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Abstract

The paper sought to explore the role of bank capital in mitigating credit risk and promoting financial stability. To achieve this, we constructed a Financial Soundness Index to evaluate financial stability conditions. A Panel Vector Auto Regression Model was employed using annual bank-level data from 2001-2020 for 37 banks, to examine the effect of bank capital on credit risk and financial stability. Overall, financial stability index long-term trend shows banks remain resilient, despite the downward trend from 2011 and instability margins since 2016. The findings also reveal that bank capital, lowers credit risk and strengthens financial stability. The paper conclude that bank capital supports financial stability through mitigating credit risks, and recommends that authorities continue adopting and implementing appropriate capital policies to foster financial stability and promote bank lending.

Key Words: Bank Capital, Credit Risk, Financial Stability, Panel Vector Auto Regression model.

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1.0 Introduction

Lessons from the global financial crisis (GFC) 2007-2009 period resulted in the introduction of stringent international standards such as Basel III framework and IFRS 9. These standards aimed at enhancing the bank capital requirement, a key pillar to promote financial sector resilience through capital accumulation requirements that could absorb anticipated losses in future crises. While regulatory consensus has focused on capital regulation, there has been less agreement among economic theorists on the role of capital in mitigating credit and financial instability risks.

Theoretical literature emphasizes that capital is a potential buffer in absorbing loses from shocks. This based on fact capital, as part of banking financing does not have a contractual requirement to be repaid and can absorb losses when a bank's assets lose value. On other hand, banks primary function is economic resources allocation and financial intermediation, through advancement of credit. Credit intermediation poses several possible risks to the banking sector, among them; credit risk, liquidity risk and market risk. Credit risk arises because of the poor performance of one or more debtors in form of the debtor's inability to fulfil part or all of the contents of the credit agreement that was mutually agreed upon previously (Ari, Chen & Ratnovski, 2019; Gande, 2008; Ismawati & Istria, 2015). Elevated credit risk evidenced by high ratio of non-performing loans to gross loans points vulnerability in the banking sector, therefore a threat to banking sector stability. Elevated credit risks contribute to a reduction in bank profitability, making it harder for banks to generate capital internally. This particularly bring fragility to the banking sector and ultimately the economy. These fragilities may persist during crisis periods and even years after the crises have ended. Ari et al. (2019) show that a buildup of credit risk during crisis periods may take from 2.5 years to 7 years after the start of a crisis for them to be recognized and fully resolved.

Onset of the global COVID-19 pandemic led to the health crisis and economic shocks that resulted in lower income for households and firms resulting from higher unemployment of households and lower financial performance of firms. This shock heightened credit risk and banks had to rely on their accumulated reserves/ capital to absorb higher than anticipated loses. The COVID-19 pandemic resulted in economic and financial crisis only precedented by the global financial crisis of 2007-2008. Monetary authorities and governments responded through various interventions which including fiscal, monetary and financial measures to cushion the financial sector, real economy and vulnerable citizens against adverse effects of COVID-19 pandemic (IMF, 2021).

Easing of some monetary and introduction of financial measures such as utilization of capital buffers, delay in implementation of Basel III and IFRS 9 capital accumulation were introduced to encourage banks to stimulate bank lending, and absorb losses occasioned by credit defaults and ultimately promote economic growth and financial stability Additionally, the prompt response from prudential authorities globally at the onset of the Covid-19 pandemic also included forbearance measures to support economic recovery. Empirical literature shows forbearance measures were found to be effective in the short run during crisis periods, though ineffective in limiting future defaults, as they are associated with lower future lending (Bergant & Kockerols, 2018). However, empirical evidence indicates banks tend to provide forbearance measures for the riskiest borrowers during crisis periods, hence exacerbating credit risks. Although economic and financial policies undertaken during the Covid-19 pandemic period were stop-gap measures, they may be unlikely limit future credit losses and thus not influence banking sector stability in the medium to long-term horizon. This raises the question on whether forbearance measures help to foster financial stability or raises the probability of bank instability due to credit losses.

Post global financial crisis (GFC) of 2007-2009 period, enhanced bank capital requirements were advocated as a key pillar to promote resilience in the financial sector through accumulation of capital buffers for absorbing financial shock during future crises. Most countries encouraged capital build-up as outlined in the Basel III framework, with the expectation that the additional capital buffers will be utilized to absorb shocks and support more lending during crisis periods. The argument for regulatory capital enhancement was that well capitalized banks are more resilient to financial shocks hence increasing financial sector stability (Oduor, Ngoka & Odongo, 2017). Prior to the COVID-19 pandemic in the post 2007-2009 GFC period no major crisis had been experienced globally to necessitate an adjustment of bank capital to mitigate a crisis.

Therefore, some policy blind spots exist particularly, on the effectiveness of regulatory capital to absorb shocks and support lending during crisis periods and on setting optimal capital requirement levels that are commensurate to banks portfolio risks among them credit and liquidity. This paper seeks to address these policy blind spots by attempting to answer two key research questions in the context of Kenya's banking sector namely; does bank capital affect credit risk; and does bank capital affect financial sector stability?

The rest of the paper is structured as follows; section 2 discusses credit risk, capital and stability conditions; section 3 present literature review; section 4 present research methodology; section 5 discusses empirical findings; and section 6 present conclusion and policy recommendations.

2.0 Credit Risk, Bank Stability and Bank Regulatory Capital

At the onset of the COVID-19 pandemic in Kenya, the monetary and prudential authorities implemented a raft of measures to cushion the economy, businesses, vulnerable citizens against adverse effects of COVID-19 pandemic. Some of these measures included; easing monetary policy; delayed loan loss provisioning occasioned by restructuring and delayed loan classification; and delayed capital build-up through prolonged implementation of IFRS 9 and Basel III framework. These measures were aimed at boosting lending to support economic recovery and absorb financial shocks emanating from the COVID-19 pandemic. At the time, the pandemic is still evolving, hence limited conclusive empirical evidence on the effectiveness of these capital measures.

