

Financial Inclusion, Bank Competitiveness and Credit Risk of Commercial Banks in Kenya

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Abstract

This paper provides an empirical analysis of the synergies and trade-offs between financial inclusion and credit risk of commercial banks in Kenya. The paper analyzed the effect of financial inclusion on credit risk and the mediation effect of bank competitiveness of commercial banks in Kenya. Financial inclusion was measured using three dimensions of bank availability, bank accessibility and bank usage, bank competitiveness used (HHI) while credit risk was represented by the non performing loans ratio. The study was anchored on financial intermediation theory supported by finance growth theory and asymmetry information theory. The target population was all the 43 commercial banks in Kenya. The study used secondary data collected from Central Bank of Kenya annual reports; commercial banks of Kenya published audited financial statements and annual data from Central Bureau of statistics of Kenya for the period of 2007-2015. Data was analyzed using descriptive statistics and panel multiple regression analysis. The results obtained found that bank availability, bank accessibility and bank usage had significant effect on credit risk of commercial banks in Kenya. Bank competitiveness was found to partially mediate the relationship between financial inclusion and credit risk. From the findings the study concluded that financial inclusion has a significant effect on stability of commercial banks in Kenya. The study recommends that commercial banks to formulate policies to ensure they remain stable and competitive while accommodating their activities to ensure financial inclusion, hence forming an all inclusive and stable financial sector over time.

Keywords: financial inclusion, stability, competitiveness, credit risk, Kenya

1. Introduction

Fluctuations in the global financial system are a constant concern and due to this many countries are prioritizing financial stability over financial growth, as growth may be unsustainable over long periods if there is instability (Schneider, 2008). To achieve financial stability, many countries are strengthening financial regulation. Spratt (2013) observed that a financial system can become unstable, triggering crisis that devastate the real economy as evidenced by the global financial crisis of 2007-2009 if sound, appropriate and effective regulation is not provided.

After the Global Financial Crisis of 2007-2009, policy makers across the world including both advanced and developing countries have put bank stability agenda as a priority (Beck *et al.*, 2009). However, while policy makers are concerned more about the systematic banking crisis, individual bank fragility can also be worrying since several systematic banking crises start as crisis in individual banks. The debate on the factors that affect bank stability continues but very little is known on how financial inclusion affects bank stability (Kalunda, 2015)

Commercial banks are important financial intermediaries in the economy who perform the basic functions of accepting deposits, lending the money and offering transfer services. The commercial banks also represent a vital link in the transmission of government's economic policies particularly monetary policy to the rest of the economy (Ongore & Kusa, 2013). In emerging market economies like Kenya, commercial banks remain the dominant channel of financial intermediation. Bank deposits represent the most significant component of money supply used by the public and changes in money growth are highly correlated with changes in prices of goods and services in the economy. For commercial banks to efficiently perform their intermediation role of providing liquidity, they must be stable. Bank stability has been a key international agenda by policy makers since the Global Financial Crisis of 2007-2009. The financial Stability Board and Basel Accord have been key in enhancing financial stability. For Kenya one of the mandates of the Central Bank is to foster financial stability through regulation. The CBK has ensured stability by adopting the Basel II Accord and ensuring compliance by the commercial banks.

In Kenya, the banking sector has been facing stability challenges from time to time (CBK, 2015). In 2015 CBK warned that commercial banks were facing challenges including; fraudulent loans, inadequate provisions for bad loans, capital inadequacy and low cash ratio which have eroded the market confidence in the banking sector (CBK, 2015). In response, CBK put all banks operating in Kenya under tight scrutiny as it moved to ensure market confidence following the collapse of Charter House Bank, Imperial Bank and Dubai Bank which were put under receivership in 2015. Chase Bank currently is also facing liquidity troubles and challenges of being put under receivership (CBK, 2016). CBK further intensified its supervision efforts and demanded commercial banks to reclassify some of their loans and increase provisioning for credit losses (CBK, 2015)

1.1 Bank Stability

Bank stability refers to the distance of an individual bank from insolvency and failure (Beck *et al.*, 2008). According to the Basels Accord, the core indicators relating to bank financial stability include capital adequacy, asset quality, management soundness, earnings and profitability, liquidity and sensitivity to market risk abbreviated as CAMELS (Beck *et al.*, 2009). Measuring of individual bank stability has been based on Non-Performing Loan (NPL) ratio (Ghosh, 2008; Beck *et al.* 2009; Mostak&Sushanta, 2015; Kalunda, 2015).

Loans (Asset quality) are the major assets of commercial banks and their most important single and largest source of income. The quality of loan portfolio determines the profitability of banks (Ongoro&Kusa, 2013). The highest risk facing a bank is the losses derived from delinquent loans. Delis *et al.* (2014) observed that NPL ratio is the best to measure credit risk exposure. A major concern of all commercial banks is to keep the amount of NPL low as this is indicative of good health of the bank portfolio and high level of NPL affects profitability negatively. NPL is computed as the ratio of the volume of non-performing loans to total loans of a bank. A default occurs when the bank considers that a borrower is unlikely to repay his credit obligations in full, without recourse to collateral (Morgan & Poutines, 2014).

1.2 Banks and Financial Inclusion in Kenya

Financial inclusion is the increasing access to formal financial services including having bank accounts, using credit and savings facilitated through the banks. Over the years financial inclusion has grown beyond physical branch as ICT is revolutionizing the access and use of bank services globally (Diniz *et al.*, 2012). Kenya has succeeded in significantly expanding the reach of financial services over the past decade since 2007 (Ngugi, 2015). There are several factors that have contributed to this greater level of inclusion; one, expanding reach of the major types of financial providers, commercial banks, savings and credit co-operatives (SACCOs) and micro finance institutions (MFIs) (CBK, 2012). Two is the identification of financial inclusion as a national priority in Vision 2030 and three is the accessibility brought about by financial innovations.

Financial inclusion in Kenya has been characterized by rapid technological change in the finance sector that has led to the development of financial innovations, new products and new forms of payment. According to the CBK 2012, the banking sector has undergone substantive transformation particularly from the year 2007. With the introduction of mobile phone payment platform M-pesa, Airtel money Yu-cash, which dramatically changed the financial landscape by offering a simple efficient and cost-effective method to transfer money and make payments (Kenyuru, 2013). Agency banking has enabled bank customers to access the basic banking services by allowing small businesses to operate as satellite branches (Musau, 2013). In 2012, Safaricom LTD in conjunction with Commercial Bank of Africa, one of the Kenya registered commercial bank, launched a service dubbed M-SHWARI that automatically opens a bank account for M-pesa registered customer and operates fully like a bank account. This has made sure that more population is included in the formal financial sector.

