, Credit and Banking*, 27, 404-431.

Berger, A. N., & Mester, L. J. (1997). Beyond the Black Box: What explains Differences in the Efficiencies of Financial Institutions? *Journal of Baking and Finance,* 21(1).

Berger, A. N., & DeYoung, R. (1997). Problem Loans and Cost Efficiency in Commercial Banks. *Finance and Economic Discussion Series, 1997-98*. Board of Governors of the Federal Reserve System (US).

Berger, A. N., Richard J. R., & Gregory F. U. (2003). Does Market Size Structure Affect Competition? The Case of Small Business Lending. *Board of Governors of the Federal Reserve System,* Working Paper No. 28.

Berger, A. N., Demirgüç-Kunt, A., Levine, R. & Haubrich, G. J. (2004). Bank Concentration and Competition: An Evolution in the Making. *Journal of Money, Credit and Banking,* 36, 433-451.

Berger, A. N., Klapper, L. F. & Turk-Ariss, R. (2008). Bank Competition and Financial Stability. *The World Bank,* Policy Research Working Paper. No. 4696.

Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2009). Bank competition and Financial Stability. *Journal of Financial Services Research*, 35(2), 99–118.

Berger, A., & Bowman, C. (2013). How does capital affect bank performance during financial crises? *Journal of Financial Economics,* 109, 146–176.

Bhattacharya, S., Boot, A., & Thakor, A. (1998). The Economics of Bank Regulation. *Journal of Money, Credit and Banking,* 30(4), 745-70.

Bichangi, W. O., & Karani, S. R. (2012). Effect of Total Quality Management Implementation on Business Performance in Service Institution: A Case of Kenya Wildlife Services. *International Journal of Research Studies in Management*, 1(1), 34-56.

Bikker, J. A., & Haaf, K. (2002). Competition, Concentration and their Relationship: An Empirical Analysis of the Banking Industry. *Journal of Banking& Finance*, 26(11), 2191 – 2214.

Blahova, N. (2015). The relationship Between Macro Prudential and Micro Prudential Policy: An Example of Regulatory Bank capital. *Procedia Economics and Finance*, 25(1), 428-434.

Blanchard, O., Dell'Ariccia, G. & Mauro, P. (2010). Rethinking Macroeconomic Policy. *IMF Staff Position Note* SPN/10/03, 12 February.

Bloom, N., Genakos, C., Sadun, R.,& Reneen, V. J. (2009). Management Practices across Firms and Countries. *Harvard Business School*, Working Paper 12-52.

Blunch, N.J. (2008). Introduction to Structural Equation Modeling Using SPSS and AMOS. *London: Sage Publications*.

Bollen, K. (1989). Structural Equations with Latent Variables. *New York*: Wiley.

Boone, J. (2008). A New Way to Measure Competition. *Economic Journal*, 118(531), 1245–1261.

Borio, C. E., English, W. B., & Filardo, A. J. (2003). A Tale of Two Perspectives: Old or New Challenges for Monetary Policy? *BNL Quarterly Review,* 221(2), 143-175.

Borio, C. (2003). Towards a Macro prudential Framework for Financial Supervision and Regulation? *Bank for International Settlement*, Working Paper No. 128.

Boyd, J. H., & Prescott, E.C (1986). Financial Intermediary-Coalitios. *Journal of Economic Theory*, 38, 211-232.

Boyd, J. H., & De Nicolo, G. (2005). The Theory of Bank Risk Taking and Competition Revisited. *The Journal of Finance*, 60(3), 1329–1343.

Boyd, J. H., De Nicolo, G., & Jalal, A. M. (2006). Bank Risk-Taking and Competition Revisited: New theory and new evidence. *International Monetary Fund*, IMF Working paper WP/06/297.

Bresnahan, T. (1989). Empirical Studies of Industries with Market Power. *Handbook of Industrial Organization*, 2(1).

Brown, T. A. (2006). Confirmatory Factor Analysis for Applied research. *Guilford Publications*.

Brucker, E. (1970). A Microeconomic Approach to Banking Competition. *Journal of Finance*, 25(5), 1133-1141.

Bruno, V., Shim, I., & Shin, H. S. (2014). Comparative Assessment of Macro Prudential Policies. *Bank for International Settlement*, Working paper 502.

Bryne, B. M. (2001). Structural Equation Model with AMOS: Basic Concept Application and Programming. *Mahwah, NJ: Lawrence Erlbaum Associates*.

Buku, M. W. & Meredith, M. W. (2013). Safaricom and M-PESA in Kenya: Financial Inclusion and Financial Integrity. *Washington Journal of Law, technology and Arts,* 8(3), 21-45.

Busch, M. O. (2017). Broadening the G20 Financial Inclusion Agenda to Promote Financial Stability. The Role for Regional Banking Networks. *G20 insights, Policy Briefs.*

Busch, R. & Memmel, C. (2015). Banks' Net Interest Margin and Level of Interest. *Bundesbank* Discussion Paper *No*. 16.

Byrne, B. (2006*).* Structural Equation Modeling with EQS: Basic Concepts, Applications and Programming(2nd ed.). *Mahwah, N.J.: Erlbaum*.

Camara, B., Distinguin, I., & Roulet, C. (2013). Bank regulatory capital and Liquidity: Evidence from US and European Publicly Traded banks. *Journal of Banking and Finance,* 37(2), 3295-3317.

Caminal, R., & Matutes, C. (2002). Market Power and Banking Failures. *International Journal of Industrial Organization*. 20(9), 1341–1361.

Capelle-Blanchard, G., & Chauveau, T. (2004). L'apport de Modeles and Quantitatifs a la Supervision Bancaire en Europe. Revue Francaise d'economie, 19(1), 77-120.

Caprio, G., & Klingebiel, D. (1997). Bank Insolvency: Bad Luck, Bad Policy, or Bad Banking, in Bruno, M. and B. Plakovic (eds.), *Annual World Bank Conference on Developing Economics*, Washington, World Bank.

Carlos, A., & Olaya, B. (2012). Macroeconomic Determinants of Non-Performing Loans in Spain and Italy. *Department of Economics*, Leicester University.

Catena, M. (200). Efficiency Structure Hypothesis: An Application to the Argentine Banking Sector. Central Bank of Argentine Republic, Working Paper No. 12.

Caskey, P. J. (1992). Macroeconomic Implications of Financial Sector Reform Program in Sub-Saharan Africa. *Swarthmore College. September*.

Cazla, A., Gartner, C., &Souza, J. (2003). Modeling the Demand for Loans to the Private Sector in the Euro Area. *Journal of Applied Economics*, 35(1), 107-117.

Cazla, A., Manrique, M., & Souza, J. (2004). Credit in the Euro Area: An Empirical Investigation using Aggregate Data. *Quarterly Review of Economics and Finance*, 46(1), 211-226.

Central Bank of Kenya, (2018). The Impact of Interest Rate Capping on the Kenyan Economy: Highlights. Central Bank Printer. Available at http://www.centralbank.go.ke.

Central Bank of Kenya, (2007-2017). Kenya Financial Sector Stability Report. Various Issues 2007-2016. Central Bank Printer. Available at http://www.centralbank.go.ke.

Central Bank of Kenya, (1990-2017). Kenya Banking Supervision Annual Report. Various Issues 1996- 2017. Central Bank Printer. Available at http://www.centralbank.go.ke.

Cerruti, E., Jihad, D., & Dell'Aricca G. (2015). Housing Finance and Real-Estate Boom: a Cross-Country perspective. *IMF Staff Discussion Note*, SDN/15/12.

Cetorelli, N., & Gambera, M. (2001). Banking Market Structure, Financial Dependence and Growth: International Evidence from Industry Data. *Journal of Finance*, 56(1), 617-648.

Chang, E. J., Guerra, S. M., Lima, E. J. A., & Tabak, B. M. (2008). The stability–concentration relationship in the Brazilian banking system. *International Financial Markets, Institutions and Money*, 18(1), 388–397.