Evidently, the COVID-19 pandemic exacerbated credit risks in the banking sector as indicated by a deterioration of bank asset quality reflected by the rising ratio of non-performing loans to gross loans (NPL ratio). The NPL ratio rose to a high of 14.1 percent in 2020 from a low of 6.2 percent in 2010. This indicates credit risk has more than doubled in the last decade, while a 2.1 percentage points jump in the NPL ratio between 2019 and 2020 may be attributed to the negative effects of the COVID-19 pandemic. Decomposing sectoral credit risk distribution reveals, tourism, hotels & restaurants; transport & communications; trade; and personal/households sectors recorded the highest rise in credit risk as at December 2020 (CBK, 2020). Evidence of enhanced lending resulting from monetary authority measures is also still missing. This is indicated by depressed annual loan growth since their highest growth recorded in 2011. The slow growth of loans from July 2020 may largely reflect the negative impact of COVID-19 pandemic resulting from lockdowns, restrictions and containment measures.

From a stability perspective, Kenyan banks maintained high capitalization levels as evidenced by Capital Adequacy Ratios (CAR) above minimum thresholds of 14.5 percent for total capital to total risk weighted assets and 10.5 percent for core capital to total risk weighted assets, indicating adequate capital buffers. These capitalization levels have been declining from December 2013. The declining trend of capitalization indicates banks experienced a capital draw down prior to the COVID-19 pandemic, hence banks might be more susceptible to financial stability risks. Additionally, declining banking sector profitability since 2015 also raises concerns on the ability of banks to accumulate capital buffers to withstand shocks like an extreme impact of the COVID-19 pandemic (**Table 1**). Financial soundness indicators from selected African countries comparable to Kenya indicates variations. In the East Africa Community (EAC), Kenya has the highest ratio of non-performing loans indicating as at December 2020, Kenya banking sector experienced higher credit risks. However, these credit risks are lower compared to Angola and South Africa (**Table 2**).

Table 1: Kenya Banking Sector Financial Soundness Indicators

Figures in percentage	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Capital to Total Risk - Weighted Assets	20.8	19.4	21.9	23.2	19.2	18.8	18.7	18.5	18.7	18.8	19.2
Core Capital to Total Risk - Weighted Assets	18.7	17.3	18.9	19.4	15.9	15.7	16.3	16.0	17.2	16.8	16.7
Profit Before Tax (Annual Growth Rate)	48.5	23.7	27.2	13.1	14.4	(17.3)	40.3	(18.30)	16.4	8.7	(28.8)
Gross Loans (Annual Growth Rate)	19.9	30.2	10.4	15.6	25.3	21.5	(1.5)	3.8	7.1	9.0	7.0
Gross NPLs (Annual Growth Rate)	(5.6)	(8.3)	5.3	31.3	30.0	20.3	57.4	24.5	30.0	7.7	16.8
Return on Assets (ROA)	3.7	3.3	3.8	3.6	3.4	2.9	3.1	2.7	2.7	2.5	1.6
Return on Equity (ROE)	30.7	32.2	34.2	28.9	26.5	23.8	24.8	20.8	22.5	21.2	13.8
Liquidity Ratio	44.5	37.0	41.9	38.6	37.7	38.1	41.4	43.7	48.6	49.7	54.6
Non Performing Loans (NPL) Ratio	6.2	4.4	4.5	5.0	5.4	6.4	9.1	10.6	12.0	12.0	14.1

Source: Central Bank of Kenya

Table 2: Banking Sector Financial Soundness Indicators from Selected African Countries

Figures in Percent (Year 2020)	Rwanda	Tanzania	Uganda	Angola	S. Africa	Nigeria	Kenya
Total Capital to Risk-Weighted Assets	21.5	17.9	22.2	25.7	16.6	15.1	19.2
Core Capital to Total Risk-Weighted Assets	20.3	17.1	20.6	26.9	15.7	12.8	16.7
Non-performing Loans to Gross Loans Ratio	4.4	8.7	5.2	23.2	25.6	6	14.1
Return on Assets	2.8	2.1	3.2	4.3	0.6	2.2	1.6
Return on Equity	16.8	13.6	18.9	34.2	7.7	24.8	13.8

Source: Global Financial Development Database

3.0 Literature Review

Theoretically, bank equity is expected to buffer against moral hazard of banks' investment thus protecting depositors' funds from banks' excessive risk taking (Rochet, 1992; Mishkin, 2007; Morrison & White, 2005; Allen et al., 2009). Bank capital hedges depositors against bank's moral hazard problem, where bank managers are likely to take up higher risks in lending in order to increase profits to satisfy shareholders and increase banks' share value in markets. Large banks in particular maintain capital ratios as close to regulatory minima as possible in an effect to manage their capital efficiently. Banks view buffers as insurance against regulation violation. In the United Kingdom, banks maintain their capital ratios at a higher level relative to the regulatory minima and when these banks anticipate changes in regulatory capital requirements, they are able to draw down on these buffers temporarily when responding to these regulatory changes (Aiyar et al., 2015).

Empirical literature on capital regulation and how banks react to changes in capital requirement and thus the effect of bank capital on stability is mixed. One strand of literature postulates positive links between capital and financial stability. These literatures argue, capital function as buffer against credit losses hence found to lower credit risk thus strengthening financial stability for G10 countries in 1990 (Matten, 1996; Van Roy, 2005). Second strand of literature shows well capitalized banks are in a stronger position to lend and have more stringent screening and monitory incentives. Higher capital requirements lower banks' incentive risk taking for value maximization and thus supports financial stability. More capital is stabilizing for banks as banks set stringent acceptance criteria for new loans thus minimizing credit risk (Holmstrom & Tirole, 1997; Coval & Thakor, 2005; Mehran & Thakor, 2011; Furlong & Keeley, 1989; Keeley, 1990; Bolt & Tieman, 2004). Capital requirements are effective in monitoring risk taking as they increase the equity to capital ratios of banks and thus lower credit risks. Higher capital reduces banks' exposure to systemic risk, thus lowers the probability of banking crises (De Jonghe, 2010; Martinez-Mierra & Suarez, 2014).

