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Deposit Insurance a Precursor of Bank System Stability? An Empirical Evidence of Kenya Banking System

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Abstract:
Despite deposit insurance increasingly gaining favour from policy makers, it remains an inconclusive debate with different authors taking different arguments on its effect on bank stability. This paper sets out to establish the link between deposit insurance and bank system stability, with an empirical review on the Kenya banking system. At first, we argued that deposit insurance tends to bring stability in the banking sector by providing assurance to the depositors, thereby reducing the possibilities of bank run. However, such an interaction is only possible where other regulatory framework is available without banking competition. The results do not support our earlier arguments but point that deposit insurance coverage-stability nexus exists in the short run and tends to favour smaller banks. The results however support our second argument that with banking competition, the coverage-stability nexus is diluted as the banks competition increases bank appetite for risky activities regardless of the deposit insurance scheme. We recommend that policy makers should not focus a lot on increasing deposit insurance coverage limit, but rather on other supervisory framework, since the effect of the coverage on stability is felt in the short run.

Keywords: Deposit Insurance, banking stability, bank competition, bank run, Kenya

1. Introduction

A sound, healthy and competitive banking industry is important in the financial system, to the economy as a whole or when geared to boost vital sectors (Ogunlokun & Liasu, 2021). First, commercial banks play an important role in ensuring that there is efficient allocation of funds from those with excess to those with the deficit (or in need of funds). Competitive intermediation roles by banks links the borrowers to savers of funds guaranteeing efficient allocation of funds (Chan, 1983).Thus, idle funds are collected through savings mechanisms to be channelled to worthwhile economic activity using credit provision. Hence, the roles of banking systems in the economic development, through credit allocation, cannot be wished away. Consequently, a stable and healthy banking industry touches on all parties, including depositors, policy makers, regulators as well as the banks themselves. Customers/depositors are eager to know whether or not their funds with the bank as issuer of deposit claims are safe and even more so with the evolving digital currencies issuers (Smits, 2014; Bossone, 2021). For borrowers, their interest is to know the ease of access to credit on favourable terms. Firms in the banking sector would wish to compete professionally and cost effectively in their service provision; it is the role of the policy makers and regulators to ensure that all stakeholders' needs are met. To achieve this, different regulations have been formulated to ensure a smooth and stable operation of the banking industry. The variety of such regulations incorporates capital reserves, liquidity coverage, asset quality management, effective risk monitoring among others. This is particularly important for bank dependent markets and financial development (Delis *et al.*, 2021; Odhiambo, 2021).

Second, banks play a key role in the payment and settlement systems within a country. They facilitate the payments and flow of money from one end to the other. In fact, the banking industry plays a key role in implementing monetary policy. The central bank formulates monetary policy since it prints and regulates the amount of money supply in the economy. It uses multiple instruments for effective implementation of monetary policy, such as the through the commercial banks. Hence, any disruptions in the banking system may ultimately disrupt the stability of the financial system and even stall economic transactions (Ennis & Keister, 2008; Juhro & Goeltom, 2015).

Third, due to their noteworthy role in asset allocation, banks act as economic stimuli through provision of credit to entrepreneurs and businesses. Many developing countries are bank based, whereby commercial banks dominate the financial systems as compared to the industrialized economies, some of which are market based (Mishkin & Eakins, 2006). Since the access to credit in developing countries is banks-reliant, the performance, soundness and stability of banks is critical to minimize volatility. Systematic disruptions do spill over to affect other sectors in the economy and even beyond due to interlink ages (Krimminger, 2008). Such failure could ignite economic instability due to banking crises as historically witnessed in 2008, 1929 and 1907 (Bordo *et al.*, 2015). In the integrated financial systems, the failures spill

over to other economies via the forex market, bond market, stock markets and the interbank lending market. Different authors such as Krimminger (2008) and Foglia *et al.*, (2011) have explored the consequence, also known as the contagion effect. Foglia *et al.*, (2011) identified three basic categories of transmission channels of financial crisis, namely the borrower balance sheet channel, the bank balance sheet channel and the liquidity channel. The contagion effect implies that systemic failure in the banking and/or economic system may arise due to one bank failure (See Krimminger, 2008; Foglia *et al.*, 2011; Luu *et al.,* 2021).

In light of the global observations and the experiences on financial crises, regulators tried to tighten measures that protect the financial systems from collapse. One such control in the banking industry is the deposit insurance scheme. Deposit insurance scheme is a central bank regulatory tool aimed at protecting small depositors. It is established as a financial safety net aimed at providing cushion in times of liquidity crisis. As noted by Schich (2009), a financial safety net is an arrangement provided by the regulator to an institution with the sole purpose of protecting the economy by ensuring financial stability. Some of the financial safety nets established in this way include i) reserve with the central bank which is considered a lender of the last resort, ii) prudential banking supervision, iii) riskless settlement of payment system transaction and iv) deposit insurance (Schich, 2009; Stein, 2012; Siddque *et al.*, 2014).