Chernykh, L., & Cole, A. R. (2011). Does Deposit Insurance Improve Financial Intermediation? Evidence from the Russian experience. *Journal of Banking and Finance*, Vol. 35, pp. 388-402

Christopoulos, A. G., Mylonakis, A. G.,& Diktapanidis, P. (2011). Could Lehman Brothers Collapse be anticipated? An Examination Using CAMELS Rating System. *Journal of International Business Research*, 4(2), 11-19.

Chu, H. C. (2011). Deposit Insurance and Banking Stability. *Cato Journal*, 31(2), 1-20.

Ciancanelli, P., & Reyes-Gonzalez, J.A. (2000). Corporate Governance in Banking: a Conceptual Framework. (Undated), Available at SSRN: *https://ssrn.com/abstract-253714.*

Ciapanna, E., & Rondinelli, C. (2011). Retail Sector Concentration and Price Dynamics in the Euro Area: A Regional Analysis. *SSRN Electronic Journal,* retrieved at 10.2139/ssrn.2023086.

Cifter, A. (2015). Bank Concentration and Non-Performing Loans in Central and Eastern European Countries. *Journal of Business Economics and Management*. 16(1), 54-78.

Cihak M.,& Melecky M. (2016). 'The Nexus of Financial Inclusion and Financial Stability: A Study of Possible Trade-offs and Synergies'. The Word Bank, *Policy Research Paper Series.*

Claessens, S., & Laeven, L. (2003). Financial Development Property Rights and Growth. *Journal of Finance*, 58(1), 2401-2436.

Claessens, S., & Laeven, L. (2004). What Drives Bank Competition? Some International Evidence. *Journal of Money, Credit and Banking*, 36(3), 563–583.

Claessens, E., Swati, G., & Roxana, M. (2013). Macro Prudential Policies to Mitigate Financial System Vulnerabilities. *Journal of International Money and Finance*, 39, 153-185.

Clark, E., & Jokung, O. (2015). The Role of Regulatory Credibility in Effective Bank Regulation. *Journal of Banking and Finance*, 50, 506-513.

Consultative Group to Assist the Poor, (2009). Financial Access 2009: Measuring Access to Financial Services around the World. *MSN P 3-300, 1818 H Street, NW, Washington DC 20433 USA.*

Cook, W., & McKay, C. (2017). Banking in the M-PESA Age. Lessons from Kenya. *Consultative Group to assist the Poor (CGAP). Working Paper.*

Corbo, V. (2010). Financial Stability in a Crisis: What is the Role of the Central Bank.? Perspectives on inflation targeting, financial stability and the global crisis. *BNL Quarterly Review,* 221(2), 143-175.

Cornett, M. M., McNutt, J. J., Strahan, P. E., &Tehranian, H. (2011). Liquidity Risk Management and Credit Supply in the Financial Crisis. *Journal of Financial Economics*, 101, 297-312.

Craig, B. R., William E. J., & James B. T. (2006). Small Firm Finance, Credit Rationing and the Impact of SBA-Guaranteed Lending on Economic Growth. *Journal of small Business Management, 45*(1), 116-132.

Cronbach, L.J. (1951). Coefficient Alpha and the internal structure of tests. *Psychometrika,* 16(3), 297-334.

Cuestas, J. C., Lucotte Y., & Reigl, N. (2017). Banking Sector Concentration, Competition and Financial Stability: The Case of the Baltic Countries. Eesti Pank *Working Paper* 7.

Cull, R., Ehrbeck, T., &Holle, N. (2014). Financial Inclusion and Development: Recent Impact Evidence. Focus Note 92, *CGAP*, Washington, DC.

Crowe, C. W., Dell'Ariccia, G., &Rabanal, P. (2011). How to Deal with Real Estate Booms. *IMF Staff Discussion Note* 11/02.

Cuestas, J. C., Lucotte Y., &Reigl, N. (2017). Banking Sector Concentration, Competition and Financial Stability: The Case of the Baltic Countries. Eesti Pank *Working Paper* 7/2107.

Dang, U. (2011). The CAMEL Rating System in Bank Supervision. A case Study of Arcada. *University of Applied Science,* International Business.

Dattels, P., Miyajim, R., & Puig, J. (2010). Can You Map Global Financial Stability? IMF Working Paper, 10/145.

Davies, S.W. (1979), Choosing between Concentration Indices: The Iso-Concentration Curve, *Economica*, 46(1), 67-75.

Demetriades, P. O. & Siong, H. L. (2006). Financial, Institution and Economic Development. *International Journal of Finance and Economics*, 11(3), 245-260.

Dell'Ariccia, G., Igan, D., Laeven, L., Tong, H., Bakker, B., & Vandenbussche, J. (2012). How to deal With Credit Booms. *IMF Staff Discussion Note* 12/06.

Demirguc-Kunt, A., & Enrica D. (1998). Financial Liberalization and Financial Fragility. *World Bank Policy Research Working Paper Series*, No. 1917.

Demirguc-Kunt, A., & Detragiache, E. (2000). Does Deposit Insurance Increase Banking System Stability? *IMF Working Paper*, 00/3.

Demirguc-Kunt, A., & Ross, L. (2001). Bank-based and Market-based Financial Systems: Cross-Country Comparisons. In: Demirgüç-Kunt, Asli and Ross Levine (Eds.): *Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets, and Development, Cambridge, MA: MIT Press.*

Demirguc-Kunt, A., & Detragiache, E. (2002). Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation. *Journal of Monetary Economics*, 49(7), 1373-1406.

Demirguc-Kunt, A., Detragiache, E., & Tressel, T. (2008). Banking on the Principles: Compliance with Basel Core Principles and Bank Soundness. *Journal of Financial Intermediation,*17(1), 511-542.

Demirguc-Kunt, A., Detragiache, E., & Merrouche, O. (2010). Bank capital: Lessons from the Financial Crisis. *IMF Working Paper*, No. 1-35.

Demirguc-Kunt, A. Klapper, L., & Singer, D. (2017). Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence. *World Bank Group,* Policy Research Working Paper, No. 8040. Washington, D.C.

Demirguc-Kunt, A. Klapper, L. Singer D., & Van Oudheusden, P. (2015). The Global Findex Database 2014: Measuring Financial Inclusion around the World. *The World Bank*,Policy Research Working Papers Series 7255.

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution. Washington, DC: *World Bank.*

Demirguc-Kunt, A. Martinez, P. Maria, S., & Tressel, T. (2015). The Impact of the Global Financial Crisis on Firms' Capital Structure. *The World Bank, Policy Research Working Paper Series 7522.*

De Nicolo, G. (2000). Size, Charter value and Risk in Banking: An International Perspective, *International Finance Discussion Paper* no. 689, Board of Governors of the Federal Reserve System.

Demsetz, H. (1974). Two Systems of Belief about Monopoly. In *H. Goldschmidt, H. Michael Mann and J. Fred Weston, eds*. Industrial Concentration: The New Learning. Boston: Little, Brown and Co. 164-84.

Deniz, A., Demirguc-Kunt, A., & Zhu, M. (2013). How Does deposit Insurance Affect bank risk? Evidence From The recent Crisis. *Journal of Banking and Finance,* 54(1), 45-78.

Dhal, S., Kumar, P., &Ansari, J. (2014). Financial Stability, Economic Growth, Inflation and Monetary Policy Linkages in India: An Empirical Reflection. Reserve Bank of India Occasional Papers. 32(3).

Diamond, D., & Dybvig, P. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*,91(3), 401–9.

Dimitrios, A., Louri, H., &Tsionas, M. (2011). Determinants of Non-Performing Loans: Evidence from Euro-Area Countries. *Journal of Finance Research Letters*, 18, 116-119.

Djankov, S., Miranda, P., Seira, E., &Sharma, S. (2015). Who Are The Unbanked? *The World Bank,* Policy research Working Paper Series 4647.

Djibril, M. M. (2013). Deepening Financial Inclusion in West Africa. CGAP Blog Post, Consultative Group to Assist the Poor, retrieved from http://www.cgap.org/.

Diamond, Douglas W., & Philip H. D. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy,* 91(5), 401–19.

Duttagupta, R. and Cashin, P. (2011). The Anatomy of Banking Crises, *Journal of International Money and Finance*, 30(2), 354-376.

Eichengreen, B., & Rose, A.K. (1998).Contagious Currency Crises: Channels of Conveyance. *Journal of Economics,* 20(1), 50-56.