Third strand of literature, empirical studies have found that an optimal capital structure may be desirable as raising regulatory capital ratios can be costly as it lowers bank profitability, bank share prices and credit provision (Aiyar et. Al., 2015). Higher capital requirements beyond certain thresholds have been shown to raise bank inefficiencies and be destabilizing for banks (Berger & Mester, 1997). Banks tend to prefer debt to equity and lending to homogenous sectors in small open, less diversified economies, thus banks face a similar macroenvironment which has implications on banks credit risk for which higher capital might not fully cover (Goodhart, 2005; Blum & Hellwig, 1995). Moreover, there is evidence of positive relationship between regulatory capital measures and bank portfolio risk (Kahane, 1977; Koehn & Santomero, 1980; Kim & Santomero, 1988). Under capitalized banks exhibited higher risk-taking in the period prior to an anticipated rise in regulatory requirements to generate income required to meet higher capital requirements in the next period (Godlewski, 2004).

Regulatory capital is set uniformly which alters the effect of capitalization on banks risk at the aggregate level and may result in the effect of capital on credit risk being more pronounced in some banks based on their level of capitalization (Goodhart, 2005). Large banks with low capital ratios were shown to slow down both lending and recovery during the 2007-09 subprime crisis. The positive effect of capital on minimizing credit risk was found to be stronger for banks with low capitalization, since these banks credit contraction due to low credit supply is attributed to low bank capitalization (Klomp & De Haan, 2012; Albertazzi & Marchetti, 2010). Empirically, on the link between credit risk and financial stability, there is evidence that high credit risk raises financial stability concerns which in turn affect banks' ability to extend credit and thus support growth. Europe's legacy NPLs that increased to as high as 9 percent of GDP were shown to slow down credit and limit recovery through tying up capital that could have been directed to lending. High provisions to cater for high NPLs resulted in lower lending, lower bank profitability and constrained credit growth (Aiyar et al., 2015). High credit risk (NPL ratio that exceeds seven percent) has been found to be undesirable due to the adverse impact on bank balance sheets, credit growth and output recovery (Kalemli-Ozcan, Laeven, & Moreno, 2015).

Evidence from countries that have experienced multiple banking crises such as Greece and Ukraine concur that higher bank capital levels not only foster bank stability by lowering systemic risk, but also increases the probability that banks will be resilient during banking crises. This suggests that over a longer horizon, regulatory capital measures such as bank capital and other macro prudential policies may be better suited to support bank stability relative to other forbearance measures (Holmstrom & Tirole,1997; Mehran & Thakor, 2011; Berger & Bouwman, 2013). Studies on the effect of both credit risk and capital adequacy on financial distress, also reveals mixed results. Ismawati & Istria (2015) found that credit risk has a positive significant effect on financial distress, while capital adequacy shows a positive, non-significant effect, a contradiction to Shidiq & Wibowo (2017), who found both credit risk and capital adequacy has a negative significant effect on financial distress. On other hand, EL-Ansary & Saleh (2018) and Peterson (2019) found credit risk and capital adequacy have positive nonsignificant and negative non-significant effects on financial distress, respectively.

In summary, limited empirical studies on Kenya focusing on capital, credit risks and financial stability exist. Our study thus contributes to the literature in three ways: first the study analyzes in detail the evolution of financial stability; second, study accounts for different policy regimes in Kenya by covering a long period of time of 2001–2019 compared with previous studies reviewed. The study period presents interesting characteristics that enrich our analysis such as; introduction of interest rate controls in 2016; period of high and prolonged inflationary episodes in 2009 and 2011, the placement of three banks under receivership in 2015 and 2016. These events affected how banks undertake their operations thus affecting their capitalization, lending and stability. Third, the paper employs appropriate econometric analysis to quantify the impact of capital and credit risks dynamics on financial stability conditions in Kenya.

4.0 Research Methodology

4.1 Measures of Financial Stability

Empirical work by Manolescu & Manolescu (2017) define financial stability in both a wide and narrow sense. Financial stability broadly refers to the situation where the financial system efficiently attracts and allot monetary assets, while at same time being resilient to shocks without damaging the real economy. On other hand, from a narrow perspective, financial stability refers to the situation when banking crises do not occur due to a functioning banking system and asset price stability. This paper applies the narrow definition of financial stability due to the bank-led nature of Kenya financial system.

To measure financial stability, we follow various empirical work (Gersl & Hermanek, 2007; Kočišová & Stavarek, 2015; Agung et al., 2019; Lepetit & Strobel, 2014; Shijaku, 2017) to construct a Financial Soundness Index (FSI). International best practice, available literature and expert judgment inform the choice of variables that form the FSI and their respective weights. Largely these indicators are drawn from the banking sector recognizing that Kenya financial sector is dominated by banks. Bank variables included are; capital adequacy measured by Capital Adequacy Ratio (CAR) and profitability measured by Return on Equity (ROE), where these two indicators form the cushion on which a bank has at its disposal to mitigate against potential risks; asset quality indicators measured the ratio of non-performing loan ratio to gross loans (NPLr), to evaluate the degree of credit risk; liquidity indicators measured by liquidity ratio (Liqr) to indicate bank's liquidity against potential liquidity problems; interest rate risk measured by ratio of interest expenses to interest income (Intrisk), to capture the mismatch between assets and liabilities and, while also indirectly capturing the potential losses caused by a rise in interest rates; and the efficiency risk measured by cost to income ratio (CI) to indicate operational costs in relation to its income.

We adopted a two- step approach in constructing the FSI. The first step involved normalization of the variables. Since the paper adopted multi-attribute variables, all data variables needed to be transformed to the same scale. We adopted a Statistical Normalization (SN) for its simplicity where all indicators are transformed into the same scale with a mean of zero and standard deviation of one, implying that standard deviation is a scaling factor. To obtain normalized values indicators (Z), the mean value is subtracted from each indicator and the result is divided by its standard deviation given as follows in **equation 1**.

$$Z_{i,t} = ((X_{i,t} - u_{i,t}))/\ \sigma_{i,j,t}\ \forall i=1,2,\ldots,37\ and\ t=1,2,\ldots,n \ldots\ldots\ldots\ldots [1]$$

The second step involves aggregating the standardized variables to obtain FSI. In the aggregation, each variable was weighted with a sign based on the its effect on financial stability. ROE, CAR and liquidity were weighted with a positive sign. This based on empirical and theoretical literature arguments that ROE, CAR and liquidity have a positive relation with financial stability, that is, high profitability, capitalization and liquidity are associated with period of high financial stability (Kiemo & Mugo, 2021). On the other hand, NPLr, Intrisk and CI were weighted with a negative sign. This based on evidence that declining asset quality evidenced by rising NPL ratio, and rising bank costs evidenced by increase in operation costs (CI) and intermediation cost (Intrisk), dampen financial stability. To obtain aggregate index, applied an equal-weighted approach as used by Puddu (2013); Hanschel & Monnin (2005) and Illing & Liu (2003) as follows in **equation 2**;

$$FSI_{i,t} = \sum_{i=1}^{n} z_{i,t} \ldots\ldots\ldots\ldots [2]$$

Where: Value of indicator X, μ= Mean Value; σ = Standard Deviation; = Normalized Value for indicator X of indicator; while t and i represent time and cross-sections respectively. Subscript i - denote the cross-sections and, Subscript t -denote the time-series dimension.