Currently commercial banks are actively targeting groups previously targeted by MFI and previously referred to as unbankable (Allen *et al.*, 2012) under a phenomenon known as downscaling (Delfiner & Peron, 2007). Chiba (2009) observed that commercial banks have taken action to address financial inclusion by designing new services and products targeting the low-wage earners and the poor throughout the world.

Financial inclusion can be measured using three dimensions, namely availability, accessibility and usage. The availability dimension is used to account for the pervasiveness of outreach of the financial sector in terms of banks' physical outlets, as physical distance to physical point of financial services deems to be an important impediment to financial inclusion (Allen *et al.*, 2014). Availability of banking services was represented in terms of penetration of bank branches, ATMs, and Agents (Mostak & Sushanta, 2015). For the accessibility the number of bank deposit, loan and mobile accounts per 1000 adult population was used to integrate the depth of the financial access. The usage dimension included the volume of credits plus deposits relative to the GDP (Beck *et al.*, 2014)

This study used the index of financial inclusion (IFI) developed by Sarma and Pias (2011). The index captures information on the three financial inclusion dimensions in a single number lying between 0-1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion. Currently commercial banks are actively targeting groups previously targeted by MFI and previously referred to as unbankable (Allen *et al.*, 2012) under a phenomenon known as downscaling (Delfiner & Peron, 2007). Chiba (2009) observed that commercial banks have taken action to address financial inclusion by designing new services and products targeting the low-wage earners and the poor throughout the world.

1.3 Financial Inclusion and Credit Risk

Increasing financial access through financial inclusion changes the composition of the customers in terms of saving and borrowing behavior. These compositional changes may support financial stability through risk diversification (Hannings & Jansen, 2010). However, if financial inclusion is expanded to unfamiliar areas and uncreditworthy clients through financial inclusion, this poses an increase in credit risk and hence a threat to stability. Mohrotra and Yetman, 2014 observed that financial stability can enhance trust in the financial system and therefore improving financial inclusion. Conversely, excessive emphasis on financial stability can prolong involuntary financial exclusion. Especially in times of regulatory tightening in an attempt to boost profits and cut off risky segment.

1.4 Bank Competitiveness

Every industry has an underlying structure or a fundamental economic and technical characteristic which give rise to a competitive force (Portet, 2008) Bank competitiveness therefore, refers to how banks manage the totality of their competencies to achieve profitability and stability, within the available structures, policies and regulatory framework. A bank must therefore seek to position itself to cope best within its industry environment or to influence that environment in its favour.

In Kenya, the commercial banks industry is characterized by intense competition, serious poaching and luring of talented personnel from one bank to the other. This situation has been intensified by the introduction of innovative technology-driven products which are more customer-friendly. Various products have being designed to suit different categories of customers. The Banks indulge in the use of strong and persuasive marketing communication efforts to promote their products, although bank products offered by competitors seem alike. New products and services are easily replicated by rivals. The only difference is the quality of service and the charges levied by various banks. (Cytonn, 2016)

Financial inclusion has been found to rely on the level of competitiveness in the market and also bank competition is one of the important determinants through which banking stability gets affected (Mostak, 2015). A study by O'Toole & McCann, 2014 established that bank competition is a key element in broadening financial access. According to Mostak (2015) the impact of lack of financial access relays on the competitiveness in the market and also bank competition is one of the important determinants through which banking stability gets affected. Literature also supports that greater market power may persuade banks to establish relationship lending hence leading to more credit availability.

According to the Global Financial Development Report 2013, most of the empirical studies on financial inclusion and competition have obtained mixed results. A study by Claessens and Laeven, 2005 posits that financial inclusion is easier in more competitive banking sectors. In their study they established that competition in the banking market reduces the cost of finance and increases the availability of credit. Carbo, Rodriguez & Udell (2009) also found evidence that competition promotes financial inclusion in their study which involved analyzing SMEs in Spain

Boyd and Nocolo (2005) observed that reducing loan rates as a result of bank competition assists borrowers to repay loans contributing to lower default risk. In contrast, when banks enter into a new market to facilitate access to finance in a competitive environment, they tend to lower informational rents with borrowers leading to moral hazard and adverse selection and this can lead to banking instability (Allan & Gale, 2004). Keeley (1990) observed that excessive competition emerging from financial inclusion may encourage banks to pursue riskier policies in taking more credit risk in their loan portfolio so as to maintain their former profit level. This study therefore investigated the mediation effect of bank competition between financial inclusion and bank stability.

2. Literature Review

2.1 Theoretical Literature

The connection between financial inclusions can be understood in the context of the finance growth theory. The crux of the finance growth theory (Bagehot, 1973) is that financial inclusion creates a productive environment for

economic growth. This theory supports financial stability which is a condition where the financial intermediation process functions smoothly. And according to Spatt (2013), the success of economic growth depends on the level of financial inclusion, composition and stability of the financial institutions. Thus the existence of an energetic financial sector has growth enhancing effects. Schumpeter (1911) posted that banks enable an economy to grow by providing efficient markets for funds. Goldsmith (1969), Mckinnon, (1973), Levin and Zervos (1996) emphasized the positive role of financial systems in economic growth as cited by Ndebbio (2004). Financial markets evolve in response to increased demand for financial services from an already budding economy. Therefore, the deepening of financial inclusion is a reflection of growth in other sectors of the economy and for financial institutions to support financial inclusion, they must be financially stable.

Another theory which offers an explanation for the possible relationship between financial inclusion and bank credit risk is the financial intermediation theory. The theory by Diamond in 1984 explains how banks act as intermediaries between borrowers and savers. As financial intermediaries, banks provide access, financial diversification and financial utilization. The extent of inclusion has an influence on the level of stability as confirmed by literature. Financial intermediation is seen as the extent to which financial institutions bring deficit spending units and surplus spending units together (Ndebbio, 2004). Diamond (1984) pointed out that banks are able to effectively monitor borrowers and thus play the role of delegated monitoring. Reduced monitoring costs are a source of comparative advantage. Diamond and Dybrig (1983) analyzed the position of liquidity that is transformation of illiquid assets into liquid liabilities by banks. In their model, identical investors or depositors are risk averse and uncertain about the timely of their future consumption need. Without an intermediary all investors are locked into illiquid long term investments that yield high pay offs to those who consume later.

The effect of financial inclusion on bank credit risk can also be viewed from the perspective of the financial asymmetry theory. Information asymmetry arises where one party in a debt contract has more and better information than the other party. The theory was proposed by Akerlof in 1970 and observes that it may be difficult to distinguish good from bad borrowers. According to Richard (2011) moral hazard and adverse selection results from information asymmetry between borrowers and lenders can contribute to contractions in credit hence affecting performance and stability. Moral hazard is the risk which a party to a transaction provides misleading information about its assets, liabilities or credit capacity. This is noted to be contributing to Non-Performing Loans.

