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Macroprudential Regulation and Bank Stability: The Credit Market Signal

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Abstract

This paper examines the effectiveness of macroprudential regulations in promoting bank stability and credit in the Kenyan financial system. The study uses bank-level and non-bank credit data for the period 2001-2019 and applies a panel estimation methodology to achieve its objectives. The study finds that bank stability has remained high, though downward trending. The findings also reveal that capital-based and asset-side macroprudential regulations effectively promote bank stability, while the liquidity-related macroprudential regulation is ineffective. Additionally, there is evidence of dampened bank credit market and domestic leakage associated with macroprudential regulations. The paper cautions policymakers to implement macroprudential policies that balance the objectives of bank stability and credit conditions. Furthermore, policymakers should note that implementing the new macroprudential measures may cause financial intermediaries to adjust their behaviour and therefore, should be implemented systematically while observing their impact at each stage.

Key Words: Macroprudential Regulation, Stability, Lending, Banks

JEL classification: E44 E51 G21

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1.0 Introduction

The post-2008-09 global financial crisis-era has seen more countries adopting various aspects of macroprudential policies in advanced and emerging markets. This is in response to lessons learnt after the crisis, such as balancing monetary policy and macroprudential policy, the latter focusing on promoting financial sector stability. Macroprudential policy as prescribed by the international standards-setting bodies encompasses but not limited to; developing legal structures to deal with systemic financial crises; putting institutional arrangements and implementing tools that limit the build-up of vulnerabilities over time in the financial system and reducing vulnerabilities that may arise from the interconnectedness of the financial system (IMF 2013).

Disparities exist on the legal structures and institutional arrangements across countries. However, there seems to be some consensus on the implementation of macroprudential tools, which are broadly classified into three categories: capital-based tools, assets-side-tools/loan restrictions tools and liquidity-related tools. Macroprudential regulations are preemptive actions that aim to strengthen the resilience of a financial system prior to periods of stress, to avoid costly effects of economic downturns due to financial crises and offset negative externalities of fire sales and contagion dynamics. Thus, the focus of macroprudential regulations is on minimizing structural vulnerabilities that emanate from the financial interconnections of the financial system—thereby creating resilience through the building of capital buffers during expansionary times (of increased credit extension), which will counterbalance any downward spiral of asset prices and enable credit extension after a financial boom. Thus, the tools are preventive rather than for the management of crisis or resolving one (Edge and Liang, 2020 and IMF, 2013). Additionally, macroprudential policies may be targeted rather than general, by placing more stringent prudential measures on banks as dominant credit providers, compared to other financial institutions. Likewise, the measures may be more stringent on large banks as they are likely to cause more significant adverse effects to the whole financial system and economy, compared to smaller institutions (IMF 2014, Gadanecz and Jayaram 2015).

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Empirical evidence on the effectiveness of macroprudential policy tools in promoting financial system resilience and credit is inconclusive. This is attributed mainly to disparities existing across different countries such as the level of financial developments, legal and institutional structures and complexities of financial products. Capital-based tools have been found to support resilience and credit growth, especially during cyclical downturns period (BIS 2015). However, other studies have found that these tools have a dampening effect on credit growth in the short-term (Dapher et al. 2016). Assets-side-tools/loan restrictions tools have been found to increase resilience through the additional buffers; however, sectoral capital requirements have led to reduced loan growth of targeted sectors (IMF 2013). Liquidity-related tools have been found to moderate credit growth (Lim et al. 2011), while other studies found weak or no influence (Bruno, Shin and Shim 2015).

The analysis of the costs and benefits of implementing macroprudential tools are still evolving. It is difficult to quantify the cost and benefits associated with macroprudential tools on issues such as economic output and increased resilience to an economic shock. However, economic leakage has been singled out as one of the significant detriments of implementing macroprudential tools. Studies such as Crowe et al. (2013) found evidence of leakage where sectoral tools were ineffective in containing credit booms. Open and developed financial systems were found to experience domestic leakage, where there was migration of credit provision to non-bank credit providers. Other economies experienced cross-border leakage, where evidence of financial services migrated to foreign-own entities outside the purview of national authorities (Buch and Goldberg 2016).

Currently, there is limited empirical evidence from developing economies on the effectiveness of implementing macroprudential tools. However, there is increased interest in this area of analysis, particularly in evaluating the impact of macroprudential policy interventions ex-post, to understand their effectiveness in systemic risk management. Some studies have focused on assessing the effects of macroprudential tools on resilience. In contrast, other research work focused on assessing leakage and other unintended side effects of macroprudential tools by evaluating the impact of these tools on the lending behaviour of both bank and non-bank credit provision.

As part of regulatory reforms measures, Kenya has over the years implemented macroprudential tools aimed at building resilience for banks, while moderating banks risk exposure. The question of whether these tools have effectively reduced banks risk exposure or build resilience in the banking sector is what this paper seek to address. Evidence from advanced economies and emerging market economies on studies in this area show mixed outcomes. Moreover, there is a dearth of empirical evidence from Africa, and to the best of our knowledge, we have found no study on Kenya addressing the same question. Therefore, this paper attempts to fill this knowledge gap and

contribute to existing literature from advanced and emerging economies, by providing empirical insights on the effectiveness of macroprudential tools from a developing country's perspective -where the banking sector is characterized by the presence of segmentation, informality, and lack of depth. The findings will be useful to policymakers in understanding the impact macroprudential tools have on the banking sector, and how best to implement them to maximize their effectiveness.