The regulators enforce a deposit insurance scheme meant to protect the savers and eliminate the possibility of bank runs, due to many depositors, either from information by fact or rumour, deciding to withdraw their deposits simultaneously. This causes cash constraint to the bank which may end up looking for borrowing from other quarters in the financial system, which may disrupt the smooth running of the system. To avoid such happenings, deposit insurance provides a sense of assurance to the depositors that their money is safe. Such public assurance is important as it prevents individuals and small business from running to withdraw their money when certain information is in the market. Public confidence is considered as an asset in the banking industry by Phiri and Muponda (2016) who argue that it is needed in establishing stable financial systems. It ensures that depositors in a particular bank will not panic due to any information and trigger a run. Hence, the deposit insurance system tends to cool down tempers that may initiate a bank run. The approach favours deposit insurance to ensure stability and smooth out the payment systems in an economy (Demirgüç-Kunt & Detragiache, 2002; Kozińska, 2021).

However, different authors have pointed out possible negative effect of establishing deposit insurance. For instance, Hon Chu (2011) argues that the presence of deposit insurance makes the depositors to go about their business without any worries knowing that their deposits are protected. This attitude therefore eliminates the need for the depositors to monitor and police the activities of the bank especially in relation to risk appetite of the bank. As such, without this oversight, the banks may take up risky investments or engage in risky activities that may expose them to solvency risk. Therisk-taking attitude may be aggravated by the too-big-to-fail syndrome especially where the market competition is dominated by a few large banks. In addition, establishing a deposit insurance scheme may not by itself be a panacea to the instability of the banking industry. Authors like Anginer and Demirguc-Kunt (2018) emphasise the needs of establishing other macro and micro prudential regulations that support the deposit insurance scheme (DIS). A successful DIS can only be achieved when the overall environment is supportive of the same. While Shy, Stenbacka and Yankov (2016) in their paper argue that limited deposit insurance coverage reduces bank competition, in the current paper, we argue that the presence of bank competition within a DIS framework weakens the bank stability. This is because the banks compete to cover the tied-up capital in the insurance scheme by taking up innovative and risky activities (please see Contreras *et al.*, 2021).

This paper investigated the effect of deposit insurance on the stability of the banking industry in Kenya. In Kenya, the Kenya Depository Insurance Corporation (KDIC) is mandated to provide deposit insurance and incentives for sound risk management. The KDIC achieves this objective by ensuring that depositor's money is protected under a safety net scheme aimed to provide the public with an assurance about their deposit protection. The deposit insurance scheme was initiated in 1986 when the Deposit Insurance Fund Board, as spearheaded by KDIC, was created. The corporation is mandated to proactively address sectoral matters such that it can detect and intervene early enough to any indications that endanger the depositors' money as well as the stability of the financial sector as a whole. The paper contributes to the body of knowledge by focusing on deposit insurance coverage and provides useful sights on the link between deposit insurance coverage and bank stability.

1.1. Study Objectives
The main objective of this study was to investigate the effect of deposit insurance on the stability of the banking industry, a survey of Kenya banking industry.
The specific objectives that guided this study included the following:
- To investigate the effect of regulatory framework on the stability of the banking industry.
- To investigate the effect of deposit coverage on the stability of the banking industry.
- To determine the effect of banking competition on the stability of the banking industry.

2. Literature Review

2.1. Regulatory Framework
As discussed by Martin *et al.* (2017), bank regulations are a set of government interventions in the banking industry through imposing various restrictions, requirement, procedures, disclosures, standards, among others. The main objective of the government interventions through the banking regulations is to strive to protect bank depositors and other stakeholders from bank failures. In addition, the bank regulatory framework is established with the objective to

stabilizing the financial system. This is because the banking industry dominates the financial systems in most economies where the bank dependence is high. The policy makers and the regulators are well aware that a bank failure, especially of a large bank, can trigger losses within the industry which if not controlled can easily spill over to other industries. The contagion effect, which refers to the spread of a shock be it financial or economic, from a point of origin to other areas, is usually experienced whenever there is bank failure. The contagion effect is accelerated in the modern-day financial systems due to high level of integration and interdependence of the markets, such that a failure in one part of the market quickly spreads out to other regions. The contagion effect can create a crisis within a particular domestic market or even spread across to other foreign markets (Bordo *et al.*, 2015).

The main public policy objectives of a deposit insurer are to reimburse depositors after bank failure, act as receiver for failed banks, and contribute to the stability of a financial system (Lugulu, 2018). To achieve these objectives and build public confidence in a deposit insurance system, deposit insurers must be ready to act quickly after a bank failure. In addition, bank failures may have devastating effects not only to the depositors and bank owners but also to other sectors who rely on the banks payment systems. This has led to national and international laws and regulations aimed at the limitation of the financial sector in general, and the banking sector specifically. The aim of these regulations is to ensure the stability of the banking sector, and some scholars argue that the most important job of regulators is to ensure the stability of the sector (Beck & Laeven, 2006; Lugulu, 2018).