Ekpu, V. (2016). Micro Prudential Versus Macro Prudential Approaches to regulation and Supervision. Lecture Presented at a *Regional Course and Advanced Banking supervision and Financial Stability for Members of the College of Supervisors of the West African Monetary Zone* (CSWAMZ). Lagos, Nigeria.

Elliot, D., Feldberg, G., &Vuletin, G. (2014). Reserve Requirement Policy over the Business Cycle. *National Bureau of Economic Research,* Working Paper Series No. 20612.

Elzinga, K. G., & Mills, D. E. (2011). The Lerner index of monopoly power: origins and uses. *The American Economic Review*, 101(3), 558–564.

Ennis, H., & Keister, T. (2006). Bank Runs and Investment Decisions Revisited. *Journal of Monetary Economics,* 53(2), 217-232.

Erina, J. & Lace, N. (2013). Commercial Banks profitability indicators: *Journal of Empirical Business Review*, 2(1), 1-9.

Erturk, K. A. (2006). Asset Price Bubbles, Liquidity Preference and the Business Cycle. *International Review of Economics*, 57(2), 121-283.

Evrensel, A. Y. (2008). Banking Crisis and Financial Structure: A survival-time analysis. *International Review of Economics & Finance*, 17(4), 589–602.

Fan, H., Lee, A, Amalia, L., &Gao, Q. (2018). The Assessment of Systematic Risk in the Kenyan Banking Sector. *Glorius Sun School of Business and Management, Donghua University, Shanghai, China,* 20(8), 1-15.

Farhi, E., &Tirole, J. (2012). Collective Moral Hazard, Maturity Mismatch and Systematic Bailouts. *Journal of Economic Review,* 102(1), 60-93.

Feldman, H. (2015). Banking System Concentration and Unemployment in Developing Countries. *Journal of Economics and Business*, 77, 60–78.

Fernandez, A. I., Gonzalez, F., & Suarez, N. (2010). How Institutions and Regulation Shape the Influence of Bank Concentration on Economic Growth: International Evidence. *International Review of Law and Economics*, 30(1), 28-36.

Festic, M., Kavkler, A., & Repina, S. (2011). The Macroeconomic Sources of Systematic Risk in the Banking Sectors of Five New EU member states. *Journal of Banking and Finance*, 35(2), 310-322.

Financial Sector Deepening Kenya (2016). Household Survey. *Annual Report*

Financial Sector Deepening Kenya (2017). Creating Value through Financial Inclusion. *FSD Strategy for the Period 2016-2020.*

Financial Sector Deepening Kenya (2013). The 2013 FSD Annual report. *Nairobi, Kenya.*

Financial Sector Deepening and Central Bank of Kenya, (2016). 'FinAcess Geospatial Mapping 2015'. Retrieved from*http://dx.doi.org/10.7910/DVN/SG589T.* Harvard Database, V1.

Fiordelisi, F., (2004). Efficiency in the Factoring Industry. *Journal of Applied Economics,* 90(2), 947– 959.

Flamini, C., McDonald, G., & Liliana, S. (2009). The Determinants of Commercial Banks' profitability in Sub-Saharan Africa. *IMF Working Paper No.* 09/15.

Floquet, K., & Biekpe, N. (2008). The Relationship Between Capital Structure and Risk in Emerging Market Banks. *Journal of Problems and Perspectives in management*, 6(4), 24-36.

Fomum, A.T., &Jesse, M. A. (2017). Exploring the Relationship between Financial Inclusion and Asset Accumulation. *International Journal of Social Economics,* 44(12), 2157-2172.

Frankel, J., & Saravelos, G. (2010). Are Leading Indicators of Financial Crises Useful for Assessing Country Vulnerability? Evidence from the 2008-09 Global Crises. *National Bureau of Economic Research, Inc,* NBER Working Paper No. 16047.

Freixas, X., & Rochet, J-CH. (2008). Microeconomics of Banking.*2nd ed., MIT Press*.

Freixas, X., & Santomero, A. (2002). An Overall perspective on Banking Regulation. *Federal reserve bank of Philadelphia,* Working Paper 02-10.

Friedman, M., & Schwartz, M. (1970). A Monetary History of the United States: 1867-1960. *Columbia University Press for the National Bureau of economic research*.

Friedman, M., &Anna J. S. (1963). A Monetary History of United States 1867-1960. New York, *National Bureau of Economic Research*.

Gachua, N. F. (2011). The Effect of Foreign Exchange Exposure on a Firm's Financial Performance. A case of Listed Companies in Kenya. *Unpublished PhD Thesis, Kenya Catholic University.*

Galetic, F., & Obravodic, T. (2018). Measuring Concentration of the Banking Market of the Republic of Croatia, In: Tipuric, Darko Labas, Davor (Ed.*): 6th International OFEL Conference on Governance, Management and Entrepreneurship.*

Galor, O., & Zeira, J. (1993). Income Distribution and Macroeconomics. *Journal of the Review of Economic Studies*, 60(2), 35-52.

Garcia, N., Grifoni, A., Lopez, J. C., &Mejia, D. (2013). Financial Education in Latin America and the Caribbean: Rationale, Overview and Way Forward, *OECD Working Papers on Finance, Insurance and Private Pensions* No. 33.

Garson, D.G., (2010). Reliability Analysis. Statnotes: Topics in Multivariate Analysis, *North Carolina State University.*

Gebhardt, G., & Novotny-Farkas, Z. (2011). Mandatory IFRS Adoption and Accounting Quality of European Banks. *Journal of Business Finance and Accounting*, 38, 289-333.

Genay, H., & Podjasek, R. (2014). What is the Impact of Low Interest Rate Environment on Bank Profitability? Chicago Fed Letter. *The Federal Reserve Bank of Chicago,* No. 324.

Ghosh, S. (2008). Financial Inclusion and Financial Fragility: An Empirical Note. *Munich Personal Repository Archive,* Paper No. 24252.

Gichuhi, M. M. (2013). The Role of Financial Systems in the Kenyan Economy Challenges and Possible Interventions (A theoretical review).*Prime Journal of Business Administration and Management*, 3(10), 1197-1201.

Glowker, C., & Towbin, P. (2012a). Reserve Requirement for Price and Financial Stability: When are they Effective? *International Journal of Central Banking*, 8(1), 66-113.

Goldsmith R. W., (1969). Financial Structure and Development, New Haven, CT: *Yale University* 41 Press, 1969.

Goodhart, C. (2015). Linkages between Macro-Prudential and Micro-Prudential Supervision. *Butterworth's Journal of International Banking and Financial Law*, 30(10). 607-609.

Gorton, G. (1988). Banking Panics and Business Cycles. *Oxford economic Papers*, 40(2), 751-78.

Gorton, G., &Pennacchi, G. (1993). Security basket and Index-Linked Securities. *Journal of Finance*, 66(1), 1-27.

Government of Kenya (2004). Economic Recovery Strategy for Wealth and Employment Creation, 2003-2004. *Government Printer, Nairobi*.

Government of Kenya (2007). Kenya Vision 2030, Nairobi: Ministry of Planning and National Development.

Greenwood, J., & Jovanovich, B. (1996). Financial Development Growth and the Distribution of Income. *Journal of Political Economy,* 98(2), 1076-1107.

Grier, W. A. (2007). Credit Analysis of Financial Institutions. *Euro money institution Investor PLC*. 2nd Edition.

Gropp, R., & Vesala, J. (2004). Bank Contagion in Europe. Paper Presented at the Symposium of ECB-CFS *Research Network on Capital Markets and Financial Integration in Europe.* European central Bank.

Grossman, S.J & Stiglitz, J. (1980). On the Impossibility of Informational Efficient Market. *Journal of American Economic Review*, 70(1), 393-403.

Gudmundsson, R., Ngoka-Kisinguh, K., & Odongo, M. T. (2013). The Role of Capital Requirements on Bank Competition and Stability: The Case of the Kenyan Banking Industry. Nairobi: *Kenya Bankers Association*.

Gujarati, D. N. (2003). Basic Econometrics. *4th Economy Edition*, McGraw-Hill, New York.