1.1 Research Objectives

The focus of this paper is twofold; first, the paper examines the effectiveness of macroprudential regulations in promoting bank stability and, secondly the paper examines the impact of macroprudential regulations on credit market in Kenya while exploring any evidence of domestic leakage. To achieve these, the paper employs the following three objectives.

i) Evaluate the effectiveness of macroprudential regulations in promoting bank stability conditions in Kenya.

ii) Examine the effect of macroprudential regulations on bank credit market in Kenya; and

iii) Explore any evidence of domestic leakage due to macroprudential regulations in Kenya.

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2.0 Macroprudential Regulation and Stability

Macroprudential policy is defined as the use of primarily prudential tools to limit systemic risk (IMF 2013, Lim et al. 2011). The focus of macroprudential policy is to minimize systemic risk. This is the risk of widespread disruption to the financial system hence provision of financial services limited posing negative consequences on the real economy. Systemic risk is usually evaluated in two ways namely, 'time dimension', where vulnerabilities relate to a build-up of risks over time; and 'cross-sectional or structural dimension', where vulnerabilities relate to interconnectedness (IMF-FSB-BIS 2016). Macroprudential policy is implemented by various financial sector tools to address the drivers of systemic risk, by; increasing resilience to shocks through buffers, containing the build-up of systemic vulnerabilities over time, and limiting structural vulnerabilities through interconnectedness. These tools are broadly categorized into three categories; capital-based tools both broad-based and sectoral; assets-side-tools/loan restrictions; and liquidity-related tools (IMF 2014). Table 1 provides examples of some macroprudential tools.

Table 1: Some of the Macroprudential Tools

Macroprudential Instruments	Macroprudential Tools
Asset-Side Tools	Caps on Debt-to-Income Ratio
	Caps on Loan-to-Value Ratio
	Caps on foreign currency lending
	Ceilings on credit or credit growth
Liquidity-Related Tools	Net Stable Funding Ratio (NSFR)
	Liquidity Coverage Ratio (LCR)
	Limits on Net Open Currency positions/ Currency Mismatch
	Margins and Haircuts in the Market
	Reserve Requirements

Macroprudential Instruments	Macroprudential Tools
Capital-Based Tools	Counter-cyclical Capital Buffer
	Capital Conservation Buffer
	Leverage Ratio
	Dynamic Provisioning
	Restrictions on Profit distribution
	Sectoral capital requirements
	Capital Surcharges on SIFIs

The outlined macroprudential instruments are primarily used to limit exposure of the financial system from shocks and vulnerability affected by externalities. Macroprudential tools are designed as efficient control policies, with a particular focus on improving the resilience of the financial system to systemic risk that arises due to external factors such as economic shocks. However, the application of the macroprudential tools varies across countries depending on financial system complexity, institutional setup, the source, and magnitude of the systemic risk in the financial system (Cizel 2016).

According to Dukic et al. (2011), there are two approaches in the implementation and enforcement of macroprudential tools, the variable approach, and the fixed approach. The variable approach, where tools are used in a specific situation to counter capital depreciation. The macroprudential regulator may change variables to adjust automatically, or regularly modify them depending on macroprudential indicators that fluctuate with economic cycles. These tools are mostly used to limit pro-cyclical tendencies and associated risks that increase the risk of an economic crisis. In the second approach, the fixed access, the tools usage is constant, as tools such as the ratio of gross leverage, and the relationship between the ratios of financing, do not have to be adjusted during the economic cycle.

2.1 Status of Macroprudential Regulation and Stability in Kenya

In the last decade, Kenya has adopted various aspects of macroprudential tools to boost the resilience of the banking sector and moderate credit growth. These tools encompass the three categories of macroprudential policies. They include the Capital Conservation Buffer (CCB) as the capital-based tool, the foreign exchange limit, Loan to Value ratio (LTV), and Debt-Service to Income ratio (DSI) as asset-side tools and the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) as the liquidity-based tools.

In January 2013, Central Bank of Kenya (CBK) introduced 2.5 percent Capital Conservation Buffer (CCB) a capital-based tool which became effective in January 2015. CCB was designed to ensure that banks build up capital buffers during good times, which makes the bank more resilient during stress periods. The 2.5 percent CCB is over and above the minimum capital ratios of 8 percent and 12 percent for the minimum core capital to risk-weighted assets and total capital to risk-weighted assets requirements, respectively. The CCB should be made up of high-quality capital which should comprise mainly of common equity, premium reserves and retained earnings. Banks are also expected to undertake regular stress testing to identify sources of potential risks and vulnerabilities each bank is exposed to and calibrate bank resilience to these risks in case they materialize.