In interpreting the FSI, zero is the threshold. Any FSI level above zero shows that the stability of the system is above average and the further away above zero the index is, the more stable the system. Similarly, any level below zero reflects instability.

4.2 Measures of Bank Capital and Credit Risk

Based on banking practice, we adopted Capital Adequacy Ratio (CAR) computed as ratio of total capital to risk weighted assets as measure of bank capital. CAR determines the bank's capacity to absorb loses emanating from risks among them credit risk, operational risk, and market risk. Basel recommends that CAR should be more than 8 percent, Kenya has set the CAR minimum at 14.5 percent, inclusive capital conservation buffer of 2.5 percent.

To measure credit risk, we adopted the ratio of non-performing loans to gross loans following the empirical work of Ismawati & Istria (2015); Shidiq & Wibowo (2017); EL-Ansary & Saleh (2018). To capture the bank intermediation process which is generally the source of credit risks, volume of gross loans measure banking lending was adopted.

4.3 Model Specifications

Studies investigating the effect of bank capital on credit risk have employed various econometric techniques to capture both the time series and cross-sectional aspects of this relationship. Among these techniques include; simultaneous equations, three-stage least squares and Dynamic stochastic general equilibrium modeling (DSGE) (Godlweski, 2004; Shrieves & Dahl, 1992; Jacques & Nigro,1997; Martinez-Miera & Suarez, 2014). Empirical studies illustrate differentiated effects of capital on credit risk and thus stability. They reveal capital may not have an absolute positive or negative effect on credit risk and be stabilizing for banks on aggregate but rather depending on banks specific factors including size, level of capitalization and economic development of countries where these banks operate. Based on similar studies and the nature of the data, a panel VAR is employed as applied in Pedroni (2013) and Abrigo & Love (2013).

To address study objective of examining relationship between capital, credit risk and financial stability, we estimated Panel Vector Autoregressive (PVAR) model as follows in **equation [3]:**

$$y_{it}= \alpha_t+\varphi_{it}\ (L)y_{t-1}+\beta_{it}(L)x_{t-1}+\epsilon_{it} \quad \text{...} \quad [3]$$

Where, y_{it}, is the dependent variable, y_{t-1} is the lagged variable of the dependent variable and x_{t-1} is a 3x3 matrix of the independent lagged variables, CAR, log_loans , $NPLr$ and FS, representing matrices of; net loans, credit risk and financial stability, respectively. β and φ are matrices of coefficients of independent variables and lag operator respectively. α is the constants, while ϵ- error term, subscript i - denote the cross-sections and, subscript t -denote the time-series dimension.

4.4 Data and Population

To achieve the study objective, the paper uses annual bank-level and peer level data for 37 banks out of a population of 43 banks covering the period 2001 to 2020. The choice of study period largely was based on availability of bank level data. Additionally, the twenty-year study period and 37 cross-sections adequately provides a large data pool that incorporate periods of economic shocks experienced in Kenya. Secondary data was extracted from the published financial statements. Six banks were dropped from the population due to limited data series as result of consolidation/mergers, entrants and exit of commercial banks in the industry. The definition and measurement of the study variables is summarized in **Table 3.**

Table 3: Definition and Measurement of Study Variables

Notation	Definition	Measurement
FSI	Financial Soundness Index	An index constructed to measure the evolutions of bank conditions in regards to its proper performing banking functions in the economy.
CAR	Bank Capital	Ratio of total capital to risk-weighted assets
ROE	Return on Equity	Ratio of earnings to shareholders funds
LIQR	Liquidity	Ratio of liquid assets to current liabilities
Log_loan	Bank lending	Natural log of volume of net loans
NPLR	Credit risk	Ratio of non-performing loan to total gross loan
INTRISK,	Interest rate risk	Ratio of interest expenses to interest income
CI	Cost to income ratio	Ratio of bank's overhead costs to income

5.0 Empirical Findings

To achieve the study's two objectives, the methodological approach described in section 4 and the empirical findings are presented and discussed in this section.

5.1 Descriptive Statistics

We computed the study descriptive statistics to analyse the basic characteristics of the variables and presented the results in **Table 4.** The results indicate that the overall majority of the study variables were fit for statistical analysis, after some adjustment for the variables to meet Ordinary Least Square (OLS) assumptions. The low standard deviation across each of all the variables indicates less variations across each individual indicator data sets. The mean FSI was found to be 0.2 indicating banking sector is within the stability region.

Table 4: Panel Descriptive Statistics of Study Variables

	CAR	Log_loan	NPLr	FSI
Mean	23.94	9.20	16.35	0.20
Maximum	90.42	13.11	93.59	10.40
Minimum	(48.05)	5.31	0	(10.82)
Std. Dev.	12.10	1.61	17.13	2.79
Observations	718	718	718	718

5.2 Evaluating Evolution of Financial Stability Conditions in Kenya

To evaluate the evolution of financial stability conditions in Kenya, we estimate equation [2] and the results are presented in **Table 5.** The FSI long-term trend indicates that overall financial stability conditions have been on an upward trend, despite fluctuations. This indicates that Kenyan banks are generally financially healthy and face a low probability of experiencing financial insolvency issues if the long-run trend is maintained. The results further indicate that since