Gutierrez de Rozas, L. (2007). Testing for competition in the Spanish banking industry: The Panzar-Rosse approach revisited. *Banco de España Research Paper* No. 0726.

Guttentag, J. M., & Herring, R. (1983). What Happens When Countries Cannot Pay Their Bank Loans? The Renegotiation Process. *Journal of Comparative Business and Capital Market Law*, 5(3), 209-231.

Hakenes, H., & Schnabel, I. (2010).Capital Regulation, Bank Competition and Financial Stability. *Leibniz University of Hannover*, MPI Bonn, and CEPR.

Hall, K. (2008). The Importance of Financial Literacy. Address to the Conference on Deepening Financial Capacity in the Pacific Region. Sydney-25 August 2008.

Hancock, D., & Passmore, W. S. (2008). Did the Federal Reserve MBS Purchase Program lower Mortgage Rates? *Federal Reserve Working Paper* No. 2011-01.

Hannig, A., & Jansen, S. (2010). Financial Inclusion and Financial Stability: Current Policy Issues. *Asian Development Bank, Working Paper Series*, No. 259.

Han, R., & Melecky, M. (2013). Financial inclusion for financial stability: Access to bank deposits and the growth of deposits in the global financial crisis, *Working Paper* No. 6577.

Hansen, P. L. (2012). Challenges in Identifying and Measuring Systemic risks. *National Bureau of Economic Research, Working Paper* No. 18505.

Hardy, D., & Pazarbasioglu, C. (1999). Determinants and Leading Indicators of Banking Crises: Further Evidence, *IMF Staff Papers*, 46(3), 247-258.

Hawkins, P. (2006). Financial access and financial stability. In Central banks and the challenge of

Development. *Bank for International Settlements,* Basel, 65-79.

Henson, R. K. & Roberts, J. K. (2006). Use of Exploratory factor Analysis in Published Research: Common Errors and some Comments on Improved Practice. *Journal of Educational and Psychological Measurement,* 66(1), 393-416.

Heremans, D., (2000). Regulation of Banking and Financial Markets, *Encyclopedia of Law and Economics,* Edward Elgar Publishers, Cheltenham.

Hernandez-Cos, R., & Goofben, R. (2012). Better Data Can Mean Better Decision for Financial Inclusion Policy making. Available at: *http://microfinance.cgap.org/2012/04/19/Better-Data-Can-Mean-Better-Decision-for-Financial-Inclusion-Policy-Making*.

Heyer, A., & King, M. (2015). Kenya's Financial Transformation in the 21st Century. Nairobi Kenya: FSD Kenya.

Honohan P. (2004). Financial Sector Policy and the Poor: Selected Findings and Issues, Washington DC*: World Bank Working Paper 43*.

Huang, R & Ratnovski, L. (2011). The Dark Side of Bank Wholesale Funding. *Journal of Financial Intermediation,* 20(2), 248-263.

Huljak, I. (2015). Net Effect of Bank Market Power in Central and Eastern Europe, PhD dissertation, Economics Faculty, Split, July 2014.

Hu, L.T., & Bentler, P.M. (1999), Cut-off Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives. *Structural Equation Model,* 6(1), 1-55.

Hu, T., & Xie, C. (2016). Competition, Innovation, Risk-Taking, and Profitability in the Chinese Banking Sector: An Empirical Analysis Based on Structural Equation Model. *Discrete Dynamics in Nature and Society,* 32(1), 25-56.

Hussain, M. E., &Hassan, M. K. (2005). Basel capital Requirement and Ban Credit Risk Taking in Developing Countries. *Department of Economic and Finance*, Working Papers, 1991-2006.

International Monetary Fund (2014). Deposit Insurance Database. *International Monetary Fund,* Washington.

Ibrahim. H. M. (2006). Stock Prices and Bank Loan Dynamics in a Developing Country: The Case of Malaysia. *Journal of Applied Economics,* 9(1), 71-89.

Ibrahim H. M., &Mohamed, E. S. (2012). Bank Lending, Macroeconomic Conditions and Financial Uncertainty: Evidence from Malaysia. *Review of Development Finance,* 2(1), 3-4.

Igan, D., & Kang, H. (2012). Do Loan-To-Value and Debt-To-Income Limits Work? Evidence from Korea. *IMF Working Paper* 11/297.

Ioannidou, V., & Penas, M. F. (2010). Deposit Insurance and Bank Risk Taking: Evidence from International Loan Ratings. *Journal of Financial Intermediation*, 19(1), 95-115.

Iwatsubo, K. (2007). Bank capital Shocks and Portfolio Risk: Evidence from Japan. *Journal of Japan and the World Economy*, 19 (2), 166-186.

Izaguirre, J. C., Lyman, T., McGuire, C., & Grace, D. (2016). Deposit Insurance and Digital Financial Inclusion. CGAP, October 2016.

Jan, K., & Rongrong, S. (2017). Macro Prudential Policy, Central Banks and Financial Stability: Evidence from China. Munich Personal Repository Archive Paper 79033, University Library of Munich Germany.

Jensen, M., & Meckling, W. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(1), 305–360.

Jimenez, G., Lopez, J. A., & Saurina, J. (2013). How Does Competition Affect Bank Risk-Taking? *Journal of Financial Stability*, 9(2), 185–195.

Jimenez, G., Peydro, S., & Salas, S. J. (2012). Macro Prudential Policy, Counter Cyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiment. *National Bank of Belgium Working Paper No. 45*.

Johnson, W. T. (2004). Predictable Investment Horizon and Wealth Transfer among Mutual Fund Shareholders. *The Journal of Finance*, 59(7), 45-80.

Kamau, A., Karingi, S., Ndung'u, N., & Mwaura, S. (2004). Capital Requirements and Bank Behavior in Kenya: Empirical Evidence. *KIPPRA Discussion Paper* No. 36.

Kanittha, T. (2015). Financial iInclusion, Financial Regulation, and Financial Education in Thailand. *Asian Development Bank Institute Working Paper Series* 537.

Karas, A., Pyle, W., & Schoors, K. (2013). Deposit Insurance, Banking Crises and Market Discipline: evidence from a Natural experiment on Deposit Flows and Rates. *Journal of Money, Credit and Banking*, 45(1), 179-200.

Kareken, J., & Walace, N. (1978). Portfolio Autarky: A Welfare Analysis. *Journal of International Economics*, 7, 19-43.

Kasekende, L., Bagyenda, J., & Brownbridge, M. (2011). Basel III and Global Reform of Financial Regulation: How should Africa Respond? A Bank regulator's Perspective. *Journal of Economics and Finance*, 1(2), 141-150.

Kasman, S., & Kasman, A. (2015). Bank Competition, Concentration and Financial Stability in the Turkish Banking Industry. Journal of *Economic Systems*, 39(4), 502-517.

Kenya Institute for Public Policy Research and Analysis (2014). Kenya Economic Report: Navigating Global Challenges while Exploiting Opportunities for Sustainable Growth, Nairobi: KIPPRA.

Keynes, J. M. (1936). The General Theory of Employment, Interest and Money. London Macmillan and Co. Limited.

Khan, H. R. (2011). Financial Inclusion and Financial Stability: Are They Two Sides of the Same Coin? Address given at BANCON 2011. Chennai. 4–6 November.

Kheechee, D. S. (2011). Comparative Study of Profitability of Different Groups of Scheduled Commercial Banks in India. *Indian Journal of Management and Technology*, 19(1), 62-74.

Kibua, T. N. (2007), ―Poverty Reduction through Enhanced Access to Financial Services: Case studies of Botswana, Kenya and Namibia‖. *Institute of Policy Analysis and Research*, Occasional Paper No. 010/2007.

Kick, T., & Prieto, E. (2015). Bank Risk and Competition: Evidence from Regional Banking Markets. *Journal Review of Finance*, 19(3), 1185-1222.

Kim, S., & Mehrotra, A. N. (2017). Effect of Monetary and Macro Prudential Policies-Evidence from Inflation Targeting Economies in the Asia-Pacific region and Potential Implications for China. *Bank of Finland Research paper Series. Discussion Paper* No. 4.