CBK introduced limits on foreign exchange, that was revised in 2013. This tool restricts the mismatch between banks' foreign asset and liability positions, including off-balance sheet exposures, limiting them not to exceed 10 percent of core capital. Additionally, CBK has encouraged banks to adopt additional asset-side macroprudential tools such as LTV and DSI, to reduce concentration risks by moderating credit growth while also building resilience. Loan to Value Ratio (LTV), capped the size of a secured loan relative to the value of a property. LTV is commonly applied to mortgage markets to contain credit risk through equity contribution from the borrower. In, CBK's 2010 survey on mortgage finance in Kenya, LTV was found to average 90 percent. Debt-Service-to-Income (DSI) caps aggregate mortgage servicing to the borrower's income. As per Kenya's labour laws, DSI is capped at two-thirds of household income for households, translating to an average of 60 percent. DSI intends to ensure that the borrower can timely meet debt obligations and thus avoid a rise in non-performing loans.

In January 2013, CBK issued a risk management framework encouraging banks to adopt various liquidity-related macroprudential tools. These tools are aimed at increasing the banking sector's resilience to liquidity risks. These liquidity-related tools include the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). LCR aims to raise the resilience of banks to short-term liquidity risk, through holding sufficient unencumbered high-quality liquid assets that can be easily converted into cash to meet their liquidity needs for 30 days. The ratio is required to be equal to or above 100 percent. NSFR's objective is to ensure banks' funding is not susceptible to fluctuations and is readily available at an affordable cost and for a more extended period (at least one year). The NSFR requires an institution to hold a minimum threshold of stable funding relative to its asset's liquidity profile and be adequate to meet potential contingent liquidity needs arising from off-balance sheet commitments, over a one-year horizon. The NSFR aims to limit over-reliance on short-term wholesale funding during times of buoyant market liquidity and encourage better assessment of liquidity risk across all on- and off-balance sheet items iii) Cash Reserve Requirements (CRR) which is used both as a monetary policy tool and macroprudential tool by CBK.

CRR prescribes the amount of liquid assets banks are to hold at CBK as bank reserves and is currently set at 4.25 percent of total deposits.

Implementation of macroprudential tools is expected to have a significant impact on bank lending and resilience. This is because some macroprudential tools are implemented to curtail lending and others to build capital buffers. Although there is limited empirical evidence of bank stability as an outcome, selected banking indicators suggest Kenya's banking sector has been stable over the past decade. Data shows that capitalization has remained above the minimum requirement of the Capital Adequacy Ratio by at least 5-7 percentage points. Additionally, bank liquidity has also remained high, way above the 20 percent minimum requirement, almost double the minimum requirement. Conversely, credit risk has remained elevated as indicated by the rising ratio of non-performing loans and profitability has been declining, prompting the question of the long-term viability of banks in Kenya. Aside from stability, low levels of credit to GDP and credit contractions in both the private and government sectors signal a downward trend in the credit market. The growth of bank credit has been declining, bank credit as a percentage of Gross Domestic Product has also remained relatively low, raising concerns of possible domestic leakage (Table 2). The recent spike of non-bank and foreign-owned credit providers also raises suspicion of leakage.

Table 2: Selected Bank Stability and Lending Indicators

Figures in Percent	2006	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CAR (Total Capital)	17	18	20	21	19	22	23	19	19	19	18	19	19
CAR (Tier 1)	16	16	17	19	17	19	19	16	16	16	16	17	17
Gross NPLs to Gross Loans	21	8	8	6	4	5	5	5	6	9	11	12	12
NPLs Net to Total Capital	29	11	12	6	3	4	6	7	11	18	20	30	16
Return on Assets (ROA)	3	3	2	4	3	4	4	3	3	3	3	3	3
Return on Equity (ROE)	29	29	20	31	32	34	29	27	24	25	21	23	21
Liquidity Ratio	45	37	40	45	37	42	39	38	38	41	44	49	50
Private Sector Credit Growth	12	29	13	20	30	11	20	22	17	5	3	2	7
Credit to Government Growth	53	3	27	13	35	64	(21)	15	78	30	8	(2)	
Total Bank Credit as a % GDP			27	29	32	32	34	36	37	36	32	30	31

Preliminary analysis on Kenya's banking sector indicators, on the impact of macroprudential tools adopted by the banking system in Kenya, suggest ambiguous effects of macroprudential tools on bank stability and credit extension. The research question that this paper seeks to address, as to the impact of these tools on the stability and credit provision in Kenya's banking system remains paramount and is further emphasized by the ambiguity of the preliminary effects observed in the banking indicators. This is due to the fact that financial stability has become one of a key policy objective with its policy instrument complimenting both microprudential regulation and macroeconomic policies, as a stable financial system contributes to sustainable economic growth (ESRB 2013a).

3.0 Literature Review

The theoretical basis for macroprudential regulations emanates from negative externalities that result from information asymmetry, limited liability, and enforcement. Financial agents/ managers bestowed with the role of running financial institutions, act in their capacity, to increase risks through borrowing extensively and expanding their assets (balance sheets) while relying on short-term liquidity. Since the financial system is interconnected, the agents' behaviour generates a systemic risk. Moreover, these financial agents do not internalize the negative externalities from/ on other agents or the economy. Hence, the justification of the development and implementation of macroprudential regulation since the cost of a financial crisis from the externalities exceeds the cost of failure and regulation (Borchgrevink et al. 2014, De Nicolo et al. 2012 and Brunnermeier et al. 2009).