Adverse selection assumes that lenders cannot distinguish between borrowers of different degrees of risk and that loan contracts are limited. This leads to borrowers repaying loans when they have the means to do so, and hence significant accumulation of Non-Performing Loans (Bofondi&Gobbi, 2003). Financial Inclusion is characterized by entry of new, inexperienced and numerous customers into the formal financial sector including Commercial Banks (Hansen & Jansen, 2010). This creates a challenge in the debt market because lenders have difficulties in determining whether the customer is a good risk and this threatens financial performance and hence stability. Therefore it becomes difficult for banks to establish whether financial inclusion is a low risk good investment or otherwise.

2.2 Empirical Review

In Kenya, the concept of financial inclusion has been fused with the goals of poverty alleviation and general economic growth as envisaged in the vision 2030, the country's economic blueprint (Government of Kenya, 2007). This has seen the banking system undergo numerous important reforms and structural changes. Key among those changes include: increased bank and branch network, shift from brick and mortar outlets, agency banking which was commissioned in 2010, innovations in product development, use of information communication and technology (ICT) and emergence of non-bank financial institutions. According to CBK (2013) the country's banking sector has undergone substantial transformation between 2006 and 2013 was the number of deposit accounts went up from 2 million to 18 million while loan accounts increased from 1 million to 3 million. Also the population of adult population totally excluded from financial services declined from 39.3% in 2006 to 25.4% in 2013 (FSD, 2013). It's therefore important to analyze the influence these changes have had on the credit risk of the commercial banks in Kenya.

The Kenya government has embraced the concept of financial inclusion through the economic pillar contained in the vision 2030. Commercial banks in Kenya responded to the initiative by opening doors and developed products and services for the previously unbanked population. For the banks to fully appreciate the concept of financial inclusion there is need to understand its effect on the banks that engage in it. This is because financial inclusion clientele are considered opaque, numerous and characterized by frequent small value transactions with high operating costs (Hannig& Jansen, 2010) and this can pose potential threat to stability. According to Kipasha and Zhang (2013) financial inclusion in Kenya and other developing countries was previously spearheaded by MFI's and government

owned banks. However, currently commercial banks which are mainly profit seeking have engaged in financial inclusion. Due to the change in financial inclusion landscape by commercial banks, it's important to understand its implication on their stability.

Most of the early studies are carried out at the sector level with a few studies dealing with individual banks (Hanning & Johnson, 2010; Han & Maleck, 2013; Morgan & Poritiness, 2014; Mostak & Sushanta, 2015; Amatus & Alireza, 2015). These studies established that increased financial inclusion improves asset quality of the banking sector. However, other studies have revealed potential threats caused by financial inclusion. Lending to those previously excluded from the formal banking sector in India revealed that new customers were not credit worthy and were a threat to banks stability (Gokhale, 2009; Allen *et al.*, 2012; Khan 2011). This has created two divergent schools of thought with one claiming the financial inclusion-stability effect and the other claiming financial inclusion-instability outcome. Another stand of research posits that financial inclusion and financial stability have a relationship and that synergies between the two exist (Adasmeet *et al.*, 2008; Cihak *et al.* 2015). The foregoing studies confirm that there exists an empirical gap in the area of financial inclusion and stability at micro level as opposed to macro level. This study aims at enriching the existing related literature by studying the relationship between financial inclusion and stability of commercial banks in Kenya.

Based on the above literature this study sought to interrogate how financial inclusion affects the credit risk of commercial banks. **H₀₁**: Bank availability has no significant effect on the credit risk of commercial banks in Kenya. Bank availability was measured using the number of Branch networks, ATMs and Bank Agents, **H₀₂**: Bank accessibility has no significant effect on the credit risk of commercial banks in Kenya. Bank accessibility was measured using deposit, loan and mobile accounts. **H₀₃**: Bank usage has no significant effect on the credit risk of commercial banks in Kenya. Bank usage was measured using total deposit/GDP and total loan/GDP. Credit risk was measured using non performing loans ratio. **H₀₄**: There is no significant mediation effect of bank competitiveness on the relationship between financial inclusion and Credit Risk of commercial banks in Kenya.

2.2.1 Financial Inclusion, Bank Competitiveness and Stability of Commercial Banks

Competition is one of the important and fundamental issues in the banking industry especially at this point of increased financial inclusion agenda by policy makers (Kaskendeet *et al.*, 2009). The level of competitiveness has been found instrumental in broadening financial inclusion and also the impact of lack of access may rely on the competitiveness in the markets (Beck *et al.*, 2004; Ryan *et al.*, 2014).

The literature on financial inclusion, competition and credit risk is largely inconclusive (Leon F. 2015). Financial inclusion aims at drawing the many people into the formal financial system so that they have the opportunity to use financial services (Hanning & Jansen). The financial inclusion changes the composition of the financial system with regard to the transactions undertaken, client type and institutions that operate in the newly created or expanded markets. These new changes can be linked to increased bank competitiveness, Bank stability/instability and bank risk (Mostak, 2016).

This study examine whether, bank competitiveness mediates the relationship between financial inclusion and credit risk. **H₀₄**: There is no significant mediation effect of bank competitiveness on the relationship between financial inclusion and Credit Risk of commercial banks in Kenya. Bank competitiveness was measured using market share represented by the Herfindahl-Hirschman Index (HHI).

3. Research Methodology

This research employed both descriptive and explanatory none experimental research designs. The descriptive research design was chosen because of its suitability in describing the characteristics of a particular individual, or a group of individuals since the researcher did not have control over the variables. The descriptive design affords the researcher an opportunity to capture a population's characteristic and test hypothesis (Cooper & Schindler 2008). The population for this study was comprised of the 43 commercial banks in Kenya. Secondary data was obtained from banks annual financial statements, bank supervision reports by CBK and Kenya Bureau of Statistics for the period between 2007 and 2015.

3.1 Empirical Model

In this study, the dependent variable was continuous, so panel multiple regressions model was used. Multivariate analysis was used to perform regression on the relationships between the various variables so as to understand the strength of each predictor variable. The general empirical model that was used in this study is adapted from Mostak and Sushanta (2015) and Beck *et al.* (2009). However whereas they based their analysis on a cross country panel data set, this study was based on commercial banks in Kenya and the following models were estimated.