The sole objective of putting into place regulatory framework in the banking industry is to enable the regulator to oversee banks in a more systematic order as well as ensure that given standards are easily understood and followed by the particular banks. In the banking industry, a bank failure will be more felt by the depositors than the owners. This therefore makes the government regulatory intervention a case in point to protect the depositors from such failures. Moreover, the involvement of the government in the banks can ensure that financial prudence is followed by the banks in their risk assessment and in their credit and leverage decision mix. In this paper, we concentrated on the regulatory framework touching on the capital adequacy and the liquidity coverage.

Elliott (2014) argues that capital is one of the most effective safety buffer net for a bank since it provides sufficient resources to cover the bank during times of crisis. In addition, enforcement of capital requirement becomes an assurance factor for the players in the banking industry to an extent of creating public confidence to deal with the banks.

Under the liquidity framework, some authors (Mashamba & Kwenda, 2017; Bouwman, 2018) argue that the lack of sufficient and stable funding within a bank can result to fears in the market and eventually in a bank run. Elliott (2014) defines liquidity as the ability of a bank to meet its obligations as they mature, such as demand deposits that may be required at any time. For this reason, the need to put a legal framework that governs the amount of liquid cash and cash equivalents for a bank, simultaneously balanced with the associated economic costs. One option that banks can take is through the safety net provided by the DIS. Through deposit insurance, sufficient funds can be accessed in cases of bank liquidity crises or distress, even though temporal. Moreover, the fragile nature of the bank liquidity will necessitate the banks to make use of safety margins that can be solace whenever a crisis occurs.

Apart from providing covers during liquidity crisis, maintaining a sufficient safety margin enables a bank to access additional funds through the debt markets. This can help the banks to have available funds for further investment. This argument is a pointer that liquidity coverage may in itself help banks engage in other investment activities knowing that they have adequate cash to cover for demand deposits and other short-term liabilities. Looking at it from another angle, the existence of deposit insurance can help banks engage continuously with their intermediation function confidently aware of the safety net somewhere (Smits, 2014). Similarly, such a bank can engage in healthy investments where there exists a depository scheme. The need for liquidity regulation is also necessary not only to protect against bank run but also to provide an assurance to the depositors (Schich, 2009; Smits, 2014).

2.2. Deposit Coverage

Basic argument for the implementation of deposit insurance is for sharing risk between banks and insurance provider, ensuring the safety of depositor's fund, reducing risk when financial crisis happens and finally enhance the soundness of the banking industry. Depositor confidence depends, in part, on knowing that adequate funds for deposit insurance would always be available to ensure the prompt reimbursement of their claims. It is therefore considered a best practice to build credible ex-ante funding mechanisms that have the financial capacity to ensure that these obligations are met. Sound funding arrangements are essential aspects of such readiness, as they ensure prompt reimbursement of insured depositors and sufficient funds for the deposit insurer to unwind the institution (Siddque *et al.*, 2014; Shy *et al.*, 2016).

Diamond and Dybvig (1983) state that benefit of deposit insurance is to ensure the stability of banking system from systemic risks. By implementing the deposit insurance there is no reason for depositors to worry about losing their money because it is already insured and safe (Kusairi, 2015). Deposit insurance systems are designed to minimize or eliminate the risk that depositors placing funds with a bank will suffer a loss. Deposit insurance thus offers protection to the deposits of households and small business enterprises, which may represent life savings or vital transactions balances. With a deposit insurance system in place, these households and businesses can 'go about their businesses with some assurance that their funds are secure. This in turn supports the stability and smooth operations of the economy. This sense of public assurance is important. Public concern about the safety of deposits, whether based on fact or only on rumour, can lead, and has led, to the aforementioned damaging bank runs that can cause banks that are otherwise sound to fail. Similarly, concerns about one bank have at times led to concerns about others, resulting in so-called 'contagion runs' (Krimminger, 2008).

A deposit insurance scheme operates as a safety net meant to provide cushion for depositors in times of turmoil due to predicted and unpredicted failed bank (Kimmel *et al.*, 2016). The safety net is intended to shield the loss of depositors' savings. The scheme acts as an assurance if a bank were to fail. The assurance is important in that it may act as a deterrent from a bank run instigated by unfavourable information about any particular bank. Martin, Puri and Ufier (2017) note that an unlimited and consistent withdrawal of deposit, which leads to a bank run, is unsustainable both for healthy and for unhealthy banks. It is therefore prudent to provide a level assurance to the effect that the depositors are able to go on with their tasks without undue fears (Siddque*et al.*, 2014; Martin *et al.,* 2017).