Implementation of macroprudential tools requires careful consideration of costs and benefits. However, formal cost-benefit analysis has proved challenging to conduct due to problems of quantifying costs of macroprudential measures, including adjustment costs for the financial industry players; efficiency costs especially in reducing distortions; and the cost on real economic output growth. Empirical evidence indicates implementation of capital and macroprudential liquidity tools has led to a negative impact on output in the short run. However, this negative impact is mostly weak and compensated for by the benefits of the tools in the long run, reflected by reduced likelihood of a crisis. On the other hand, the short-run effect is usually uncertain and might be strong depending on the reaction of the economic agents. For example, aggressive tightening tools may lead banks to reduce lending hence stifling the economy, or tightening tools implemented during a period of financial downturn may exacerbate instability since during a financial downturn it is difficult to raise additional capital or other stable funding (IMF 2013, BIS 2015).

Unintended outcomes of economic leakage or spillover effects may result from the implementation of macroprudential tools. This involves financial agents migrating the provision of financial activities outside the scope application and

enforcement of macroprudential tools. This migration might be domestic; for instance, the rise in shadow banking or other banking agents not under the scope of macroprudential tools; or cross-border where financial activities move to foreign-owned agents who are not under the purview of national macroprudential measures. These leakages may limit the effectiveness of the macroprudential tools and also increase the negative externalities. Horvah and Wagner (2016) in their paper on macroprudential policies and the Lucas Critique (Lucas 1976), caution regulators to pay attention to the new macroprudential measures they are implementing as they may cause banks to adjust their behaviour, leading to leakages and cross border spillovers.

Empirical evidence on leakages from a study by Cizel et al. (2016) in Croatia, found that capital tools led to domestic leakages as evidenced by increased lending by non-bank companies. Cross-border leakage was found to be a challenge, especially for foreign-owned firms operating as branches instead of a subsidiary (IMF 2014). To limit domestic or cross-border leakage, policymakers have been advocating for implementing macroprudential tools such as imposing credit tightening even to non-bank credit providers or foreign-owned entities as evidenced in Dutch, Hungary, Korea, Estonia, Ireland, Romania, and the UK. Nocciola and Zochowski (2016), in their study of the Euro area, highlight the importance of cross-border spillovers on loan growth. They find that the spillovers depended on many factors -ownership structure of the bank; the policy stance measure; type of instrument; implementation time; country characteristics and the bank balance sheet. The study concludes by advocating for stronger reciprocity arrangements in implementation of new macroprudential tools to mitigate leakages. However, Forbes (2016), finds that the use of microprudential capital requirements reduced cross border bank lending as opposed to macroprudential measures.

Empirical studies on the effectiveness of the use of macroprudential tools and their outcomes on credit growth and stability show that the choice of macroprudential tools and timing of implementation is key in getting the desired outcome. Kuttner and Shim (2013) assess the effects of macroprudential tools on the extension of credit to the housing sector and their prices thereof. Using cross country data from 1980 through 2011, they find that debt service to income, and loan to value ratios were not the only factors affecting credit to housing but also housing taxes and exposure limits which positively affected extension of credit. Regarding the supply of credit, factors such as risk weights, liquidity requirements and credit limits had little or no effect on the housing loans. Yusuf (2016), in their assessment of 37 countries, evaluate whether quantity-based and price-based macroprudential measures differed in smoothing the variations in total credit. They find that quantity-based tools are effective in moderating credit cycles irrespective of the level of financial development, whereas the price-based tools effectively curbed excess variations in total credit in developed financial markets. Ahmet et al. (2016), develop a macroprudential policy index for a variety of macroprudential tools to assess their effectiveness

in the emerging market economies. Their analysis finds it is imperative to use macroprudential measures to support macro-financial stability. Further, macroprudential tools targeting demand for credit are successful in containing real credit growth, whereas tools affecting the supply of credit were effective in reducing the sensitivity of credit growth internationally.

The effectiveness of macroprudential tools has also been assessed in regard to the timing/period when they are likely to be effective. For instance, Borio (2014), finds that macroprudential policies are more effective in reinforcing resilience than in restraining booms. Moreover, he finds that loan to value or debt to income ratios are more effective than the capital requirements measures. McDonald (2015) in their study of the housing market for 17 countries for the period 1990–2013, finds that measures on tightening are effective in restraining booms when credit extension is on the rise compared to other points in the cycle. Furthermore, the measures on tightening are more significant than the loosening ones. Giovanni et al. (2012), explores historical credit booms and assesses the effectiveness of macroprudential policies in reducing the risk of a crisis. They find that Macroprudential policies are effective in containing booms and in limiting the consequences of busts. The study also establishes that it is not easy to identify a boom as it emerges, and not all credit booms are bad.