Kiviet, F. J. (2009). Strength and Weakness in Instruments in IV and GMM Estimation of Dynamic Panel Data Models. Department of Quantitative Economics, Amsterdam School of Economics, *University of Amsterdam, Roetersstraat 11,1018 WB Amsterdam, JEL: C13; C15.*

Kline, R.B. (2011). Principles and Practice of Structural Equation Model, Second Edition: *Guilford Publications*.

Kodongo, O. (2017). Financial Regulation, Financial Literacy and Financial Inclusion: Insights from Kenya. *Journal of Emerging Markets Finance and Trade*, 1(2), 43-78.

Komarkova, Z., Gersi, A., & Komarek, L. (2011). Models for Stress Testing Czech Banks' Liquidity Risk. *Czech National Bank,* working paper Series 11.

Kosmidou, A. (2008). The Determinants of Banks' Profit in Greece during the Period of EU Financial Integration. *Journal of Managerial Finance*, 34(3), 146-159.

Krosner, R. (1997). On the Political Economy of Banking and Financial Regulatory Reform in Emerging Markets. Building Better Banking Seminar for the Annual Meeting of the Board of Governors of World Bank Group and International Monetary Fund. Hong Kong.

Kumankoma, S. E., Abor, Y. J., Aboaagye, A., & Amidu, W. (2018). Freedom, Competition and Bank Profitability in Sub-Saharan Africa. *Journal of Financial Regulation and Compliance*, 10, 1108-1134.

Kuttner, K., & Shim, I. (2013). Can Non-Interest Rate Policies Stabilize Housing Market? Evidence from a Panel of 57 Economies. *Bank of International Settlement,* Working Papers No. 433.

Laeven, L., &Levine, R. (2009). Bank Governance, Regulation and Risk Taking. *Journal of Financial Economics*,93(3), 259-275.

Lanine, N., & Vennet, V. R. (2007). Macroeconomic Determinants of Acquisition of Eastern European Banks by western European banks. *Journal of Economic of Transition*, 15(2), 285-308.

La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2002). Government Ownership of Banks. *Journal of Finance*, 57(1), 265-301.

Lehman, A. (2005). JMP for Basic Multivariate and Univariate Statistics: A Step-by-Step Guide. Cary, NC: SAS Pres, pp. 123.

Lepetit, L., & Strobel, F. (2013). Bank insolvency risk and time-varying Z-score measures. *Journal of International Financial Markets, Institutions and Money*, 25, 73–87.

Lerner, A. P. (1934). The Concept of Monopoly and the Measurement of Monopoly Power. *Review of Economic Studies*, 1(3), 157–175.

Leroy, A., & Lucotte, Y. (2016). Is there a competition-stability trade-off in European banking? *Journal of International Financial Markets, Institutions and Money*,3, 123-156.

Levine, R., Norman L., & Thorsten, B. (2000b). Finance and the Sources of Growth. *Journal of Financial Economics*, 58 (1-2), 261-300.

Levine R. (1997). Financial development and economic growth: views and agenda. *Journal of economic Literature*, 35(2), 688-726.

Levine, R. (2005). Finance and Growth: Theory and Evidence. In P. Aghion and S. Durlaff (eds.), Handbook of Economic Growth. The Netherlands: Elsevier Science.

Levine, R. (2004). Finance and Growth: Theory and Evidence. *National Bureau of Economic Research*, Cambridge, MA, Working paper 10766.

Levhari, J.D and Srinivasan, T. (1969). Optimal Saving Under Uncertainty. *Review of Economic Studies Journal*,36(2), 153-163.

Li, C. H. (2016). The Performance of ML, DWLS and ULS Estimation with Robust Correction in Structural Equation Models with Ordinal Variables. *Journal of Psychological Methods*, 21(3), 369-387.

Li, X., Tripe, D., & Malone, C. (2017). Measuring Bank Risk: An Exploration of Z-score. Massey University, Palmerstone North, new Zealand.

Lim, C. H., Columba, F., Costa, A., Kongsamut, P., Otani, A., Saiyid, M., Wezel, T. and Wu, X. (2011). Macro Prudential Policy: What Instruments and How Are They Used? Lessons from Country Experiences. IMF Working Paper 11/28.

Lindbeck, A. and Snower, D. J. (2001, winter). Insiders and Outsiders. *Journal of Economic Perspective,* 15(1), 165-188.

Lopez, T., & Winkler, A. (2017). The Challenge of Rural Financial Inclusion-Evidence from Micro-Finance. *Journal of Applied Economics*, 50(14), 35-58.

Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics,* 22(4), 3-42.

Lukonga, I. (2015). Islamic Finance, Consumer Protection, and Financial stability, IMF Working Paper series No. 35.

Makina, D. (2017). Introduction to the Financial Services in Africa Special Issue. *African journal of Economic and Management Studies,* 8(1), 2-7.

Mare, D. S., Moreira, F., & Rossi, R. (2015). Nonstationary Z-score Measure. Working Paper 20.

Mason, C. H., & Perreault, D. W. (1991). Collinearity, Power and Interpretation of Multiple Regression Analysis. *Journal of Marketing Research*, 28(2), 268-280.

Mason, E. S. (1939). Price and production policies of large-scale enterprise. *The American Economic Review*, 29(1), 61–74.

McCoy, P. A. (2007). The Moral Hazard Implications of Deposit Insurance: Theory and Practice. IMF, *Journal of Current Developments in Financial and Monetary law*, 5, 417-441.

Marconi, R., & Mosley, P. (2006). Bolivia during the Global crisis 1998-2004. Towards a Macroeconomics of Microfinance. *Journal of International Development,* 18(3), 237-261.

Marquez, R. (2002). Competition, Adverse Selection, and Information Dispersion in the Banking Industry. *Review of Financial Studies*, 15(2), 901-926.

Matutes, C., & Vives, X., (1996). Competition for Deposits, Fragility, and Insurance. *Journal of Financial Intermediation*,5(4), 184-216.

Maudos, J., & de Guevara, J. F. (2007). The Cost of Market Power in Banking: Social Welfare Loss vs. Cost Inefficiency, *Journal of Banking & Finance,* 31(7), 2103 – 2125.

Mdoe, I. J., Omolo, J.O., & Wawire, N. H. (2016). The Dynamics of Bank Competition in Kenya. Retrieved from*https://editorialexpress.com/cgi-bin/conference/download.cgi?db.*

Mehrotra, N. A., & Yetman, J. (2015). Financial Inclusion and Optimal Monetary Policy. *Bank of International Settlement,* Working Paper No. 476.

Mercieca, S., Schaeck K., & Wolfe S. (2007). Small European Banks: Benefits from Diversification? *Journal of Banking and Finance,* 31(2), 1975-1998.

Michael, J. N. (2010). Effect of Non-Performing assets on Operational efficiency of Central-Cooperative Banks. *Journal of Indian Economic Panorama*, 16(30), 330-39.

Milanova, E. (2010). Market Risk Management in Banks Models for Analysis and Assessment. *Journal of Economics and organization*, 7(4), 395-410.

Miles, D., Yang, J., & Marcheggiano, G. (2011). Optimal Bank Capital. Bank of England External Monetary Policy Committee Unit, *Discussion Paper* 31,

Miller, M. (1991). Financial Innovations and Market Volatility. Blackwell: Cambridge.

Minsky, H. P. (1977). A theory of systemic fragility, in Edward Altman and Arnold W. Sametz, eds., Financial Crises, *New York Wiley*, 138-152.

Mirzaei, A., Tomoe M., & Guy L. (2013). Does Market Structure Matter on Banks' Profitability and Stability? Emerging vs. Advanced Economies. *Journal of Banking and Finance,* 37(8), 2920-2937.

Mishkin, F. (1999). Financial consolidation: Dangers and opportunities. *Journal of Banking & Finance*, 23(2-4), 675–691.

Mishkin, Frederic S. (2001a). The Transmission Mechanism and the Role of Asset Prices in Monetary Policy, in Aspects of the Transmission Mechanism of Monetary Policy, Focus on Austria 3(3-4), 58-71.

Mishkin F (1999). Global Financial Instability: Framework, Events, Issues, *Journal of Economic Perspectives,* 13(4), 3-20.