2.3. Banking Competition

There is a widespread view that permitting institutions to freely compete might endanger the sector's stability by leading to widespread panics and uncontrollable bank runs that can easily spread to the economy as a whole. Banks play a crucial role in the economy because of their core products: loans to businesses and mortgages. Hence competition and efficiency in banking are also highly important as indicators of stability (Samantas, 2017). The literature on the relationship between the structure of the banking sector and financial stability concerted around two distinct strands with utterly opposite conclusions. They are arranged according to whether they support the idea that banking concentration has a destabilizing effect (concentration-fragility hypothesis) or whether on the contrary it has a stabilizing effect (concentration-stability hypothesis) (Ali *et al.,* 2015; Bandaranayake *et al.*, 2018).

The traditional view considers a competitive banking sector to be more prone to a crisis than a less competitive one. Becker (2010) supports this claim by using the profit variable as a means of comparison. He claims that in a highly competitive sector the profit margin will be very small for banks, and this will encourage them to take on more risky investments and, thus, endanger the stability of the sector. Shy *et al*. (2016), show that a high level of competition incentivizes financial institutions to take on riskier investments. However, they add that an adequate capital requirement level and deposit rate ceilings can help restore cautious bank behaviour.

Those in favour of competition emphasize its importance for adequate monetary transmission, which is the speed at which policy interest rates set by central banks pass through to bank interest rates. Competition also affects financial innovations, banks' financial health, financial stability and the accessibility of banking services to customers. As argued by Anginer, Demirguc-Kunt and Zhu (2014), bank competition may be healthy for the banking industry as it promotes stability of the banks. In the banking industry also, the presence of deposit insurance ensures that small banks can compete favourably with bigger banks. The reason is that deposit insurance motivates depositors to place their funds even in smaller banks knowing that they are protected. In addition, deposit insurance may aid the private commercial banks to compete with state-owned banks which enjoy explicit and implicit deposit guarantee. Therefore, deposit insurance scheme levels the playing ground for competition.

2.4. Public Interest Theory

Public interest theory which was first established by Arrow (1985) proposes that regulations from the government are usually legislated in good faith and in the interest of the public. The underlying argument in this theory is that government interventions in institutions through provision of guidelines, producers, restrictions and policies are meant to streamline and correct the markets for the sake of the public and the minority in the market (Mathis & Tor, 2019). Public interest theory is of the view that government regulations put in place to govern various institutions and fields are meant for the public interest. The theory holds that regulations are instruments for creating harmony and bringing about healthy competition, sound market operations and correct market imperfection (Mohd Amin, & Abdul-Rahman, 2020).

When the theory is extended to the banking industry, it is seen to hold that governments regulate the commercial banks for public interest. This is aimed at increasing the crucial public confidence in the banking sector. This would be achieved if the banking systems allocate resources efficiently and that their earnings are equitably desired by the society they serve. The theory forms the basis in this article endearing the regulations for deposit insurance necessity for banks to protect their depositors. The government in this case act to protect the depositors who in good faith put their money in the deposit taking institutions trusting that their money is safe(See Smits,2014; Mohd Amin, & Abdul-Rahman, 2020). Since the depositors are not concerned in the day-to-day running of such institutions, enforcing a scheme that aims to protect them is seen as move in the public interest rather than a restriction to a free market. Hence the theory is applicable in this paper in as far as the regulation on the deposit insurance as a government regulation is done in the hope of reducing the risk of systemic failure in the banks.

2.5. Empirical Review

The study by Demirguc-Kunt and Kane (2002) implies that high deposit insurance limits are more feasible in countries with better institutional environments. The primary objective of this paper was to investigate the impact of moral hazard on the effectiveness of deposit insurance in achieving banking stability. If moral hazard explains banking instability arising from the adoption of deposit insurance, then deposit insurance would be linked to bank insolvency more than with bank runs (See Schich, 2009). To test the hypothesis, the researchers developed a new empirical framework distinguishing between banking instability initiated by panic withdrawals of deposits, and banking instability initiated by the insolvency problem of banks. Using a dataset covering 118 countries over the period 1980–2004, the findings were that deposit insurance per se has no significant effect either on bank insolvency or on bank runs. However, interacting deposit insurance with credit to the private sector, there was a positive and significant effect on bank insolvency and bank

runs, suggesting that moral hazard outweighs the positive effect of deposit insurance on banking stability (Demirguc-Kunt and Kane, 2002)

On their part Cull, Senbet and Sorge (2001) carried out an empirical study investigating the impact of deposit insurance on the financial development and stability. Their main findings indicated that the use of deposit insurance, though initially aimed to prevent or reduce the risk-taking attitude of the banks, offers little help in this area. Consequently, the basic moral hazard that drives banks to engage in high-risk activities increases as they attempt to cover for the cost of deposit insurance scheme. For them, the existence of deposit insurance has a negative effect on the financial development and growth in the long run (Delis *et al.*, 2021; Odhiambo, 2021).