In assessing macroprudential policies and their impact on the stability of the financial system, studies have focused on tools that address the time dimension that is procyclicality and cross-sectional dimension that is how risk is distributed within the financial system (Ascarya & Karim, 2016, Zhang & Zoli, 2016 Alamad, 2016). They find that in the case of Islamic banks, procyclicality benefits economic growth in the long run as it does not generate credit bubbles. They also conclude that macroprudential instruments/tools are vital in mitigating systemic risks and dampening financial instability in Asian financial systems and may be used by the policymakers during the expansion phase of the financial cycle. However, Cagliarini (2016), states that macroprudential instruments do not target the underlying causes of financial instability. Among the weaknesses of macroprudential policy is the lack of an analytical framework on the effects (positive or negative) of its implementation in the economy. Regarding the use of macroprudential tools in the World, Cerutti et al. (2016), survey 119 countries over 14 years 2000-2013 in their assessment of the effectiveness of macroprudential policies. They find that EMEs use exchange rate-related macroprudential policies, while advanced economies use the borrower-based policies more. Moreover, usage was associated with lower credit growth, notably in household credit. While macroprudential policies managed financial cycles, they worked less well in busts. They, however, do not include a country from Sub Sahara Africa.

The literature reviewed reveals that empirical studies on assessment of macroprudential policies are emerging. The studies are concentrated in advanced economies and the analysis period is the last

decade. These studies have attempted to assess the impact or effectiveness of the implementation of macroprudential policies on the financial system. The findings are not conclusive, and some seem to suggest that the implementation of macroprudential policies leads to an increased cost of regulation that may be higher compared to the intended benefits. These costs may include effects such as leakages, negative spillovers and financial instability, that are away from the prevention of systemic risk and more towards financial instability.

Moreover, the approach used in analysis varies from the studies reviewed as there is lack of an analytical framework to assess the effects of macroprudential policy. This study fills the literature gap in two ways (i) adds onto a dearth of literature by undertaking research in a developing country (ii) uses panel approach and bank-level data to assess the effectiveness of macroprudential policy on bank stability and credit conditions in Kenya. The use of panel analysis will not only enable us to assess the cause-and-effect relationship but also assess the before and after 2013, when the macroprudential policies were implemented. Moreover, the panel approach enables us to isolate the assessment of the effects of macroprudential policies on banks, from other factors affecting the commercial banks, thus providing clarity on their effectiveness in Kenya.

4.0 Data Variables and Methodology

4.1 Measures of Bank Stability

Various methodologies of measuring bank stability have received considerable empirical attention in post-2007-2009 global financial crisis. These methodologies are broadly categorized into two approaches, namely, market-based models and accounting-based models. Market-based models measure bank stability using information of bank's securities held and traded in the secondary market such as stock returns. These market-based models are preferred due to their ability to utilize current and updated securities information hence indicating securities true value (Ohlson 1980, Platt & Platt 2002). The major drawback of the market-based model is, it is based on market data which is not observable hence prone to estimation errors and information distortion.

On the other hand, the accounting-based models usually employ historical financial performance indicators such as liquidity, profitability, leverage, and asset quality to assess bank stability. Accounting-based models have become popular due to the simplicity in their application and the fact that these indicators are observable and readily available in usable form hence free from market distortions driven by information asymmetry (Kiemo et al. 2019, Altman & Hotchkiss, 1993, Athanasoglou et al. 2006). However, accounting-based models have been criticized for overreliance on historical accounting data which are conservative estimates prone to critical errors that may be over or understated. Accounting-based models also rely heavily on historical trends hence reducing predictive powers of current and future outcomes.

Due to insufficient market-based information on banks secondary trading, the paper adopted an accounting-based model of estimating bank stability by constructing a 'Bankometer S-Score' to evaluate the evolution of stability

conditions in Kenya. Bankometer S-Score was advanced by the International Monetary Fund (IMF 2000) to supplement other tools such as "CAMELS" rating system in supervisory activities. The CAMELS rating system evaluates bank Capital, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk to create a watch list of risky banks to be monitored between on-site examinations. However, CAMELS ratings are kept strictly confidential by the prudential supervisors and are not available to the public (Agung et al. 2019, Lepetit & Strobel 2014, Shijaku 2017). Empirical works such as Onyema et al. (2018), Kattel (2015) found Bankometer S-score to be an accurate tool for measuring banks' financial health conditions. The Bankometer S-score measure deploys the use of banks indicators as follows; capital asset ratio to measure whether the bank has sufficient capital to support its assets; equity to asset ratio to evaluate the financial health and long term profitability of the banks; capital adequacy ratio to measure of the amount of bank's capital exposure to its risk-weighted assets; non-performing loan ratio measuring asset quality of the banks (efficiency); loan to asset ratio as an indicator of liquidity conditions in the bank; cost to income ratio to measure bank's costs to its income. IMF recommends the following S-Score Variables; Capital Asset (CA) ratio should be more than 4%; Equity to Asset (EA) ratio must be more than 2%; Capital Adequacy (CAR) ratio minimum 8% Basel III; Non-performing Loan (NPL) ratio up to 15% is acceptable; Loan to Asset (LA) ratio should be below 65%; Cost to Income (CI) ratio should be below 40%.