Mminele, D. (2016). Reducing Systematic Risk in South Africa. Speech at the launch of Equity Market Settlement Cycle, Johannesburg, South Africa.

Mohr, B., & Wagner, H. (2013). A Structural Approach to Financial Stability: On the Role of Regulatory Governance. *Journal of Governance and Regulation*. 2(1), 34-75.

Moreira, A., & Savov, A. (2013). The Macroeconomic of Shadow Banking. *Journal of Finance,* 5(4), 32-56.

Morgan, P., & Pointes, V. (2014). Financial Stability and Financial Inclusion. Asian Development Bank Institute, *ADBI Working Paper 488*.

Mork, R., Yueng, Y. B., & Yu, W. (1999). The Information Content of Stock Markets: Why do Emerging Markets Have Synchronous Stock Price Movements? *Journal of Financial Economics,* 58(2), 1-2.

Mostak, M., and Sushanta, M. (2015). Is Financial Inclusion Good for Financial Stability? International Evidence. *University of London, U.K. Retrieved from https://editorialexpress.com/cgi-bin/conference/downloadcgidb_name*.

Moyo, J., Nandwa, B., Oduor, J., & Simpasa, A. (2014). Financial Sector Reforms, Competition and Banking System in Sub-Saharan Africa. Paper Presented at IMF/DFID Conference on "Macroeconomic Challenges facing Low-Income Countries", IMF Washington DC, January 30-31.

Mueller, D. C. (2003). Public Choice III. Cambridge. *Cambridge University press.*

Muriithi, J. G., & Waweru, K. M. (2017). Liquidity Risk and Financial Performance of Commercial Bank in Kenya. *International Journal of Economics and Finance*, 9(3), 45-59.

Muriithi, J. G., Muturi, M. W., & Waweru, K. M. (2016). The Effect of Market risk on Financial Performance of Commercial Banks in Kenya. *Journal of Finance and accounting,* 4(4), 225-233.

Murinde, V., &Yassen, H. (2004). The Impact of Basel Accords Regulation of Bank capital and Risk. Centre for regulation and Competition (CRC) Conference, September.

Muriithi S.M.,& Louw L. (2017). The Kenyan Banking Industry: Challenges and Sustainability. In: Ahmed A. (eds) Managing Knowledge and Innovation for Business Sustainability in Africa. Palgrave Studies of Sustainable Business in Africa. Palgrave Macmillan, Cham.

Musinga, M., & Ongayo, M (2002). An Evaluation of Micro-Finance Programs in Kenya. Steering Committee for the Evaluation of the Netherlands Co-Financing Program. New York. UN Development Program.

Mutuku, N. (2008). Case for Consolidated Financial Sector Regulation in Kenya. Retired Benefit Authority Research Paper No. 16-27.

Mwaniki, C., & Okibo, B. W. (2014). Effect of Total Quality Management on Financial performance in the Banking Sector. A Case Study of National Bank of Kenya. *IOSR Journal of Economics and Finance*, 3(2), 34-40.

Mwega, F. M. (2014). Financial Regulation in Kenya: Balancing Inclusive Growth with Financial Stability. *Overseas Development Institute*, Working paper 407, 27-36.

Ngalawa, J., & Ngare, P. (2013). Interest Rate Risk Management for Commercial Banks in Kenya. Retrieved from www.iosrjournals.org.

Ngugi, R. W., & Kabubo, J. W. (1998). Financial Sector Reforms and Interest Rate Liberalization: the Kenya Experience. *African Economic Research Consortium* (AERC) Research Paper No. 72.

Nunnally, J. C., &Bernstein, I. H. (1994). Psychometric Theory (3rd ed.) New York: McGraw-Hill. 1999, 17(1), 275-280.

Obiero, D. (2002). The Banking Sector Regulatory Framework: It's Adequacy in Reducing Bank Failures. Unpublished MBA dissertation. University of Nairobi.

Odunayo, M. O., &Oluwafeyisayo, K. A (2015). Causal Relationship between Liquidity and Profitability of Nigerian Deposit Money banks. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 5(2), 165-171.

Oduor, J., Ngoka, K., & Odongo, M. (2017). Capital Requirement, Bank Competition and Stability in Africa. *Journal of Review of Development Finance*, 7(8), 45-51.

Okioga, C. K. (2013). The Upshot of Financial Sector Reform Regulation on the Financial Market Performance in Kenya - Perspective from Kisii County, Kenya. *Business Management Dynamics*, 1(2), 1-14.

Oloo, O. (2013). Banking Survey 2013. Think Business Ltd, Nairobi.

Olweny, T., &Shipho, T. M. (2011). Effect of Banking Sectoral Factors on the Profitability of Commercial Banks in Kenya. *Journal of Economics and Finance Review*, 3(1), 237-252.

Ombaba, K. B. (2013). Assessing the Factors Contributing to Non-Performing Loans in Kenyan Banks. *Journal of Business and Management*, 5, 32-40.

Ongore, O. (2013). Determinants of Commercial Banks Performance in Kenya. *International Journal of Economics and Finance*, 1(2), 237-252.

Operana, B. (2016). Financial Inclusion and Financial Stability in the Philippines. Unpublished Masters Dissertation. Graduate School of Public Policy (GraSPP). The University of Tokyo.

Osinki, J., Seal, K., & Hoogduin, L. (2013). Macro Prudential and Micro Prudential Policies: Towards Cohabitation. *IMF Staff Discussion Note*.

Ouhibi, S., Ezzeddine, S., & Hammami, A. (2017). Non-Performing Loans and Systemic risks: Empirical Evidence to Tunisia and Morocco. *Arabian Journal of Business and management Review*.7(2), 34-60.

Owen, A. L., & Pereira, J. (2018). Bank Concentration, Competition, and Financial Inclusion. Retrieved at *SSRN: https://ssrn.com/abstract=2836521*.

Padoa-Schioppa, T. (2003). Central banks and financial stability: exploring the land in between. The Transformation of the European Financial System, pp. 269-310.

Panzar, J. C., & James, N. R. (1987). Testing for Monopoly Equilibrium. *Journal of Industrial Economics*, 35(1), 443-456.

Park, H. K. (2013). Testing for Competition in the South Korean and Chinese Commercial Banking Markets. *Journal of Financial Studies*, 42(1), 56-75.

Patten, R. H., Rosengard, J. K., & Johnson, D. E. (2001). Microfinance Success amidst Macro Economic Failure: The Experience of Bank Rakyat Indonesia during the East Asian Crisis. *World Development*, 29(6), 1057-1069.

Pearl, J. (2000). Causality: Models, Reasoning and Inference: Cambridge University Press.

Pearce, D. & Ortega, C. R. (2012). Financial Inclusion Strategies: Reference Framework. *The World Bank,* Working Paper No. 78761.

Peltzman, S. (1976). Towards a More General Theory of Regulation. *Journal of law and Economics*, 19(1), 211-240.

Perez, D., Salas-Fumas, V. & Saurina, J. (2008). Earnings and Capital Management in Alternative Loan Loss Provision Regulatory Regimes. *Journal of European Accounting Review*, 17(3), 423-445.

Perotti, E. & Suarez, J. (2011). A Pigovian Approach to Liquidity Regulation. *International Journal of Central Banking*, 7(4), 3-41.

Petersen, M.A. & Rajan, R.G. (1995). The Effect of Credit Market Competition on Lending Relationship. *Quarterly Journal of Economics*, 90(2), 407–443.

Phillips, A. (1967). Evidence of Concentration in Banking Markets and Interest Rates. *Federal Reserve Bulletin*, 53(6), 916–926.

Pigou, A. C. (1932). The Economics of Welfare. London: Macmillan and Co.

Ponce, J. &Tubio M. (2010). Estabilidad financiera: conceptos básicos. *Documento de trabajo del Banco Central del Uruguay*, 4(1).

Popdiera, J. & Weill, L. (20070. Bad Luck or Bad Management? Emerging Banking Market Experience. *Journal of Financial Stability,* 4(2), 135-148.

Posner, A. R. (1974). Theories of Economic Regulation. *Journal of Economics and Management Science,* 335(1), 34-78.