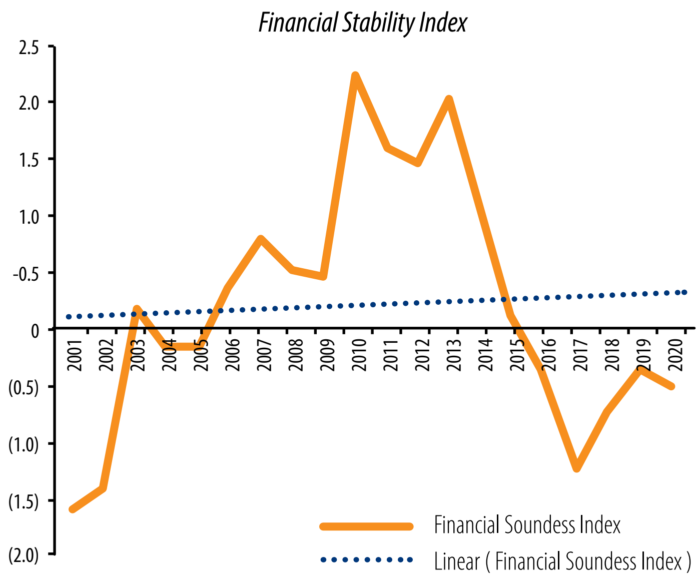
2012, the financial soundness index has been on an upward trend reaching the maximum point in 2015. Bank stability during this time may be associated with prudential authority in Kenya directing banks to accumulate additional capital buffers by the introduction of Capital Conservation Buffer in 2013 which become effective in 2015.

However, from 2010 to 2017 the FSI has been on a downward trend reaching negative margins around 2015. However, there was slight uptick in 2018-19 period although still within negative margins. The downward trend indicates that the financial health of banks in Kenya has been declining, hence increasing their probability of experiencing financial stability problems in the future. The decline in financial health of the Kenyan banks during this period was further exacerbated by financial crisis experienced during 2015/2016 as a result of closure of three banks namely Chase Bank, Imperial Bank and Dubai Bank. Since COVID-19 pandemic is still evolving, it's not possible to predict when the FSI will emerge from negative region, and whether its dip might surpass the lowest level recorded during the 2008-2009 global financial crisis period.

Overall, financial stability index long-term trend shows banks remain resilience, despite FSI downward trending from 2011 and remaining in instability margins since 2016.

Figure 1: Evolution of Financial Stability Conditions in Kenya using FSI

Year	FS Index
2001	(1.61)
2002	(1.43)
2003	0.17
2004	(0.19)
2005	(0.18)
2006	0.38
2007	0.79
2008	0.50
2009	0.43
2010	2.26
2011	1.59
2012	1.44
2013	2.04
2014	1.08
2015	0.10
2016	(0.41)
2017	(1.27)
2018	(0.75)
2019	(0.38)
2020	(0.53)



Interpretation FSI>0, stability region; FSI<0, instability region.

5.2.1 Diagnostic Tests

We applied panel VAR model to investigate the relationship between bank capital, bank credit risk and financial stability. Prior to running the pVAR, diagnostic tests were applied to determine the right specification, lag length and residual properties of the variables. Lag length criterion tests indicate a lag structure of one (1) period as suitable for the model (**Table 6**).

Table 6: VAR Lag Order Selection Criteria

Lag	MBIC	MAIC	MHQIC
1	-525.19*	-83.31*	-258.62*
2	-461.78	-83.01	-233.28
3	-397.92	-82.29	-207.51
4	-331.44	-78.94	-179.11

*indicates lag order selection by the criterion

Table 7: Eigenvale stability conditions

Real	Imaginary	Modulus
0.966	0	0.966
0.824	0.144	0.836
0.823	-0.144	0.836
0.774	0	0.774
-0.048	0.169	0.176
-0.048	-0.169	0.176
0.092	-0.062	0.111
0.092	0.062	0.111

The panel VAR model eigenvalues were found to lie within the unit circle confirming that the VAR is stable. According to Lutkepol (2005) we assume all the variables in the VAR follow stationary processes based on the stability of the VAR. The VAR stability test confirm the suitability of the associated impulse response functions that follow **Table 7**. The table reveals all the eigenvalues lie inside the unit circle. pVAR satisfies the stability condition.

5.3 Empirical Results

The panel VAR model is ordered as bank capital, loans, credit risk, and financial stability. The equation is informed by theoretical and empirical studies that suggest that a rise in bank capital in a future period affects credit risk and financial stability through banks' lending decisions which determine profits and future bank capital accumulation. The regression results are presented in **Table 8**:

Table 8, reveals in equation A, a change in ***NPLr*** (credit risk) has a statistically significant positive impact on CAR (capital) in the next period. In equation B, ***FSI*** (financial stability) in the current period leads to a statistically significant increase in *log_loan* (lending) in the next period, while credit risk has a statistically significant negative impact on lending in the next period. In equation C, financial stability in the current period has a negative impact on credit risk in the next period. Equation D, reveal credit risk negatively affects financial stability. All variables are positively affected by their own lag.