Following IMF (2000) recommendation, the estimation of Bankometer S-score is as given in Equation 1.

$$S_{it}=1.5CA_{it}+1.2EA_{it}+3.5CAR_{it}+0.6NPL_{it}+0.3CI_{it}+0.4LA_{it} \quad .....(1)$$

Where, S –Score Interpretation:

$S>70$ - termed as solvent & super sound banks.

$50<S>70$ - termed gray area, banks susceptible to solvency problems.

and $S<50$- Termed banks, not solvent. i and t represent cross-sectional and time dimensions.

4.2 Model Specifications

To achieve the study objectives, the paper adopted panel estimators. Panel regression estimators were applied due to its ability in providing more information and sample variability in comparison to pure cross-sectional and time-series estimators. Following Lim et al. (2011), we estimate the Equation 2, 3 and 4 as illustrated below.

To achieve the first objective, Equation 2 was estimated as follows:

$$S_{it}= \lambda_t+\Omega_{it}+\emptyset_i M_{it}+\sum_{i=1}^{n} \beta_i X_{it}+\epsilon_{it} \quad ... (2)$$

To achieve the second objective, Equation 3 estimated as follows:

$$\log\_bga_{it}=\alpha_t+\Omega_{it}+\emptyset_i M_{it}+\sum_{i=1}^{n}\beta_i X_{it}\beta_i X_{it}+\epsilon_{it} \quad \text{..... (3)}$$

To achieve the third objective, Equation 4 estimated as follows:

$$Log\_nbc_{it}= \pi_t+\Omega_t+\emptyset_i M_t+\sum_{i=1}^{n}\beta_i Y_{it}+\epsilon_{it} \quad \text{..... (4)}$$

Where, S, $\log\_bga$, $\log_{nbc}$, M, X, Y - represent matrices of; bank stability, bank credit market, non-bank credit market, macroprudential regulation, and control variables, respectively. - are the matrices of coefficients of macroprudential regulation, control, and lag operator of the dependent variable, respectively. α, λ and π - the constants, while - error term, subscript i - denote the cross-sections and, subscript t - denote the time-series dimension. In the *apriori*, a positive coefficient was expected for bank-specific variable $\log_{ta}$, gr and lr Equation 2. This is based on the fact that an increase in bank size and liquidity levels for banks is expected to promote stability levels for banks. The larger the bank, the more likely it is to experience a high level of stability due to economies of scale. Similarly, increased liquidity levels reduce the probability of banks not meeting its short-term obligations leading to a high level of stability.

Additionally, in a *priori*, positive coefficients were expected for $\log_{ta}$, whereas gr and lr were expected to have a negative coefficient in Equation 3. This is based on the fact that as banks increase in size, more and more resources are available for banks to expands their loan book. On the other hand, as the bank liquidity levels increases, it means the bank is holding more liquid assets hence reducing resources available to expands its loan book.

4.3 Data and Population

The paper adopted bank-level and peer-level annual data for 32 banks out of a population of 43 banks during the period 2001 to 2019. The study period covers the pre- and post-global financial crisis period when most macroprudential regulations were adopted in the latter period. Secondary data was extracted from the published financial statements. Eleven banks were dropped from the population due to limited data series as a result of consolidation, entrants and exit of commercial banks in the industry. The definition and measurement of the study variables are summarized in Table 3.

Table 3: Definition and Measurement of Study Variables

Notation	Definition	Measurement
	Dependent Variables	
S	Solvency Score	Measure availability of the cash over the long terms to meet the financial commitment.
log_bga	Bank credit market	Natural log of bank gross advances
log_nbc	Domestic leakage	Natural log of non-bank credit
	Independent Variables	
CA	Capital Asset Ratio	Ratio of capital to total assets
EA	Equity to Asset Ratio	Ratio of total equity to total asset
CAR	Capital Adequacy Ratio	Ratio of total capital to risk-weighted assets
NPL	Non-performing Loan Ratio	Ratio of non-performing loan to total gross loan
LA	Loan to Asset Ratio	Total loans to total assets- an indicator of the bank's liquidity
CI	Cost to Income Ratio	Ratio of operating costs (excl. bad debts written-off) to operating income
CCB	Capital Conservation Buffer	Additional capital of 2.5% over and above minimum capital adequacy ratios of 8% and 12%
CRR	Cash Reserve Ratio	Ratio of banks balances held with the CBK for cash reserve requirements to bank's total deposits
LFE	Limits on foreign exchange	Ratio of banks foreign asset and liability positions including off-balance exposures to core capital
	Control Variables	
LTV	Loan to Value Ratio	Ratio of a loan advanced by bank to the value of an asset purchased
DSI	Debt-Service-to-Income	Ratio of aggregate mortgage servicing to borrower's income
GR	Bank gearing ratio	Ratio of shareholder's equity to borrowed funds
LR	Bank liquidity ratio	Ratio of banks liquid assists to short-term liabilities
LOG_TA	Bank size	Natural log of total bank assets
GDPR	Economic growth rate	Annual percentage growth rate of real GDP

Bankometer (S-score) used as a proxy for bank stability; the natural log of bank gross advances (log_bga) used as a proxy of bank credit market, and the natural log of non-bank credit (log_nbc) used as a proxy for domestic leakage; were used as the dependent variables. The sum of credit advances from deposit taking SACCOs and microfinance banks were used as the non-bank credit variable.