$CreditRisk_{it} = \alpha + \beta_1 BAV_{it} + \beta_2 BAC_{it} + \beta_3 BUS_{it} + \epsilon_{it}$	Model 1
$Credit Risk_{it} = \alpha + \beta_1 IFI_{it} + \epsilon_{it}$	Model 2
$Bank Competitiveness (HHI)_{it} = \alpha + \beta_1 IFI_{it} + \epsilon_{it}$	Model 3
$Credit Risk_{it} = \alpha + \beta_1 HHI_{it} + \epsilon_{it}$	Model 4
$Credit Risk_{it} = \alpha + \beta_1 IFI_{it} + \beta_2 HHI_{it} + \epsilon_{it}$	Model 5

Where:

Credit Risk_{it} = The level of exposure to Credit risk for bank i at time t

BAV_{it} = Bank availability of bank i at time t

BAC_{it} = Bank accessibility of bank i at time t

BUS_{it} = Bank usage of bank i at time t

IFI_{it} = A composite Index of Financial Inclusion for bank i at time t

HHI_{it} = Mediating variable Bank Competitiveness (HHI) of bank i at time t

α = Constant term

β_s = Coefficients of the explanatory variables

ε_{it} = Error term

4. Presentation and Interpretation of Results

The results of the analysis are presented as follows; Descriptive trend analysis, Diagnostic checks and panels multiple regressions.

4.1 Descriptive Results

4.1.1 Trends in Financial Inclusion

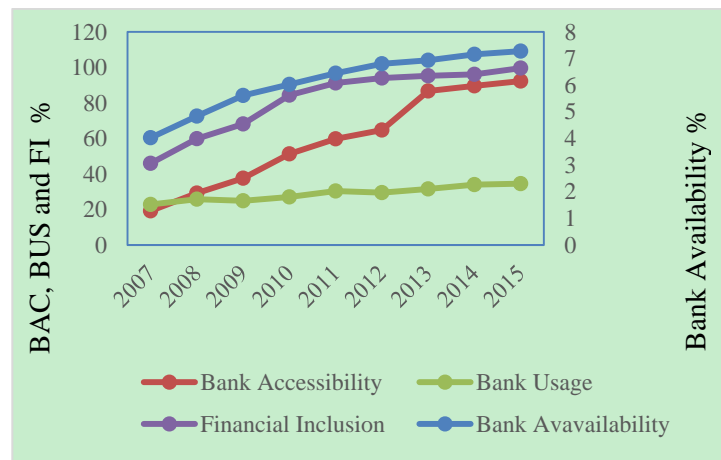


Figure 4.1. Trend in financial inclusion

Source of Data: CBK annual Reports

Figure 4.1 presents the trend analysis of financial inclusion variables measured using bank availability, bank accessibility (BAC), bank usage (BUS) and an overall financial inclusion index (IFI). This study used the index of financial inclusion (IFI) developed by Sarma and Pias (2011). The index captures information on the three financial inclusion dimensions in a single number lying between 0-1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion.

Overall with respect to financial inclusion Figure 4.1 shows that all the measures of financial inclusion had an upward trend in the entire study period. Bank availability was measured using a composite index comprising of the number of ATMs and bank branches per 100 people. Being the primary means of accessibility bank branches was

assigned a weight of two thirds while ATMs were assigned a third. The weighted average of the bank branches, ATMs and agents yielded the composite index of bank availability. A value of zero would imply no availability at all while a value of 100 would mean perfect availability. Figure 4.1 shows that the index rose consistently during the study period to stand at eight. At the beginning of the study period the index stood at four percent. Comparing this figure to eight percent at the end of the period means that on average commercial bank availability doubled during the study period. Therefore, commercial banks customers had more variety in obtaining banking services bank with respect to branches and ATMs.

On the hand bank accessibility was proxied by the number of bank accounts per 100 people. A value of zero implies no accessibility at all while a value of 100 shows perfect accessibility. Figure 4.1 shows that bank accessibility rose rapidly from 19 accounts at the beginning of the study period to 92 accounts per 100 people. This implies that bank accessibility more than quadrupled during the study period. This means that the population of Kenyans with bank accounts more than quadrupled between 2007 and 2015. The holding of bank accounts by 92 persons per 100 people means that commercial banks accessibility in Kenya can be considered near perfect. This is supported by a report by FSD Kenya in 2016 which placed Kenya to be above 70% in financial inclusion.

Banks usage was measured by the ratio of lending to the private sector. This component measures those who are able to access commercial banks and use their services. A value of zero would mean no usage at all while a value of 100 would imply perfect usage. Figure 4.1 shows that bank usage grew from 23 to 34 per cent during the entire study period. The 11 percentage points are meager compared to the other domains of financial inclusion. This means that though a lot of people are able to access commercial banks through bank accounts only a small fraction is able to make use of the commercial banks' lending opportunities. Therefore, commercial banking in Kenya is accessible but not largely usable.

The overall Index of financial inclusion was obtained using the formula suggested by Sarma (2008). The index ranged from zero to 100 percent. A value of zero would imply imperfect inclusion while that of 100 implies perfect inclusion. Figure 4.2 shows that the index raised from 46 to 99.6 during the study period. This implied that in general financial inclusion in Kenya is nearing a perfect state and this is also supported by FSD report 2016 which placed Kenya to be above 75% in financial inclusion.

4.1.2 Bank Competitiveness

The study sought to establish the mediating effect of market competition as measured by Herfindahl-Hirschman index (HHI) computed from the market share of individual players in the banking industry in Kenya. It was calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers.

The rule of thumb state that lower values of HHI indicate high completion while the high values of HHI indicates low competition. HHI takes values between 0 and 10,000 with 0 indicating very high competition while 10,000 indicated industry controlled by a single firms with a market share of 100%. The results presented in Table 4 shows that Kenya banking Industry is competitive as shown by HHI mean of 573.41. However, the study period experienced slightly reduced competition as shown by the HHI maximum value of 700.64 and intense competition shown by HHI minimum value of 419.03.

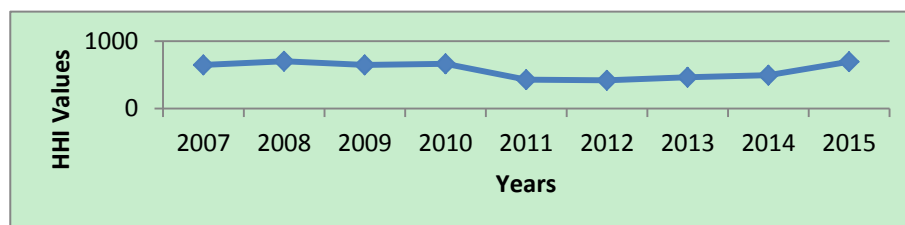


Figure 4.2. Trends in HHI

The trend analysis results showed that competition in banking industry in Kenya was lowest between 2011 and 2013. Intense competition was experienced in 2015 and 2008. However, banking sector in Kenya has remained competitive due to major players hence controlling a larger market share is a challenge.

4.1.3 Bank Credit Risk

This section contains descriptive results for bank credit risk measured by non performing loans ratio as measures of commercial bank stability.