Table 8: Panel VAR Results

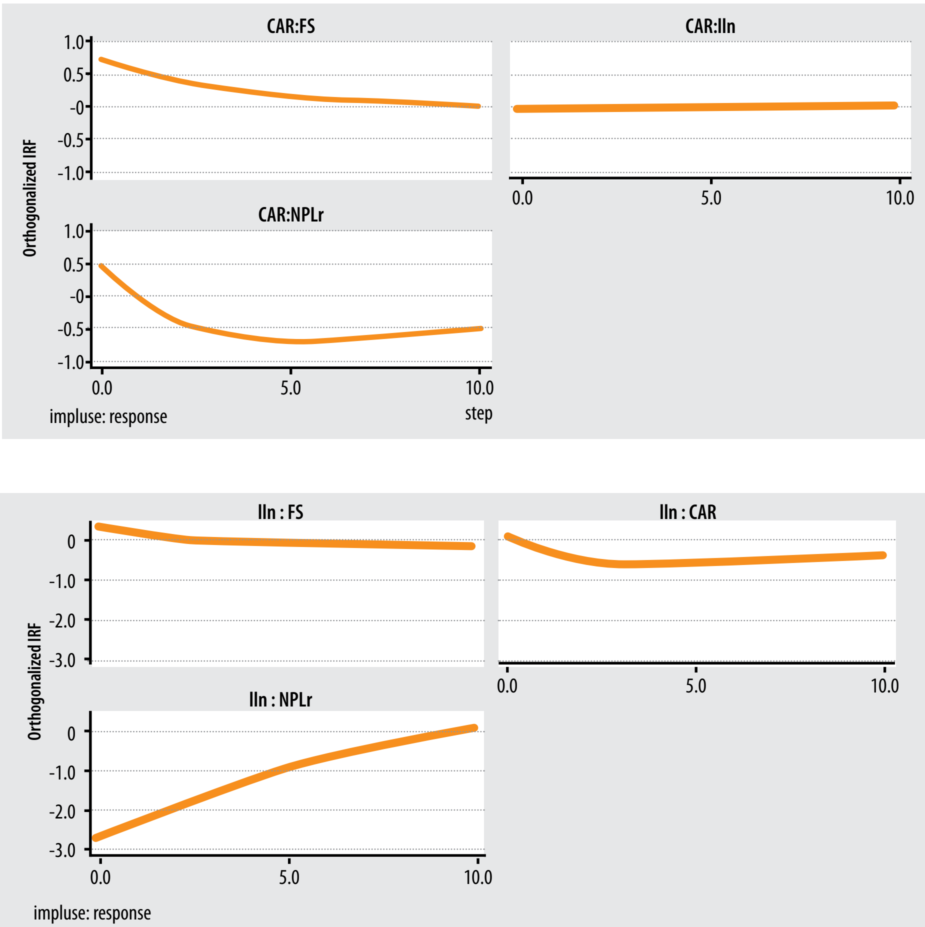
Equation	Dependent Variable	Independent Variable	Coefficient	Standard error
A	CAR	CAR	0.649*** (5.31)	0.1220
		Log_loan	-0.325 (-1.04)	0.312
		NPLr	0.114* (1.91)	0.060
		FS	0.201 0.78)	0.2259
B	Log_loan	CAR	-0.0007 (-0.50)	0.0016
		Log_loan	0.923*** (81.67)	0.0113
		NPLr	-0.0043*** (-4.25)	0.0010
		FS	0.013** (2.51)	0.0051
C	NPLR	CAR	-0.025 (-0.43)	0.059
		Log_loan	0.735 (1.57)	0.469
		NPLr	0.873*** (23.17)	0.0377
		FS	- 0.347** (2.34)	0.148
D	FSI	CAR	0.008 (0.53)	0.0152
		Log_loan	-0.331** (-2.50)	0.1324
		NPLr	-0.065 (-0.75)	0.0087
		FS	0.633*** (13.84)	0.0458

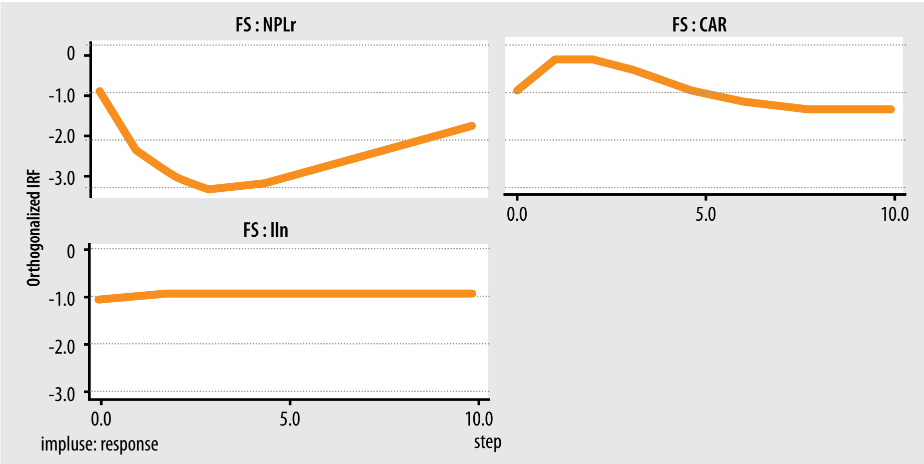
Number of observations 604; number of panels 37; average number of periods 17.32.

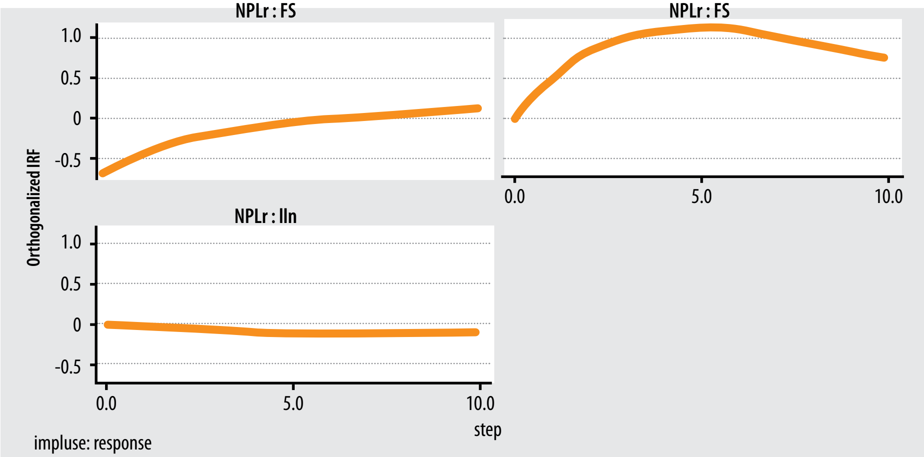
Figure 2 illustrate Impulse Response Functions (IRF) of the pVAR. In the upper left panel, an exogenous shock in capital lowers credit risk through a decline in the NPL over five years and weakens financial stability as shown by the declining FSI. However, the effect on lending is muted. In the upper right panel, an exogenous shock in lending leads to a sharp and continuous rise in credit risk where the NPL increases, capital decline marginally thus weakening financial stability.

The lower right panel, shows the exogenous shock on credit risk, results in a marginal decline in lending, increase in capital thus strengthening financial stability. The effect indicated financial instability as financial stability are in the negative territory for the first five years before financial stability normalizes. The lower left panel, shows the exogenous shock on financial stability, results in an asymmetric effect on credit risk which initially falls for the first three years before rebounding. The asymmetric effect is also reflected on bank capital which increases sharply in the first two years before declining, while the effect on lending is muted.