The macroprudential tools categorized into three; capital based proxied by Capital Conservation Buffer (CCB); liquidity-related tools proxied by Cash Reserve Requirements (CRR); and asset-side tools proxied by Limits on foreign exchange (LFE) were used as explanatory variables. On the other hand, the bank-specific variables such as bank gearing ratio (Gr), liquidity ratio (lr) and the natural log of total bank assets (log_ta) and macro-economic variable economic growth rate (gdpr) were used as control variables. For robustness check, asset-side tools proxied by Loan to Value Ratio (LTV) and Debt-Service-to-Income (DSI) were also employed as control variables.

5.0 Results and Empirical Findings

5.1 Evaluating Evolution of Banks Stability Conditions in Kenya

To address the first study objective, we followed a two-stage approach. First, we attempted to evaluate the evolution of stability conditions in Kenya by estimating Equation 1 and the results are presented in Table 4. The S-score results indicate that the overall banking sector in Kenya has remained within the 'Safe" Zone, during the period under study. This is supported by the S-Score falling within the range of $S > 70$. The overall S-score mean of 165 indicates, banks in Kenya are financially healthy and faced the least probability of experiencing financial insolvency problems in the near future. On the other hand, the standard deviation of 61 shows the stability conditions of individual banks in Kenya have widespread variations. The finding also reveals that the overall industry S-score over the study period has remained high and stable, at S-score of 176 in 2019 compared to S-score of 210 reported in 2001. This indicates an average of 17 percent decline over the 19 years of the study period. These findings indicate that during the study period, the banks' resilience has remained high, though downward trending.

Table 4: Evolution of Stability Conditions in Kenya using S- Scores Measures

Year	Overall	Large Peer	Medium Peer	Small Peer
2001	210	170	208	245
2002	217	156	204	270
2003	210	148	181	275
2004	201	152	168	262
2005	195	141	156	262
2006	185	139	159	239
2007	182	160	149	228
2008	181	143	161	226
2009	179	150	160	219
2010	177	148	163	214
2011	170	142	155	205

Year	Overall	Large Peer	Medium Peer	Small Peer
2012	180	159	169	209
2013	175	164	167	198
2014	166	156	161	186
2015	168	154	158	193
2016	175	152	170	202
2017	173	152	168	197
2018	175	150	166	198
2019	176	151	167	197
Mean	165	**S_ Score Interpretation:** S>70 'Stability Zone, 50<S>70 'Gray' Zone,		
SD	61	S<50 'Distress' Zone		

5.2 Evaluating the Role of Macroprudential Regulation on Bank Stability

5.2.1 Diagnostic Tests

The second part involved evaluating the effectiveness of macroprudential regulations in promoting bank stability in Kenya. However, before undertaking regression analysis, stationarity data specification diagnostic tests were conducted to determine the suitability of the data. These tests were aimed at verifying if the study data violated the ordinary linear squares (OLS) classical assumption on stationarity. We undertook panel unit root tests as prescribed by Levin, Lin & Chu (LLC, 2002). LLC test allows the degree of persistence in individual regression error, the intercept and trend coefficient to vary across individual data freely. The LLC panel unit test revealed the gdpr, log_bga, gr, log_bga, log_ta, S_score, crr and log_nbc were all found to be stationary at level (Appendix 1).

Following Gujarati (2003), panel data estimation techniques may adopt three approaches, namely, pooled regression model (PRM), fixed effect model (FEM) and the random effect models (REM). PRM are mostly applicable where it involves pooling all the data for running an ordinary least square (OLS) since cross-sectional or temporal effects are not significant. In this study, there was a need to establish cross-sectional effects; hence PRM was not the best suitable model. FEM and REM were the most suitable models due to these model's ability to establish cross-sectional effects. To determine the most suitable model between FEM and REM, we followed Hausman (1978) recommendation and estimated Hausman test for fixed / random effects model. This is a test statistic for endogeneity by directly comparing fixed and random effects estimates of coefficients values. The results for this test are presented in Table 5

Table 5: Hausman Test for Model Effects Estimation

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.7999	5	0.2360

Null Hypothesis: Random Effects Model is Appropriate: Significance level 5 Percent

The Hausman test results in Table 5 show the Chi-Square test statistics of 6.8 that corresponds to 5 degrees of freedom and P-value of 0.236 for Equation 2. The P-value reveals that the results are not statistically significant at 5 percent level of significance; hence we fail to reject the null hypothesis. This means REM was found to be the most appropriate

5.2.2 Effectiveness of Macroprudential Regulations in promoting Bank Stability

After undertaking diagnostic tests, we estimated Equation 2 and the regression results presented in Table 6.