Ngalawa, Fulbert and Nicola (2011) researched on Banking Instability and Deposit Insurance: The Role of Moral Hazard. This paper aims at empirically investigating the role of moral hazard in the affectivity of deposit insurance in achieving banking stability. If the negative effect of deposit insurance on banking stability is through moral hazard, then deposit insurance will be associated with banking insolvency and credit crunch more than with bank runs. To test this hypothesis, the authors computed measures of these two types of banking instability. The findings were that deposit insurance per se has no significant effect either on bank insolvency and credit crunch or on bank runs. However, when the deposit insurance is coupled with an increase in credit to private sector, it has a positive and significant effect on bank insolvency and credit crunch but not on bank runs.

3. Methodology

The bank stability is measured using the z score following the approach used by Anginer and Demirguc-Kunt (2018) to measure bank risk. This forms the dependent variable which is defined as the bank return on assets plus bank equity to asset ratio scaled by the standard deviation of ROA.

$$zscore = \frac{ROA + \frac{Equity}{Asset}}{\sigma ROA}$$

This study used multiple regression analysis with bank stability as the dependent variable. All the data were obtained from the Central Bank of Kenya website, Bank Supervision and Bank Sectors reports. The data covered the period from 2005 to 2020, both inclusive giving period of sixteen years. The study used secondary data as obtained from the bank supervision and bank sector reports. Both descriptive and inferential statistics were used in data analysis.

4. Findings

4.1. Panel Data Diagnostics

The first step in the research was to look at the descriptive statistics which enabled the researcher to check for any outliers and to decide on the best course of action if outliers are found. In addition, the descriptive statistics give a good overall view of the behaviour of the study variables. This enables the researcher to 'clean' data where unexpected values are obtained.

Variable	N	Mean	Median	SD	Max	Min	Skewness	Kurtosis
zscore	675	6.260	5.967	2.922	12.66	1.173	0.474	2.538
zscore1	675	13.10	12.59	7.243	29.31	1.178	0.417	2.587
CAR	675	0.158	0.146	0.0595	0.317	0.0634	1.082	3.911
Mkt share	675	0.0222	0.00782	0.0277	0.0947	0.00111	1.530	4.067
coverage	676	0.0921	0.0663	0.0809	0.337	0.00605	1.712	5.434
LR	622	40.82	40.06	9.933	62	19.39	0.270	2.761
deposit	676	42,077	13,099	60,142	218,153	823	1.891	5.481
profit	675	1,967	317	3,455	12,074	-968	1.888	5.399
assets	675	57,322	17,360	79,397	284,691	2,147	1.810	5.156
equity	675	8,735	2,741	12,654	45,163	354	1.889	5.377
ROE	675	0.143	0.169	0.169	0.372	-0.396	-1.146	4.492
ROA	675	0.0198	0.0227	0.0277	0.0580	-0.0749	-1.371	5.479
Log(assets)	675	10.06	9.762	1.429	13.54	6.252	0.269	2.349

Table 1: Descriptive Statistics

Table 1 displays the descriptive statistics for the variables of interest in this study. All the data (apart from the computed ones) for these variables were obtained from the website of Central Bank of Kenya, Bank Supervision & Bank Sector reports. Z score is used as the proxy for banking system stability and is calculated as bank return on assets (ROA) plus bank equity to asset ratio scaled by the standard deviation of ROA for the all banks per year; zscore1 is a variant of z score with standard deviation of ROA for all years of study per bank; CAR is the capital adequacy ratio; mktshare is the share for each bank computed as the ratio of bank assets to total assets of the industry per year; coverage is the deposit insurance coverage computed as the ratio of the insured deposit to total deposit per bank per year; LR is the liquidity ratio; deposit represents the amount of customers' deposit (in million Ksh); profit is the net profit after tax (in million Ksh); assets, equity are in million Ksh; ROE and ROA is the return on equity and return on assets respectively; log(assets) represents the natural log of assets which is the proxy for bank size. All data cover the period from 2005 to 2020.