Figure 2: Orthogonalized Impulse Response Functions







The pVAR and IRF results reveals four key findings. Firstly, a rise in bank capital lowers credit risk. This is confirmed by the impulse responses of bank capital. The findings support theoretical and empirical studies that higher capital minimizes credit risk (Rochet, 1992; Bolt & Tieman, 2004; Van Roy, 2005; Oduor, Ngoka & Odongo, 2017). Secondly, a rise in lending lowers capital, increases credit risk thus weakening financial stability. This finding reflects literature that increasing capital can be costly (Aiyar et al., 2015) and may increase credit risk in small open homogenous markets facing the same macroeconomic risks (Goodhart, 2005). Thirdly, capital promotes financial stability through its effect on credit risk and lending.

Finally, financial stability has an asymmetric relationship with bank capital and credit risk, while lending weakens financial stability. This may reflect the fact that sustained credit growth affects financial stability as much as credit risk, thus increasing capital beyond a certain threshold to lower credit risk can weaken financial stability conditions by decreasing credit growth. This finding supports the threshold indicated by Berger and Mester (1997) and signals the need for an optimal capital and the potential usefulness of adopting dynamic bank capital as suggest by some studies (Imerman, 2020; Herring,1999).

Table 11: Granger Causality

Variable		Chi	Probability
CAR	Log_loan	1.080	0.299
	NPLr	3.633	0.057
	FS	0.604	0.437
	All	6.671	0.083
Log_loan	CAR	0.253	0.615
	NPLr	18.060	0.000
	FS	6.305	0.012
	All	40.828	0.000
NPLR	CAR	0.183	0.669
	Log_loan	2.459	0.117
	FS	5.479	0.019
	All	22.560	0.000
FS	CAR	0.281	0.596
	Log_loan	6.245	0.012
	NPLR	0.559	0.455
	All	9.297	0.026

6.0 Conclusion and Policy Recommendations

The paper sought to examine the effect of bank capital and credit risk on financial stability. This was achieved by evaluating a measure of financial stability using bank-level annual data from 2001 to 2020 for 37 banks using panel VAR. To evaluate the evolution of financial stability conditions in Kenya, the paper constructed a Financial Soundness Index. Overall, the FSI's long-term trend shows banks remain resilient, despite the downward trend from 2011 and in instability margins since 2016.

This paper concludes that higher bank capital, lowers credit risk and strengthen financial stability. For banks with low capital buffers, anticipating a rise in regulatory capital ratios triggers these banks to increase lending to raise profitability and increase reserves to accumulate buffers. This increase in lending, increases credit risk and is also destabilizing for financial stability. Increasing capital supports financial stability indirectly through the effect of capital on minimizing credit risk for banks.

The relationship between bank capital, credit risk and financial stability is asymmetric and may be affected by various factors including banks' discretion for holding a specific level of capital above regulatory minima, size of a bank and the composition of its total assets in enabling it to generate capital internally, the uniform regulatory minima levels and if they are commensurate with credit risk faced by banks. Nonetheless, the debate on the optimal level of regulatory capital remains pivotal as higher regulatory capital fosters financial stability if it cushions banks against credit losses to a larger extent than it affects banks' ability to support credit growth and generate adequate profits to meet higher capital levels to commensurate to their risks. The paper recommends that policy makers adopt appropriate capital policy measures that minimize credit risk while promoting financial stability. The paper suggests an area of further research on the threshold of capital ratios that minimize credit risk while supporting banks' lending.

References

1. Abrigo, M. R., & Love, I. (2016). Estimation of panel vector autoregression in Stata. *The Stata Journal,* 16(3), 778-804.

2. Agung, R., Atiti, F., & Kimani, S. (2019). Competition and Banking Sector Stability in Kenya. *Kenya Bankers Working Paper Series*, 2019

3. Aiyar, M. S., Bergthaler, M. W., Garrido, J. M., Ilyina, M. A., Jobst, A., Kang, M. K. H., ... & Moretti, M. M. (2015). *A strategy for resolving Europe's problem loans.* International Monetary Fund.

4. Aiyar, S., A. Banerji, B. Barkbu, W. B. W., P. Berkmen, J. Bluedorn, J. Garrido, A. Jobst, J. John, K. Kang, T. Kinda, H. L. H., Y. Liu, D. Monaghan, M. M. M., S. Saksonovs, H. Schoelermann, and T. Wu (2015): "*Euro Area Policies: Selected Issues,*" International Monetary Fund.

5. Aiyar, S., Calomiris, C. W., & Wieladek, T. (2015). Bank capital regulation: Theory, empirics, and policy. *IMF Economic Review, 63(4), 955-983.*

6. Albertazzi, U., & Marchetti, D. J. (2010). Credit supply, flight to quality and evergreening: an analysis of bank-firm relationships after Lehman. Bank of Italy Temi di Discussione *(Working Paper) No, 756*.

7. Allen, Franklin, Carletti, Elena, Marquez, Robert. "Credit Market Competition and Capital Regulation" *The Review of Financial Studies, Volume 24, No. 4 (November, 2009*), pp.983-1018

8. Ari, A., Chen, S., & Ratnovski, L. (2019). The Dynamics of Non-Performing Loans during Banking Crises. *IMF Working Papers, 2019(272), 7.*

9. Bergant, K., & Kockerols, T. (2018). Forbearance Patterns in the Post-Crisis Period. SSRN *Electronic Journal, 4.*

10. Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions?. *Journal of Banking & Finance, 21(7), 895-947.*

11. Berger, A., & Bouwman, C. (2013). How does capital affect bank performance during financial crises? *J. Financ. Econ. 109:146–76*

12. Blum, J., & Hellwig, M. (1995). The macroeconomic implications of capital adequacy requirements for banks. *European Economic Review, 39(3-4), 739-749.*

13. Bolt, W., & Tieman, A. F. (2004). Banking competition, risk and regulation. *Scandinavian Journal of Economics, 106(4), 783-804.*

14. Central Bank of Kenya. (2020). *Bank Supervision Annual Report 2020.*

15. Central Bank of Kenya. (2020). *The Kenya Financial Sector Stability Report 2019*, September 2019 Issue no. 17.

16. Central Bank of Kenya. (2021). *Monetary Policy Statement*, March 2021.

17. Coval, J. D., & Thakor, A. V. (2005). Financial intermediation as a beliefs-bridge between optimists and pessimists. *Journal of Financial Economics, 75(3), 535-569.*

18. De Jonghe, O. (2010). Back to the basics in banking? A micro-analysis of banking system stability. *Journal of Financial Intermediation, 19(3), 387-417.*

19. EL-Ansary, O., & Saleh, M. (2018). Predicting Egyptian banks distress. *International Journal of Accounting and Financial Reporting, 8(3), 39.*

20. Furlong, F. T., & Keeley, M. C. (1989). Capital regulation and bank risk-taking: A note. *Journal of Banking & Finance, 13(6), 883-891.*

21. Gande, A. (2008). Commercial banks in investment banking. In Handbook of financial intermediation and banking, Elsevier. (pp. 163-188)

22. Gersl, A., & Hermanek, J. (2007). Financial stability indicators: advantages and disadvantages of their use in the assessment of financial system stability. *Occasional Publications-Chapters in Edited Volumes, 69-79.*

23. Godlewski, C. J. (2004). Capital regulation and credit risk taking: Empirical evidence from banks in emerging market economies. Available at SSRN 588163.