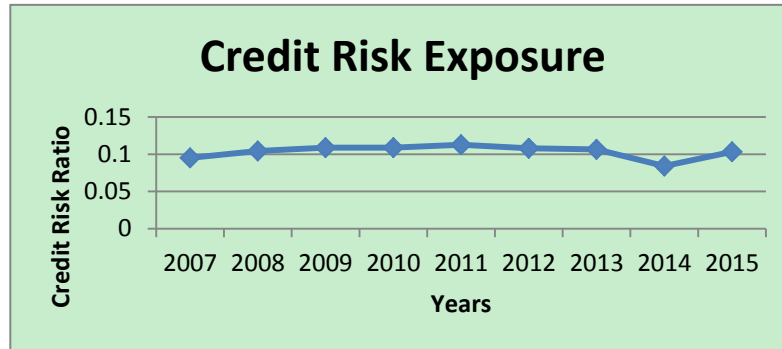


Figure 4.3. Trends in credit risk

The findings in figure 4.3 showed constant credit risk exposure with a slight drop in 2014. This implied that commercial banks exposure to credit risk minimum in 2014. The finding showed that exposure to credit risk increased in 2015 which coincided with the collapse of a number of commercial banks in Kenya.

4.2 Diagnostic Checks

The study performed tests on statistical assumptions i.e. test of regression assumption and statistic used. This included test of normality, heteroskedasticity, multicollinearity, autocorrelation, panel unit root test and Hausman test for model specification. The tests were conducted to make sure that the statistical analysis conducted adhered to regression assumption hence avoid spurious and bias findings.

4.2.1 Normality Test

The normality test was conducted using the Jarque-Bera (JB) and normality graph. The results in the figure indicate that the residuals were normally distributed. To further establish whether the residuals were normally distributed the study adopted the Jarque-Bera test which is a more conclusive test than the graphical inspection approach of testing for normality. The results of the Jarque-Bera test are shown in figure 4.4

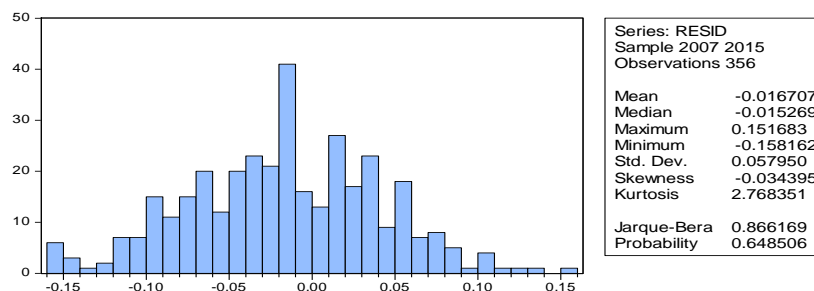


Figure 4.4. Normality test results

Source: Research Data, 2017

The null hypothesis under this test is that the residuals are not significantly different from a normal distribution. Given that the p-value was greater than 5% for the residual, we failed to reject the null hypothesis and thus the conclusion that the residuals are normally distributed. It's clear that the residual were normally distributed and therefore, OLS regression methodology could be applied to estimate the regression models (Brooks, 2008).

4.2.2 Heteroskedasticity

The study further conducted Heteroskedasticity test to test the assumption that the residuals have a constant variance (they should be Homoskedastic). The Modified Wald test was used to test for Heteroskedasticity where the null hypothesis of the test is that error terms have a constant variance (i.e. should be Homoskedastic).

Table 4.1. Test for Heteroskedasticity

xttest3
Modified Wald test heteroskedasticity
chi2 (42) = 2.4e+09
Prob>chi2 = 0.0000

Source: Research Data, 2017

The study failed to reject the null hypothesis given that the reported p-value 0.000 was less than the critical value and thus concluded that the observations have constant variance or do not have the problem of Heteroskedasticity.

4.2.3 Multicollinearity

To test for multicollinearity the study used VIF. This study adopted the rule of thumb for VIF value of 10 as the threshold. The VIF values of greater than 10 indicated presence of multicollinearity.

Table 4.2. Results for Multicollinearitytest

	Tolerance	VIF
Bank Availability	0.893	1.119
Bank Usage	0.734	1.362
Bank Accessibility	0.711	1.407
GDP	0.247	4.051
Credit Risk	0.348	2.87

Source: Research Data, 2017

These results indicated that the VIF values of the independent variables were within the threshold of 10. This indicated that there was no threat of multicollinearity problem and therefore, the study used linear regression model. The tolerance value was greater than 0.1 ruling out the possibility of multicollinearity (Field, 2009). The result, therefore implied non- existence of a multicollinearity problem among the variable and hence the level of multicollinearity in the model could be tolerated

4.2.4 Autocorrelation

The test for autocorrelation was performed to establish whether residuals are correlated across time. Regression analysis assumptions require that residuals should not be correlated across time and thus the Wooldridge test for autocorrelation which is also an LM test was adopted in this study.

Table 4.3. Results for serial correlationtest

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
F(1,38) = 0.022
Prob> F = 0.8836

The null hypothesis is that no first order serial /auto correlation exists. The results indicated that we failed to reject the null hypothesis that there is no serial autocorrelation of any order and that residuals are not auto correlated (p-value=0.8836).

4.2.5 Panel Unit Root Test

Panel unit root tests were conducted using the ADF test to establish whether the variables were stationary or non-stationary. The purpose of this was to avoid spurious regression results being obtained by using non-stationary series.

Table 4.4. Panel unit root test results

Variables	ADF-Statistics	Prob
Bank Availability	84.8610	0.3339
Bank Usage	126.579	0.0000
Bank Accessibility	86.6128	0.3426
Bank Competitiveness	146.261	0.0000
Credit Risk	82.4762	0.5266

Source: Research Data, 2017

Results in Table 4.4 indicated that Bank Usage, and bank competitiveness were stationary (i.e. no unit roots) since the p value was less than 0.05 which implied that the null hypothesis that there is a unit root was rejected. Bank Availability, Bank Accessibility, Credit Risk, were non-stationary since their p-values were greater than 0.05. This therefore, called for first differencing of the non-stationary variables to make them stationary as shown in table 4.5

Table 4.5. Panel unit root test results at first difference

Variables	ADF-Statistics	Prob
Bank Availability	152.921	0.0000
Bank Usage	126.579	0.0000
Bank Accessibility	137.554	0.0000
Bank competitiveness	146.261	0.0000
Credit Risk	773.669	0.0000

Source: Research Data, 2017

The results in table 8 indicated that all the variables become stationary (unit root disappears) on first differencing since there p value was less than 0.05 meaning that the study rejected the null hypothesis that there is a unit root.