Table 1 shows that the descriptive statistics fairly provide data within the expected normal distribution with lowest skewness being -1.371 and the highest being 1.891 while kurtosis range from 2.349 to 5.481. Similarly, Figure 1 shows the distribution for the residue used to check for outliers by use of histogram. The diagram provides a visual picture of the residue and as depicted in the diagram, there were no visible outliers needing attention.
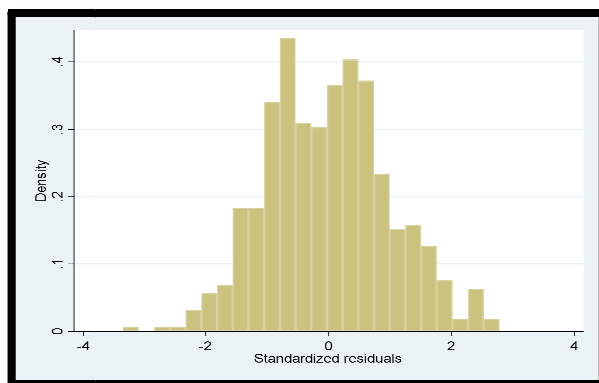

Figure 1: Histogram for Normality Test for the Residue Terms

While testing the data for multicollinearity, variance inflation factor test was used. According to this test, if the VIF result is greater than 10, the data has problems of multicollinearity. As shown in Table 2, no VIF result was more than 10. Hence the data

Variable	VIF	1/VIF
Mktshare	1.071	.934
CAR	1.041	.961
coverage	1.04	.961
LR	1.012	.988
Mean VIF	1.041	

Table 2: Variance Inflation Factor

This table reports the VIF test for multicollinearity. All variables are defined in the legend of Table 1.

4.2. Model Specification

In this phase, we determined which panel model to use, either fixed effect model or random effect model. A fixed effect model allows for individuality or heterogeneity. That is, the individual firms have their own intercept but the intercepts do not vary over time. On the other hand, a random effect model does not allow individual firms to have their own intercept but rather a common intercept that varies over time. To test whether to use FE model or RE model, Hausman test was used with the following hypotheses:

H_0: Random effect model is the appropriate model
H_1: Fixed effect model is the appropriate model

Test statistics	Coef.
Chi-square test value	13.057
P-value	.011

Table 3: Hausman Test for Choice of Fe Or Re
Hausman (1978) Specification Test

Since the ρ-value is less than 5%, then the null hypothesis was rejected. Hence, the research uses fixed effect model.

4.3. Model Formulation

This study investigated the effect of deposit insurance on bank system stability. The dependent variable was therefore the bank system stability which was measured using z score. Anginer and Demirguc-Kunt (2018) defines z score as the bank return on assets plus bank equity to asset ratio scaled by the standard deviation of ROA. In this case, we first calculate the standard deviation of ROA based on the entire banking industry. That is, we calculate the volatility of return on asset for all the banks per year. This was consistent with our argument that banking stability is a market indicator for the entire bank system. Our independent variables include the regulatory framework with capital adequacy ratio (CAR) and liquidity ratio (LR) as the proxies, deposit coverage (calculated as the ratio of deposit insurance to total customers' deposits) and bank competition with proxy being market share (calculated as the ratio of individual bank assets to total assets for all banks per year). We also control for bank size (using natural log of assets). Hence, the main model is as specified below:

$$zscore = \beta_0 + \beta_1 * x_1 + \ldots + \beta_k * x_k + b_{d*} + y_{d*} + u_i$$

Where z score measures the bank system stability, $\beta_1\ to\ \beta_k$ measure the regression coefficients for the independent variables for our models, $x_1\ to\ x_k$ are the predictor variables in our model, $b_{d*}\ and\ y_{d*}$ are the full set bank dummies and the full set year dummies; and u_i measures the error term.
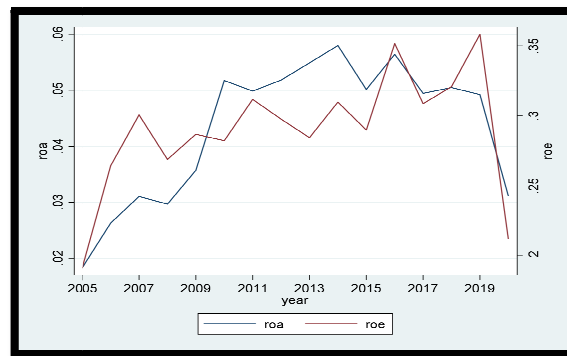

Figure 2: Graph Showing ROA and ROE for KCB Plc
Source: Published Annual Reports

The stability of the bank performance can be established by looking at the volatility in the bank performance in terms of its profitability. Figure 2 shows the trends of return on assets and return on equity for Kenya Commercial Bank (KCB) plc one of the biggest banks by assets. As shown in the diagram, the bank has experienced volatility in its profitability as measured by ROA and ROE over the study period. This provided an impetus for this research investigation, in which our interest was to investigate whether bank stability can be assured through deposit insurance coverage.