Powell, D. & Schafer, W. (2001). The Robustness of the Likelihood Ratio Chi-Square Test for Structural Equation Models: A Meta-Analysis. *Journal of Educational and Behavioural Statistic*, 26(1),105-132.

Prasad, E. (2010). After the Fall: Central Banking Challenges in the Aftermath of the Crisis. *Finance and Development*, 47(2), 22–25.

Quagliariello, M. (2009). Macroeconomic Uncertainties and Banks' Lending Decisions: the Case of Italy. *Journal of Applied Economics*, 41(5), 323-336.

Rabe-Hesketh, S., Skrondal, A.,& Pickles, A. (2004). Generalized Multilevel Structural Equation Modeling. *Psychometrika*, 69(2), 167-190.

Rahman, A. (2014). The Mutually Supportive Relationship between Financial Inclusion and Financial Stability. *Alliance for Financial Inclusion Viewpoints*, Issue 1,

Randle, T. (2009). Risk Based Supervision, Primer Series on Insurance. *The World bank*, discussion paper No. 14.

Ratnovski, L. (2013). Liquidity and Transparency in Bank Risk Management. *IMF Working Paper*No.13.

Ratnovski, L. (2009). Bank Liquidity Regulation and the Lender of Last Resort. *Journal of Financial Intermediation,* 18(4), 541-558.

Reed, M., Jotischky, N., Newman, M., Mbongue, T., & Escofet, G. (2013). Africa Telecom Outlook: Maximizing Digital Services Opportunities. Retrieved from http://www.informatandm.com.

Rhoades, S. A. (1985). Market Share as a Source of Market Power: Implications and Some Evidence. *Journal of Economics and Business*, 37(4), 343–365.

Rhyne, E. (2001). Mainstreaming Microfinance: how Lending to the Poor Began, Grew and Came of Age in Bolivia, West Hartford CT: Kumarian Press.

Riva P., & Eck, J. (2016). The Many Faces of Social Exclusion, in Social Exclusion: Psychological Approaches of Understanding and Reducing Its Impacts. Springer International Publishing 9-15.

Roa, M. J. (2015). Financial Inclusion in Latin America and the Caribbean: Access, Usage and Quality. *CEMLA*, Research Papers 19.

Robinson, J. (1952). The rate of Interest and Other Essays. London MacMillan (Chapter 'The Generalization of the General Theory').

Roldan, J. M. (2013). Factors That Affect Financial Stability. SEACEN Course on Financial System Stability Analysis and Surveillance. Kuala Lumpur, 1 September 2013.

Saayman, A. (2003). Securitization and Bank Liquidity in South Africa. Presented at the Bi-Annual Conference of the Economic society of South Africa on Africa's Millennium: Trade Investment and Growth 17-19 September. Somerset West, South Africa.

Saez, L., & Shi, X. (2004). Liquidity pools, risk sharing and financial contagion. *Journal of Financial Services research.* 25(1), 5-23.

Sahay, R., Cihak, M., N'diaye, P., Brajas, A., Mitra, S., Kyobe, A., Mooi, N.,& Yousefi, S. R. (2015). Financial Inclusion: Can it Meet Multiple Macroeconomic Goals? *IMF Discussion Note*, SDN/15/17.

Sahile, W. G., Tarus, D., & Cheruiyot, T. (2015). Market structure-performance hypothesis in Kenyan banking industry. *International Journal of Emerging Markets*, 10(2), 697-710.

Sahu, K. (2013). Commercial Banks, Financial Inclusion and Economic Growth in India. *International Journal of Business and Management Invention*, 2(1), 01-06.

Said, M. &Saucier, P. (2003). Liquidity, Solvency and Efficiency: An empirical Analysis of the Japanese Banks' Distress. *Journal of Oxford*, 5(3), 354-358.

Smith. A. (1776). An Inquiry into the Nature and Causes of the Wealth of Nations. *Oxford University Press.*

Santomero, A. M. (2002). The Importance of Financial Service. Speeches at the European Banking and Financial Forum, Prague.

Santos, J. A. (2001). Bank Capital Regulation in Contemporary Banking Theory: A Review of the Literature. *Financial Markets, Institutions and Instruments*. *10*(2), 41-84.

Santos, J., & Suarez, J. (2015). Liquidity Standards and the Value of an informed lender of last Resort. *Journal of Financial Economics*, 4(3), 23-58.

Sanya, S., & Wolfe, S. (2011). Can Banks in Emerging Economies Benefit from Revenue Diversification? *Journal of Financial Services Research*, 40, 79-101.

Sarma, M., & Pais, J. (2011). Financial Inclusion and Development. *Journal of International Development*, 23, 613-625.

Saurina, J. (2009). Dynamic Provisioning: The Experience of Spain. *The World Bank*, Crisis response Note No. 7.

Schaeck, K., Cihak, M., & Wolfe, S. (2009). Are Competitive Banking Systems More Stable? *Journal of Money, Credit and Banking*, 41(4), 711–734.

Scherer, F. M., &Ross, D. (1990). Industrial Market Structure and Economic Performance. 3rd ed. Boston Houghton-Mifflin.

Schreiber, J. B. (2008). Core Reporting Practices in Structural Equation Modelling. *Journal of Research in Social and Administrative Pharmacy*, 4(2), 83-97.

Schwartz, A. J. (1986). Real and Pseudo-Financial crises. In Forrest Capie and Geoffrey E. Wood, eds., Financial crises and the World banking system. Basingstoke, Macmillan, 11-31.

Schreiner, M. (2013). Estimating Consumption-Based Poverty in Ethiopia Demographic and Health Survey. *Ethiopia Journal of Economics*, 21(1), 106-76.

Schumpeter J. (1912). The Theory of Economic Development. Harvard University Press, Cambridge, MA.

Sen, A. (1981). Poverty and Famine: An Essay on Entitlement and Deprivation. Oxford: Clarendon Press.

Shaffer, S. (1993). A Test of Competition in Canadian Banking. *Journal of Money, Credit and Banking*, 25, 49-61.

Shehzad, C.T., De Haan, J., &Scholtens, B. (2010). The Impact of Ownership Concentration on Impaired Loans and Capital Adequacy. *Journal of Banking and Finance,* 34(3), 399–408.

Shepherd, W. G. (1986). Tobin's q and the Structure-Performance Relationship: Comment. *American Economic Review*, 76(1), 1205-10.

Shijaku, G. (2017). Does Concentration Matter for Bank Stability? Evidence from the Albanian Banking Sector. *Journal of Central Banking Theory and Practice*, 3(4), 67-94.

Shipley, B. (2009). Confirmatory Path Analysis in a Generalized Multilevel Context. *Journal of Ecology*, 90(2), 363-368.

Singh, N. (2017). Financial Inclusion: Concepts, Issues and Policies for India. International Growth Centre. *Journal of Money, Credit and Banking*, 17(1), 69–83.

Sinha, A. (2011). Financial Sector Regulation and Implications for Growth. Paper presented at CAFRAL-BIS International Conference on Financial Sector Regulation for Growth, Equity and Financial Stability in the post-crisis world, Mumbai, 15–16 November.

Sirri, E. R., & Tufano, P. (1995). The Economics of Pooling. In: Crane, D.B., et al. (Eds.), The Global Financial System: A Harvard Business School, Press, Boston, MA, pp.33-36.

Smirlock, M. (1985). Evidence on the Non Relationship between Concentration and Profitability in Banking. *Journal of Money, Credit and Banking*, 17(1), 69–83.

Soedarmono, W., Machrouh, F., & Tarazi, A. (2011). Bank Market Power, Economic Growth and Financial Stability: Evidence from Asian banks. *Journal of Asian Economics*, 22(6), 460 – 470.

Soskic, D. (2011). Financial Literacy and Financial Stability. Key Note Speech at the Bank of Albania Ninth International Conference Building, 'Our Future through Financial Literacy, Tirana, 15 September.

Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics,* 87(3), 355-374.

Spratt, S. (2013). Financial Regulation in Low Income Countries: Balancing Growth with Stability. Part 1 and 2 Unpublished.