4.2.6 Hausman Test for Model Specification

In order to choose between fixed and random effect model for model 1 credit risk, the Hausman test was used as presented in Table 4.6. The null hypothesis of the Hausman test was that there are no systemic differences between the estimates of the random effect model and the fixed effect model.

Table 4.6: Hausman Test for Credit Risk

	Fixed (b)	Random (B)	Difference (b-B)	$\sqrt{\text{diag}(V_b - V_B)}$ S.E.
BAV	-2.986118	-2.986118	-7.22e-13	0.0410677
BAC	0.60003	0.60003	3.36e-13	0.00266681
BAU	-0.0227047	-0.0227047	-2.13e-12	0.0138897

b= Consistent under Ho and Ha; obtained from xtreg

B= Inconsistent under Ha, efficient under Ho; obtained from xtreg

Test Ho: differences in coefficients not systematic

$\chi^2(3) = (b-B)'[V_b - V_B]^{-1}(b-B) = 9.23$

Prob> $\chi^2 = 0.003$

Source: Research Data, 2017

In Table 4.6, for credit risk model, the Hausman test reported a chi-square of 9.23 with a p value of 0.003 implying that at 5 percent level, the chi-square obtained was statistically significant. The study therefore failed to reject the null hypothesis of no systematic difference between the estimates of the Random effects model and fixed effects model. Thus the fixed effects model was interpreted as recommended by Green (2008).

4.3 Test of Hypothesis

Table 4.7. Effect of financial inclusion on credit risk- Model 1

Financial inclusion	Coef.	Std. Err.	t	P
Bank Availability	-2.986118	0.117039	-25.51	0.002
Bank Accessibility	0.060003	0.0076037	7.89	0.0040
Bank Usage	-0.0227049	0.0395843	-0.57	0.0026
_cons	21.96	0.927997	23.66	0.0012
Observations	369			

R-sq: within = 0.8683

F statistics = 73.132

Prob> $\chi^2 = 0.0000$

Source: Research Data, 2017

The results in Table 4.7 indicate an R squared of 0.8683. This implies that the financial inclusion indicators (bank availability, bank accessibility and bank usage) had high explanatory power on bank stability (Measured by Credit Risk). The F statistics value was 73.132 with a p value of 0.000 which is less than 0.05. This indicates that financial inclusion had significant effects on the stability of commercial banks in Kenya.

Based on the analysis in Table 4.7 the following model was formulated.

$$\text{CreditRisk} = 21.96 - 2.986118(\text{BAV}) + 0.060003(\text{BAC}) - 0.0227049(\text{BUS}) + \epsilon \quad \text{Model 1}$$

In Table 4.7 the coefficient of bank availability ($\beta = -2.986118$, $p = 0.000 < 0.05$) shows a statistically significant relationship between bank availability and bank stability. The regression coefficient of -2.986118 obtained in this case implies that increase in bank availability variable would lead to 2.986118 unit decreases in exposure to credit risk hence increasing stability. The coefficient of accessibility ($\beta = 0.060003$, $p = 0.000 < 0.05$) shows that the coefficient of bank accessibility in the model is significantly different from zero at five per cent level of significance. This implies that increase in bank accessibility would increase in exposure to credit risk leading to instability. While the coefficient of ($\beta = -0.0227049$, $p = 0.0026 < 0.05$) shows that the coefficient of bank usage in the fixed effect model is significantly different from zero at five per cent level of significance. This implies that increase in bank usage would lead to 0.0227049 decreases in exposure to credit risk.

The findings concur with those of Han and Malecky (2013) who established that a greater share of people with bank deposits would increase banks share of stable funding (deposits) and tend to reduce volatility of the bank deposits during economic downturns, thereby contributing to financial stability by reducing the procyclical effects of economic downturns on bank liquidity. This finding are also in agreement with those of (Gokhale, 2009; Allen *et al.*, 2012; Khan 2011) who established that increase in the number of banked individuals' through financial inclusion,

may lead to risky clients in the banking system. Such individuals fail to pay their loans once extended a facility thereby increasing credit risk.

However, the results are inconsistent with Ghosh (2008) in India who investigated the interaction between financial inclusion and financial fragility of state owned banks between 1997 and 2007. He concluded that an increased availability of banking services is associated with increased fragility due to banks compromising on their credit evaluation procedures and qualifications.

Table 4.8. Effect of IFI on credit risk of commercial bank Model 2

	Coefficients	P-Value
Constant	11.4089	0.001
IFI	-5.16174	0.000
R-Squared	0.7495	
F statistic	81.28	0.004

Source: Study Data, 2017

The results in Table 4.8 indicate Rsquared of 0.7495 for credit risk. This implies that financial inclusion had explanatory power on credit risk as it accounted for 74.95 percent of credit risk of commercial banks in Kenya. This indicates that financial inclusion can adequately explain variation in stability of commercial banks in Kenya. The F statistics value was 81.28 with a p value of 0.004 which was less than 0.05. This indicates that financial inclusion was significant in explaining variations in stability of commercial banks in Kenya.

The coefficient of IFI ($\beta = -5.16174$, $p = 0.000 < 0.05$) for credit risk shows a statistically significant relationship between financial inclusion and credit risk of commercial banks in Kenya. The findings implied that a unit increase of financial inclusion would lead to 5.16174 decreases in credit risk of commercial banks in Kenya.

$$\text{Credit Risk} = 11.4089 - 5.16174 * \text{IFI} + \varepsilon_{it} \quad \text{model 2}$$

In the second step, IFI (independent variable) was regressed on HHI (Bank competitiveness) as dependent variable. The regression results are as shown Table 4.9

Table 4.9. Effect of IFI on bank competitiveness (HHI) Model 3

HHI	Coeff.	Std. Err.	T	P
IFI	0.01705	0.00184	9.28	0.004
Constant	0.076136	0.000181	40.45	0.000
R-sq: within = 0.412				
Fstatistic = 0.8616				
P value = 0.0003				

Source: Research Data, 2017

The results in Table 4.9 indicate Rsquared of 0.412. This implies that financial inclusion had high explanatory power on bank competitiveness (HHI) as it accounted for 41.2 percent of bank competitiveness of commercial banks in Kenya. This indicates that financial inclusion can adequately explain variation in bank competitiveness of commercial banks in Kenya. The F statistics value was 0.8616 with a p value of 0.0003 which was less than 0.05. This indicates that financial inclusion was significant in explaining variations in bank competitiveness of commercial banks in Kenya.

The coefficient of financial inclusion (IFI) at ($\beta = 0.01705$, $p = 0.004$, < 0.05) shows a statistically significant relationship between Financial inclusion and bank competitiveness (HHI) of commercial banks in Kenya. The

regression coefficient of 0.01705 obtained in this case implies that a unit increase of the financial inclusion would lead to 0.01705 increases in bank competitiveness.