Variables	(1) zscore	(2) zscore	(3) zscore
coverage	3.394**	2.995**	2.024*
	(2.412)	(2.124)	(1.675)
Mkt share		27.45**	54.17***
		(2.513)	(8.634)
CAR			23.40***
			(14.89)
LR			0.00997
			(1.096)
Log(assets)	-0.892***	-1.359***	-1.127***
	(-4.527)	(-5.030)	(-9.080)
Constant	12.22***	16.95***	12.24***
	(4.741)	(5.327)	(9.517)
Observations	675	675	621
R-squared	0.762	0.765	0.405

Table 4: Main Model

Table 4 reports the estimation results for the fixed-effect specification for the main model. All variables are defined in the legend of Table 1. All the regressions include the full bank and year dummies. The t-statistics are reported in parentheses; ***, ** and * show significance at 1%, 5% and 10% respectively.

The results displayed in Table 4 show the main model specifications with stability as measured by zscore as the dependent variable. In the first column, deposit insurance coverage was found to be positive and statistically significant. This showed that deposit insurance coverage increases bank stability within a framework with no banking competition and without other regulatory framework. Further, the bank size as measured using the natural log of assets was negatively and significantly related to zscore. This implies that bigger banks experience high volatility whenever there is deposit insurance scheme in the system. Column 2 reports the same model but inclusive of bank competition. In the face of competition, the deposit insurance coverage is still significant. However, as revealed by the results, the level of significance goes down while the negative effect of bank size increases. These results show that bank competition decreases the coverage-stability nexus while at the same time increases the instability effect for larger banks. This implied that bigger banks are more exposed to fragility as they compete to cover for tied up capital in the deposit insurance scheme. For this, they engage in more risky activities as compared to smaller banks who tend to benefit from a deposit insurance scheme. The third column reports the results when regulatory framework as measured by capital adequacy ratio and liquidity ratio are included in the model. As shown by the results, the effect of deposit insurance coverage in a more regulated industry tends to decrease the effect on bank stability.

Variables	(1) zscore1	(2) zscore1	(3) zscore1
coverage	10.07***	9.670***	-5.974*
	(3.874)	(3.699)	(-1.709)
Mkt share		27.44	23.54
		(1.355)	(1.297)
CAR			42.29***
			(9.300)
LR			0.0886***
			(3.364)
Log(assets)	-0.590	-1.057**	1.324***
	(-1.622)	(-2.110)	(3.689)
Constant	23.74***	28.46***	-10.44***
	(4.984)	(4.824)	(-2.807)
Observations	675	675	621
R-squared	0.868	0.868	0.205

Table 5: Alternative Specification

Table 5 reports the alternative model specification with bank system stability measured using zscore1. Different from the previous model, the zscore is obtained by dividing with standard deviation of ROA for individual bank period covered. All variables are defined in the legend of Table 1. All the regressions include the full bank and year dummies. The t-statistics are reported in parentheses; ***, ** and * show significance at 1%, 5% and 10% respectively.

In Table 5, we estimate the alternative model where the bank stability is computed using the zsore but from a different approach. Unlike in the main model specification, the standard deviation used in computing the zscore is for the individual banks during the period 2005-2020. The standard deviation is considered a good indicator of volatility, computed based on the profitability of the individual banks within the study period. In this case, we argue that the stability of a bank should be considered from its volatility in return on assets. As shown in Table 5, deposit coverage is positive and highly significant in the absence of competition and other regulation (column one) but its significance decreases with introduction of market competition (column two). In column three, the effect of deposit insurance coverage becomes negative meaning that in the face of competition and regulatory framework, the use of deposit insurance coverage leads to instability in the bank.

Furthermore, the study also reviewed the possibility of deposit insurance coverage having a long run effect on the bank system stability. To address this concern, we introduced the first and second difference for bank stability and observed the changes. Table 6 reports the results obtained from this additional analysis. As per Table 6, the effect of deposit insurance coverage on bank system stability is a short run effect. After first differencing (Table 6, column 2), the effect is negative implying deposit insurance coverage leads to instability. However, with the second differencing (column 3) and third differencing (column 4), the deposit insurance coverage has no significant effect on bank system stability. We therefore conclude that deposit insurance coverage only provides a positive short-term effect on stability but loses its effect in the long run. This could be possible as the banks try to adjust their investment portfolio in the long run to cover for the tied-up capital in the deposit insurance scheme.

Variables	(1) zscore	(2) Δzscore	(3) Δ2zscore	(4) Δ3zscore
coverage	2.024*	-0.606	0.221	3.952
	(1.675)	(-0.413)	(0.0892)	(0.843)
mktshare	54.17***	5.863	-8.969	6.164
	(8.634)	(0.765)	(-0.686)	(0.250)
CAR	23.40***	2.111	3.976	-0.690
	(14.89)	(1.079)	(1.172)	(-0.107)
LR	0.00997	0.0261**	0.0352**	0.0415
	(1.096)	(2.430)	(1.976)	(1.278)
Log(assets)	-1.127***	-0.0721	0.228	-0.353
	(-9.080)	(-0.468)	(0.850)	(-0.684)
Constant	12.24***	-0.976	-4.411	1.512
	(9.517)	(-0.613)	(-1.608)	(0.286)
Observations	621	570	520	470
R-squared	0.405	0.015	0.013	0.006

Table 6: Dynamic Interactions

Table 6 reports the results for dynamic analysis with the first (column 2), second (column 3) and third (column 4) difference of the bank stability (zscore). Dummy variables for bank and year were not included in the analysis. All variables are defined in the legend of Table 1. All the regressions include the full bank and year dummies. The t-statistics are reported in parentheses; ***, ** and * show significance at 1%, 5% and 10% respectively.