24. Goodhart, C. A. (2005). Financial regulation, credit risk and financial stability. National Institute Economic Review, 192, 118-127.

25. Hanschel, Elke, and Pierre Monnin. (2005). Measuring and forecasting stress in the banking sector: Evidence from Switzerland. *BIS Papers 22: 431–49*

26. Herring, R. J. (2002). C*redit risk and financial instability. In Ratings, Rating Agencies and the Global Financial System,* Springer, Boston, MA. (pp. 345-367)..

27. Holmstrom B, Tirole J. (1997). *Financial intermediation, loanable funds, and the real sector.* Q. J. Econ. 112:663–91

28. Illing, Mark, and Ying Liu. (2003). An Index of Financial Stress for Canada. Ottawa: *Bank of Canada Ottawa Working Paper 2003-14,*

29. Imerman, M. B. (2020). When enough is not enough: bank capital and the Too-Big-To-Fail subsidy. Review of Quantitative Finance and Accounting, 55(4), 1371-1406.

30. International Monetary Fund. (2021). Policy Responses to Covid-19. Policy Tracker. *https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19*

31. Ismawati, K., & Istria, P. C. (2015). D*etektor Financial Distress Perusahaan Perbankan Indonesia.* Ekonomi Bisnis & Kewirausahaan, IV(1), 6–29.

32. Jacques, K., & Nigro, P. (1997). Risk-based capital, portfolio risk, and bank capital: A simultaneous equations approach. *Journal of Economics and business, 49(6), 533-547.*

33. Kahane, Y. (1977). Capital adequacy and the regulation of financial intermediaries. *Journal of Banking & Finance, 1(2), 207-218.*

34. Kalemli-Ozcan, S., Laeven, L., & Moreno, D. (2015). *Debt overhang in Europe: Evidence from firm-bank-sovereign linkages.* University of Maryland.

35. Kalemli-Özcan, Ṣ, Laeven, L., & Moreno, D. (2018). Debt overhang, rollover risk, and corporate investment: Evidence from the European crisis (No. w24555). *National Bureau of Economic Research.*

36. Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. T*he American Economic Review, 1183-1200.*

37. Kiemo, S & Mugo, C. (2021). Banking Sector Consolidation and Stability in Kenya. Journal of Applied Finance and Banking, 11(3), 129-159.

38. Kim, D., & Santomero, A. M. (1988). Risk in banking and capital regulation. *The Journal of Finance, 43(5), 1219-1233.*

39. Klomp, J., & De Haan, J. (2012). Banking risk and regulation: Does one size fit all? *Journal of Banking & Finance, 36(12), 3197-3212.*

40. Kočišová, K., & Stavárek, D. (2018). The evaluation of banking stability in the European Union countries. *International Journal of Monetary Economics and Finance, 11(1), 36-55.*

41. Koehn, M., & Santomero, A. M. (1980). Regulation of bank capital and portfolio risk. The Journal of Finance, 35(5), 1235-1244.

42. Lepetit, L., & Strobel, F. (2014). Bank income smoothing, ownership concentration and the regulatory environment. *Journal of Banking &*

Finance, 41, 253-270.

43. Lütkepohl, H. (2005). *New introduction to multiple time series analysis.* Springer Science & Business Media.

44. Manolescu, C. M., & Manolescu, E. (2017). The financial stability index-An insight into the financial and economic conditions of Romania. *Theoretical & Applied Economics,* 24(4).

45. Martinez-Miera, D., & Suarez, J. (2014). Banks' endogenous systemic risk taking. Manuscript, CEMFI, 42.

46. Matten, C. (1996). Managing bank capital: capital allocation and performance measurement. Chichester: Wiley.

47. Mehran, H., & Thakor, A. (2011). Bank capital and value in the cross-section. *The Review of Financial Studies*, 24(4), 1019-1067.

48. Mishkin, F. S. (2007). Monetary policy strategy. Mit press.

49. Morrison, A. D., & White, L. (2005). Crises and capital requirements in banking. American Economic Review, 95(5), 1548-1572.

50. Oduor, Jacob., Ngoka, Kethi., Odongo, Maureen., (2017) *Capital requirement, bank competition and stability in Africa. Review of Development Finance,* Volume 7, Issue 1, 2017, Pages 45-51, ISSN 1879-9337

51. Pedroni, P. (2013). *Structural Panel VARs.* Econometrics, 1(2), 180-206.

52. Puddu, Stefano. (2013). Optimal Weights and Stress Banking Indexes. *IRENE Working Papers*. Dublin: IRENE Institute of Economic Research.

53. Rochet, J. C. (1992). Capital requirements and the behaviour of commercial banks. *European Economic Review*, 36(5), 1137-1170.

54. Shidiq, I., & Wibowo, B. (2017). Prediksi Financial Distress Bank Umum di Indonesia: *Analysis Diskriminan dan Regresi Logistik.* Esensi, 7(1), 27–40.

55. Shijaku, G. (2017). Does concentration matter for bank stability? Evidence from the Albanian banking sector. *Journal of Central Banking Theory and Practice,* 6(3), 67-94.

56. Shrieves, R. E., & Dahl, D. (1992). The relationship between risk and capital in commercial banks. *Journal of Banking & Finance,* 16(2), 439-457.

57. Van Roy, P. (2005, July). *The impact of the 1988 Basel Accord on banks' capital ratios and credit risk-taking: an international study.* In EFMA 2004 Basel Meetings.

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