The regression coefficient of 0.076136 under constant indicates the value of Bank competitiveness of commercial banks when financial inclusion was zero.

Based on the result in table 4.9, the following model was formulated

$$\text{Bank Competitiveness} = 0.076136 + 0.017050 * \text{IFI} + \varepsilon \tag{Model 3}$$

Where

IFI=Index of Financial Inclusion

HHI=Herfindahl Hirschman Index (Bank Competitiveness)

In step three, Bank competitiveness variable (independent variable) was regressed on stability of commercial bank measures (dependent variable). The results are shown in Table 4.10.

Table 4.10. Effect of bank competitiveness (independent variable) on credit risk of commercial banks Model 4

	Coefficients	P-Value
Constant	0.8110	0.002
HHI	127.926	0.004
R-Squared	0.43481	
F statistic	65.20	0.003

Source: Study Data, 2017

The results in Table 4.10 indicate Rsquared of 0.43481 for credit risk, liquidity risk and this implies that Bank competitiveness (HHI) had explanatory power on credit risk, as it accounted for 43.481 percent of credit risk of commercial banks in Kenya. This indicates that bank competitiveness (HHI) can adequately explain variation in credit risk of commercial banks in Kenya. The F statistics value was 65.20 with a p value of 0.003 which was less than 0.05. This indicates that Bank competitiveness (HHI) was significant in explaining variations in credit risk of commercial banks in Kenya.

The coefficient of bank competitiveness (HHI) ($\beta=127.9260, p=0.004 < 0.05$), shows a statistically significant relationship between bank competitiveness and credit risk of commercial banks. The findings implied that a unit increase of bank competitiveness (HHI) would lead to 127.9260 increases in credit risk of commercial banks in Kenya.

$$\text{Credit Risk} = 0.8110 + 127.9260 * \text{HHI} + \varepsilon_{it} \tag{Model 4}$$

Where

HHI=Herfindahl Hirschman Index (Bank Competitiveness)

In the fourth step, financial inclusion (IFI) and Bank competitiveness (HHI) (independent variable) were regressed on stability measures (dependent variable). The results are shown in Table 4.11

Table 4.11. Effect of HHI and IFI on credit risk of commercial Model 5

	Coefficients	P-values
Con	-7.592	0.000
IFI	8.51010	0.001
HHI	283.03	0.002
R-Squared	0.6492	
F statistic	79.71	0.001

Source: Study Data, 2017

The results in Table 4.11 indicate Rsquared of 0.649 for credit risk, This implies that financial inclusion (IFI) and Bank competitiveness (HHI) had h explanatory power on bank credit risk as it accounted for 64.9 percent of credit risk of commercial banks in Kenya. This indicates that financial inclusion and bank competitiveness can adequately explain variation in credit risk of commercial banks in Kenya. The F statistics value was 79.71 with a p value of 0.001 which was less than 0.05. This indicates that financial inclusion and bank competitiveness were statistically significant in explaining variations in stability of commercial banks in Kenya.

The coefficient of financial inclusion IFI ($\beta=8.51010$, $p=0.001<0.05$) for credit risk model shows a statistically significant relationship between financial inclusion and credit risk. The regression coefficient of 8.51010 obtained in this case implies that a unit increase of financial inclusion would lead to 8.51010 increases in credit risk commercial banks in Kenya.

The coefficient of bank competitiveness HHI ($\beta=283.03$ $p=0.002<0.05$) for credit risk model showing a statistically significant relationship between bank competitiveness and credit risk, The regression coefficient of 283.03 obtained in this case implies that a unit increase of the bank competitiveness would lead to 283.03 increases in credit risk commercial banks in Kenya.

The regression coefficient of 7.592 for credit risk model under constant indicates the value of bank credit risk when financial inclusion and bank competitiveness were zero. Based on the result in table 4.11, the following model was formulated

$$\text{Credit Risk} = 7.592 + 8.51010 * \text{IFI}_{it} + 283.03 * \text{HHI}_{it} + \varepsilon_{it} \quad \text{Model 5}$$

Where

IFI=Index of Financial Inclusion

HHI=Herfindahl Hirschman Index (Bank Competitiveness)

The fact that the stepwise regressions from step 1 to 4 had significant for bank competitiveness, financial inclusion and credit risk lead to a conclusion of partial mediation. Thus, the null hypothesis, H_{04} , There is no significant mediation effect of bank competitiveness on the relationship between financial inclusion Credit risk of commercial banks in Kenya was rejected.

The findings of the study were consistent with those of Ryan *et al.*, (2014) who bank competition has been found instrumental in broadening financial access and also the impact of lack of access may rely on the competitiveness in the markets. Boyd and De Nicolo (2005) also established that due to competition, banks are forced to reduce loan rates assisting borrowers to repay loans and hence contributing to lower default risk and banks are less likely to suffer from Non-Performing loans.

5. Conclusions and Policy Recommendation

Based on the findings, the study concluded that majority of commercial banks in Kenya have adopted various ways of ensuring financial inclusion. Commercial banks pursue financial inclusion with the main aim of increasing the numbers of their customer base and consequently boosting their deposits and loans accounts. However, increasing financial inclusion leads to increase in NPLs which jeopardize the stability of commercial banks by increasing credit risk of commercial banks. Commercial banks in Kenya that have enhanced financial inclusion through increasing the number of deposit, loan and mobile accounts have also performed well in terms of stability indicators due to increased deposit mobilization.

Based on the findings the following recommendations were made to the commercial banks and other financial institutions. First the study recommended that commercial banks in Kenya should pursue financial inclusion to increase the banking population, to advance affordable and accessible banking services to many customers in different regions in the country. This can be achieved through increasing branches, ATMs, and adoption of other mobile money technologies such as mobile and agency banking.

Secondly, commercial banks should formulate policies to ensure they remain stable while accommodating their activities to ensure financial inclusion, and also to develop new products so as to remain competitive In this regard, reforms in financial sector should aim at increasing financial inclusion through digital finance which is a cost cutting measure and to ensure that bank stability indicators commensurate in the role of increasing financial inclusion and hence forming an all inclusive and stable financial sector over time.