We further investigated our concerns that the stability of a bank, and in essence of the entire bank system may be influenced by the bank size. However, the bank size may adjust due to its performance in terms of profitability. We address these concerns of endogeneity by introducing return on assets and return on equity as instrumental variables of bank size. The argument is that, as the bank grows in size, its appetite to engage in risky activities increases. Consequently, its ROA and ROE which influence the bank investment and therefore growth may endogenously influence bank size and reduce the effect of deposit insurance coverage on its stability.

We carried out the first stage equation to investigate whether there was any significant effect between bank size and return on assets and return on equity. The results are presented in Table 7 column (1) which shows that as earlier predicated, there is a significant relationship between bank size (log assets) with ROA and ROE. We therefore proceeded to test the presence of endogeneity using Housman test with the following hypotheses:

H_0: $cov\ (y, u) = 0$ or There is no endogeneity
H_1: $cov\ (y, u) = 0$ or There is endogeneity

The results in Table 7 column (3) show that the coefficient for linear prediction was highly significant which confirmed our earlier proposition that there exists endogeneity for the bank size. This is further confirmed by the results of the coefficient of linear prediction in column (4) where we conducted the 2SLS directly. These results helped us to conclude that bank size is an important factor to consider in the coverage-stability nexus. In addition, controlling for bank size can help to clearly show the effect of deposit insurance coverage on bank stability.

Variables	(1) Log(assets)	(2) zscore	(3) zscore	(4) zscore
coverage	-2.864***	2.100**	2.46e-08	7.53e-08
	(-7.976)	(2.063)	(2.40e-08)	(7.35e-08)
mktshare	41.62***	39.87***	8.86e-07	-5.62e-07
	(34.87)	(7.170)	(1.41e-07)	(-8.95e-08)
car	-4.232***	22.91***	2.25e-07	8.05e-08
	(-8.263)	(15.73)	(1.14e-07)	(4.07e-08)
lr	0.00572**	0.00777	5.26e-10	3.54e-10
	(1.998)	(1.003)	(6.85e-08)	(4.61e-08)
Log(assets)		-1.349***	-2.55e-08	7.15e-09
		(-12.39)	(-2.02e-07)	(5.66e-08)
roa	17.38***	38.86***		
	(7.161)	(5.700)		
roe	-2.430***	1.905*		
	(-5.948)	(1.681)		
Linear prediction			1.000***	1.000***
			(15.94)	(15.94)
Constant	9.780***	13.86***	2.69e-07	-5.89e-08
	(66.90)	(12.20)	(2.03e-07)	(-4.44e-08)
Observations	621	621	621	621
R-squared	0.755	0.579	0.579	0.579

Table 7: Instrumentalism and Hausman Test

Table 7 reports the results for end ogeneity test using Hausman test and the instrumentalism test. Dummy variables for bank and year were not included in the analysis. All variables are defined in the legend of Table 1. All the regressions include the full bank and year dummies. The t-statistics are reported in parentheses; ***, ** and * show significance at 1%, 5% and 10% respectively.

5. Conclusions and Recommendations
- Deposit insurance coverage (DIC) was found to be positive and statistically significant, since it raised bank stability in the context without banking competition or other regulatory framework. However, DIC system raised volatility for the larger banks, but it retained a diminishing significance as the bank grew in the face of competition. Thus, bank competition decreased the coverage-stability nexus with a simultaneous instability upsurge effect for larger banks.
- The effect DIC on bank stability tended to reduce in case of the regulated banking sector.
- Our study also concludes that bank size is significant in the coverage-stability nexus. Moreover, when bank size is controlled for, the deposit insurance coverage influence on bank stability becomes clearer.
- The alternative model suggested the standard deviation of return on investment as proxy for bank stability, displaying the effect of DIC as positive and highly significant without competition and other regulation; when market competition

is introduced that significance decreases. Further, the effect of DIC becomes negative in the face of competition and regulatory framework, hence impact of DIC leads to instability in the banking sector.

- The deposit insurance coverage effect on bank system stability was only demonstrated in the short run, but not long run.

5.1. Recommendation

   The study contributes to the debate of applicability of deposit insurance to the Kenya banking system, which in the past witnessed bank runs and failure. A study is recommended to assess the applicability deposit insulation to cases similar to the past business failures that affected stakeholders such as public institutions.

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