Staschen, S. and Gidvani, L. (2014). Financial Inclusion and the Linkages to Financial Stability, Integrity and Consumer Protection: Insight from Russia Experience. Discussing the Linkages among I_SIP objectives in Russia. Russian Microfinance Centre, Bankable Frontier Associates.

Stever, R. (2007). Bank size, credit and the sources of bank market risk. *Bank of International Settlement,* Working Paper no. 238.

Stigler, G. (1971). The Theory of Economic Regulation. *Bell Journal of Economics and Management Science,* 2, 3-21.

Stiglitz, J. (1994). The Role of the State in Financial Markets. *In Proceedings of World Bank Annual Conference on development Economics*. Washington D.C.

Stiglitz, J. E. (1970). A Re-Examination of the Modigliani-Miller Theorem. *American Economic Review,* 59(5), 784–793.

Stiroh, K.J., (2004). Do Community Banks Benefit from Diversification? *Journal of Financial Services Research*, 25, 135-160.

Stuart, G., & Cohen, M. (2011). Cash-in, Cash-Out Kenya: The lives of M-PESA in the Lives of Low Income People. Financial Service Assessment. College Park: IRIS Centre at University of Maryland and Micro-Finance Opportunities.

Subbarao, D. (2013). Financial Literacy and Financial inclusion are Integral to each other. Speeches at the India-OECD-world bank Regional Conference BIS Speeches.www.bis.org/review.

Swamy, V. (2013). Determinants of Bank Asset Quality and Profitability: An Empirical assessment. Munich Personal Repository Archive, Paper No. 47513.

Swamy, V. (2014). Financial Inclusion, Gender Dimension, and Economic Impact on Poor Households. Journal of *World Development,* 56(4),1-15.

Tabak, B., Fazio, D., & Cajueiro, D. (2012). The Relationship between Banking Market Competition and Risk-Taking: Do Size and Capitalization Matter? *Journal of Banking and Finance,* 36(12), 3366–3381.

Talavera, O., Tsapin, A., & Zholud, O. (2012). Macroeconomic Uncertainty and Bank Lending: the case of Ukraine. *Journal of Economic System,* 10(3), 54-78.

Tanna, S., Pasiouras, F., & Nnadi, M. (2011). The Effect of Board Size and Composition on the Efficiency of UK Banks. *International Journal of the Economics of Business,* 18(3), 441-462.

Tarazi, M., & Breloff, P. (2010). Nonbank E-Money Issuers: Regulatory Approaches to Protecting Customer Fund. CGAP No. 63.

Tavakol, M., & Dennick, R. (2011). Making Sense of Cronbach's Alpha. *International Journal of Medical Education*, 2(1), 53-55.

Thompson, B. (2004). Exploratory and Confirmatory Factor Analysis: Understanding Concepts and Applications. Washington, D.C: American Psychological Association. International Standard Book Number: 1-59147-093-5.

Thumbi, G. (2014). Effects of Credit Risk and Capital Adequacy for Commercial Banks in Kenya. Unpublished Doctoral thesis, University of Nairobi.

Titko, J., Skvarciany, V., & Jurevicienė, D. (2015). Drivers of Bank Profitability: Case of Latvia and Lithuania. *Intellectual Economics*, 9(2), 120–129.

Tomarken, A. J., & Waller, N. G. (2005). Structural Equation Modeling: Strengths, limitations and Misconceptions. *Annual Review of Clinical Psychology,* 4(1), 31-65.

Tomuleasa, I. I. (2015). Macro prudential Policy and Systematic Risk: An Overview. *Journal of Procedia Economics and Finance,* 6(20), 645-653.

Toroitich, C. J., & Anyango, W. (2017). Effects of Interest Rate Stability on Kenya's Economic Performance. *The Strategic Journal of Business and Change Management*, 5(6), 23-58.

Triki, T., & Faye, I. (2013). Financial Inclusion in Africa. Africa Development Bank Group Publication.

Tsenova, T. (2016). The Importance of Being Prudent: Capital Adequacy, Financial Stability and the Macro economy. Economic World Research Library, Tsenova Academic press,

Uhde, A., & Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe further evidence. *Journal of Banking and Finance*, 33(7), 1299-1311.

Upadhyaya, R., & Johnson, S. (2015). Evolution of Kenya's Banking Sector 2000-2012. In A Heyer & M. King (Eds.). The Kenyan Financial Transformation. Nairobi: FSD Nairobi.

Vandenbussche, J., Vogel, U., & Detragiache, E. (2015). Macro Prudential Policies and Housing Prices- A new Data Base and Empirical Evidence for Central, Eastern and South Eastern Europe. *Journal of Money Credit and Banking,* 47(1), 343-377.

VanHoose, D. (2007). Theories of Bank Behaviour under Capital Regulation. *Journal of Banking and Finance,*31*(*12), 3680-3697.

Van Roy, P. (2005). The Impact of the 1998 Basel Accord on Banks' Capital ratios and Credit Risk-Taking: An International Study. ECARES: Brussels, Belgium.

Vasilescu, M. (2012). Financial Stability- A Theoretical Approach. Annals of the Constantine Brancusi. University of Targu Jiu, Economic Series, Issue 1.

Vives, X. (2010). Competition and stability in banking. CEPR, Policy Insight, No 50.

Vives, X. (2014). Strategic Complementary, Fragility and Regulation. *Journal of the Review of Financial Studies,* 27(12), 3547-3592.

Vlahovic, A. (2014). Challenges to the Implementation of a New Framework for Safeguarding Financial Stability. *Journal of Central Banking Theory and Practice*, 3(3), 19-52.

Vlastimir, V., & Ivana, D. (2013). Non-performing Loans and Systematic Risk: Comparative Analysis of Serbia and Countries in transition. *Industrija*, 41(1), 59-73.

Von Hagen, J., & Ho, T. K. (2007). Money Market Pressure and the Determinants of Banking Crises. *Journal of Money, Credit and Banking*, 39(5), 1037-1066.

Waweru, N. M., & Kalani, V. M. (2009). Commercial Banking Crisis in Kenya: Causes and Remedies. *African Journal of Accounting*, 4(4), 12-32.

Williams, J. (2004). Determining Management Behaviour in European Banking. *Journal of Banking and Finance*. 28(2), 2427-2460.

Williamson, S.D. (1987). Costly Monitoring Loan Contracts and Equilibrium Credit Rationing. *The Quarterly Journal of Economics,* 102(1), 135-146.

Wong, E. Fong, T. Li, K., & Choi, H. (2011). Loan-To-Value Ratio as a Macro-Prudential Tool-Hong Kong Experience and Cross-Country Evidence. *Research Department, Hong-Kong Monetary Authority*, Working Paper 01/2011.

Woolcock, M. (2013). Social Inclusion: Its Significance For Development Theory, Research and Policy, UNESCO. Paris.

World Bank (2011), Finance for All? Policies and Pitfalls in Expanding Access, Washington, DC, Retrieved from; http//:www.documents.worldbank.org/curated/en.

World Bank (2012). Global Financial Development Report 2013: Rethinking the Role of the State in Finance. Washington DC; World Bank.

Yaffee, R. (2003). A Primer for Panel Data Analysis. Connect Information Technology at NYU, 1-11.

Zdzienicka, A., Kalan, C., Laseen, S., & Svirydzenka, K. (2015). Effect of Monetary and Macro Prudential Policies on Financial Conditions: Evidence from the United States: *International Monetary Fund*, Working Paper No. 288/15.

Zhang, L., & Zoli, E. (2014). Leaning Against the Wind: Macro Prudential Policy in Asia. *International Monetary Fund,* Working Papers 14/12.

Zimmerman, J., Bohling K., & Parker, R. S. (2014). Electronic G2P Payments: Evidence from Four Lower-Income Countries. *CGAP, Washington, DC*, Focus Note 9.

Zins, A., & Weill, L. (2016). The Determinants of Financial Inclusion in Africa. *Review of Development Finance Journal*, 6(1), 46-57.

Zollmann, J. (2014). Kenya Financial Diaries: Shilingi Kwa Shilingi – The Financial Lives of the Poor, Nairobi: FSD Kenya.

Zollmann, J., & Collins, D. (2010). Financial Capability and the Poor. Are we missing the market? FSD insights 02, FSD Kenya, Nairobi.