References

Adasme, O., Majnoni, G., & Uribe, M. (2006). Access and risk: friends or foes? lessons from Chile. *Policy*

- Research Working Paper 4003*. World Bank, Washington, D.C.
- Aduda, J., & Kalunda E. (2012). Financial inclusion and financial sector stability with reference to Kenya. *A preview of literature*.
- Adusei, M., & Elliott, C. (2015). The impact of bank size and funding risk on bank stability in Ghana. *Cogent Economics & Finance*, 3(1). <https://doi.org/10.1080/23322039.2015.1111489>
- Allen, F., Carletti, E., Cull, R., Qian, J., Senbet, L.W., & Valenzuela, P. (2013). Improving access to banking: evidence from Kenya. *World Bank Policy Research Working Paper No. 6593*.
- Amatus, H., & Alireza, N. (2015) Financial inclusion and financial stability in Sub-Sahara Africa(SSA). *International journal of social sciences*, ISSN 2305 – 4557.
- Bartha, J.R., Caprio, G., & Levin, R. (2008). Bank regulations are changing: For better or worse & *Quest. Comp. Econ.*, 89,285-296. <https://doi.org/10.1596/1813-9450-4646>
- Beck T. (2013). *Cross border banking and financial deepening: The African experience*. Paper presented at an AERC workshop December 2013.
- Beck, Demirguc-Kent, & Peria. (2006). Banking services for everyone? Barriers to bank access and use around the world. *World Bank Working Paper 4079*.
- Beck, T. (2009). Fin Access 2009: Trends, Analysis and Policy Conclusions. *Consultant report for FSD Trust Kenya*.
- Beck, T., De Jonghe, O., & Schepens, G. (2013). Bank competition and stability: cross-country heterogeneity. *J. Financ. Intermed*, 22, 218-244. <https://doi.org/10.1016/j.jfi.2012.07.001>
- Beck, T., Demirgüç-Kunt, A., & Martínez Pería, M.S. (2011). Bank financing for SMEs: Evidence across countries and bank ownership types. *J. Financ. Serv. Res.*, 39, 35-54. <https://doi.org/10.1007/s10693-010-0085-4>
- Carneiro, F. L. (2011). Is there evidence of a trade-off between financial stability and efficiency of financial intermediation? *Preliminary insights from the global financial crisis of 2007-2009*.
- CBK. (2009). Financial Access Partnership.FAB Survey.
- CBK. (2013). Financial Access Partnership.FAB Survey.
- Central Bank of Kenya. (2013). Retrieved from website:www.centralbankofkenya.go.ke
- Central Bank of Kenya. (2014). Bank Supervision Annual Report.Nairobi, Kenya: Central Bank of Kenya.
- Central Bank of Kenya. (2015). Bank Supervision Annual Report.Nairobi, Kenya: Central Bank of Kenya.
- Chibba, M. (2009). Financial inclusion poverty reduction and the millennium development goals. *European journal of development research*, 2009 – 230.Sinclairs MC Hard F, Dobbie. <https://doi.org/10.1057/ejdr.2008.17>
- Ciha'ki, M., Mare, D., & Malecky.Y. (2016). The nexus of financial inclusion and financial stability. *World Bank working paper 7722*.
- Demirguc- Kunt, T. Beck, & P. Honohan. (2008). Finance for all Policies and Pitfalls in expanding access. *World Bank Policy Research report Washington*.
- Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. *J. Finance. Econ.*, 98, 626-650. <https://doi.org/10.1016/j.jfineco.2010.06.004>
- Demirgüç-Kunt, A., Klapper, L., & Singer, D. (2013). Financial inclusion and legal discrimination against women: evidence from developing countries. *World Bank Policy Research Working Paper*.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., & Van Oudheusden, P. (2015). The Global Findex Database 2014: Measuring Financial Inclusion around the World. *World Bank Policy Research Working Paper 7255*.
- Demirgüt-kunt, A., & Klapper, L. (2012). Measuring Financial Inclusion: The Global Findex Database. *Policy Research working paper 6025*, World Bank, Washington DC.
- Diniz, D, Rene, B., & Marlei, P. (2011). Triggers and barriers to financial inclusion.The use of ICT-based branchless banking in an Amanon country. *Electronic commerce research and application*, 11(2012), 484-494.

- Financial Sector Deepening Kenya (FSDK). (2013). Fin Access National Survey 2013.
- Gujarati, D. (2003). *Basic Econometrics* (4th ed., P. 638-640). New York: McGraw Hill.
- Han, R., & Melecky, M. (2013). Financial inclusion for financial stability: access to bank deposits and the growth of deposits in the global financial crisis. *World Bank Policy Research Working Paper*.
- Hannig, A., & Jansen, S. (2010). Financial inclusion and financial stability: current policy issues.
- Kalunda, E. N. (2015). Financial inclusion, bank stability, bank ownership and financial performance of commercial banks in Kenya.
- Kenya bankers association. (2012). *Growth of the bank sector in Kenya*. Nairobi. Government press.
- Kenya. (2007). *Kenya Vision 2030*. The popular version, Nairobi Retrieved from www.vision2030.go.ke
- Kenya. (2013). *Kenya vision 2030*. Second medium Term plan 2013 – 2017, Nairobi. Retrieved from www.vision2030.go.ke
- Khan, H. (2011). Financial Inclusion and Financial Stability: are they two sides of the same coin? Speech at BANCON.
- Matete, J. K. (2014). Factors Affecting Pricing of Loanable Funds by Commercial Banks in Kenya. *International Journal for business and social science*, 244-245.
- Morgan, P., & Pontines, V. (2014). Financial Stability and Financial Inclusion. Asian Development Bank Institute. *ADB Working Paper 488*.
- Mostak, M., & Sushanta, M. (2015). Is financial inclusion good for bank stability? *International evidence*, University of London, U.K.
- Musau, S. M. (2013). An analysis of the utilization of agency banking on performance of selected bank in Nairobi county Kenya. (Unpublished MBA Project. Kenyatta University)
- Musau, S., Muathe, S., & Mwangi, L., (2017). Deepening financial inclusion and stability of commercial banks in Kenya: synergies and Trade-offs. *A paper presented at the 6th Annual Banking Research conference in Kenya September, 2017*.
- Musau, S., Muathe, S., & Mwangi, L., (2017). Financial access, competitiveness and stability of commercial banks in Kenya. *A paper presented at Greta University International Multidisciplinary Conference November 2017*.
- Ngugi, D. (2015). Relationship between mobile banking and financial inclusion in Kenya. (UNPUBLISHED MBA PROJECT UNIVERSITY OF NAIROBI)
- Ongore, V. O., & Kusa G. B. (2013). Determinants of Financial performance of commercial banks in Kenya. *International Journal of Economics and Financial Issues*, 237-238.
- Sahrawat, R. (2010). Financial inclusion from obligation to opportunity, Tata Consultancy Services LTD.
- Sarma, M. (2007). Index of financial inclusion. India council of research on international Economic Relations, Delhi, November 2007.
- Sarma M. (2008). Index of financial inclusion. Indian council for research on international Economic Relations, Delhi, June 2008.
- Sarma, M., & Pais, J. (2012). Financial inclusion and development. *Journal of international development*, 23, 613-628. <https://doi.org/10.1002/jid.1698>
- Sarma, & Pias. (2011). Financial inclusion and development: A cross country Analysis. *Journal of Economic literature* (JEL).