Table 6: Regression Results: Effectiveness of Macroprudential Regulations in promoting Bank Stability

Dependent Variable	Bankometer S-Score					
Equation	2[a]	2[b]	2[c]	2[d]	2[e]	2[f]
Intercept	19.5784*** (12.4251)	19.0863*** (17.4125)	16.3466*** (14.4762)		19.1098*** (0.3957)	20.426** (2.7325)
CCB	52.6946*** (0.4340)					
DSI		2.5302** (0.3956)				
CRR			-2.5283** (-2.2625)			-3.007** (-2.5612)
LFE				17.6722*** (9.0103)		
LTV					-1.9117*** (-5.0483)	-6.261* (-1.1441)
GR	16.5372*** (25.8449)	16.425*** (22.8972)	18.4682*** (26.2980)	31.6704*** (23.1468)	16.4032*** (22.9767)	22.345** (3.2395)

Dependent Variable	Bankometer S-Score					
Equation	2[a]	2[b]	2[c]	2[d]	2[e]	2[f]
GDPR	-0.0451 (-0.0473)	-0.4424 (-0.0535)	-0.9370 (-0.9299)	-1.1247 (-1.2792)	-0.4425 (-0.5304)	-0.1072* (-2.504)
LR	35.9180*** (5.2491)	36.1897*** (6.2720)	36.834*** (5.418)	47.976*** (6.7047)	46.9727*** (6.1169)	16.755 (2.009)
LOG_TA	-20.1402*** (-5.5109)	-24.4525*** (-5.2613)	-25.2172*** (-10.2151)	-23.0786*** (-6.6639)	-20.5944*** (-5.2690)	-18.17** (-2.739)
Statistics						
Adjusted R-squared	0.5814	0.5849	0.5847	0.5930	0.5815	0.5915
Durbin-Watson stat	0.8065	0.8071	0.8116	0.7279	0.8071	0.8154
Prob(J-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Random Effects Specifications						
Cross-Section (Rho)	0.2501	0.2502	0.2515	0.2502	0.2502	0.2502
Idiosyncratic (Rho)	0.7499	0.7498	0.7485	0.7498	0.7498	0.7498

NB: t-values in parentheses; *** 1% level of significance; ** 5% level of significance; * 10% level of significance.

Table 6 reveals as in contrast to *a priori*, the bank-specific control variable log_TA the control variable for variation in bank size had a negative coefficient and significant at 1 percent. This shows during the period of study, as bank size increases, it reduces the bankometer S-scores. This may be attributed to the fact as banks strive to expand its balance sheet, it may engage in excessive risky lending and in some instances large banks may experience diseconomies of scale (Kiemo & Kamau, 2019). Additionally, large banks are more efficient in utilizing capital to generate loans hence retaining a significantly small portion of capital buffers in comparison to small size banks.

Table 6 also reveals other control variables such as liquidity ratio (LR) and gearing ratio (GR) had expected *a priori* positive signs. This indicates that a rise in both short-term and long-term liquidity conditions measured by liquidity and gearing ratios boost bankometer S-score. This means a reduction in bank liquidity pressure promotes bank stability. Additionally, higher shareholders' capital promotes banks' stability. These findings are illustrating the unique nature of the bank funding in the credit intermediation and maturity transformation processes. Banks transform short term deposits to long term lending. Through banks, credit creation power, where a single bank deposit creates multiple

loans hence increases income generation leading to more profitable banks that are less likely to experience instability. Similar results were found by Fungacova, Turk & Weill (2015), Dermerguc-Kunt & Huizinga (1998), Kiemo et al. (2019).

Table 6 also reveals the explanatory study variables, CCB, DSI and LFE used as proxies for capital-based and asset-side macroprudential regulation had positive and highly significant coefficients as indicated by Equations 2^a, 2^b and 2^d respectively. This finding reveals that over the study period, the introduction of these macroprudential regulations raises the bankometer s-score, the proxy for bank stability. The additional 2.5 percent counter-cyclical capital buffer, the encouraged DSI ratio on loans and 10 percent limit on banks' exposure foreign liabilities have strengthened banking sector resilience. These results support Cerutti et al. (2016) findings that macroprudential policies managed financial cycles, especially during periods of no financial busts. Similar results were also found by Borio (2014), whose findings indicated macroprudential policies were more effective in reinforcing resilience than in restraining booms. Moreover, he finds that loan to value or debt to income ratios are more effective than the capital requirements measures.

The table 6 also reveals, the explanatory variable CRR, the proxy for liquidity-related macroprudential regulation had a negative and statistically significant at 5 percent as indicated by Equation 2^c. This indicates that the introduction of this liquidity-related macroprudential regulation was ineffective in promoting bank stability. These findings may be attributed to the fact that an increase in CRR leads reduction of resources available for banks to settle maturing obligations. The cash reserves are usually held by the prudential authority hence not readily available for banks for utilization. The table also reveals explanatory variable ltv, a proxy for asset-based macroprudential regulation had a negative and statistically significant at 5 percent as indicated by equation 2^e. This indicates that this asset-based macroprudential regulation was ineffective in promoting bank stability.

Table 6 also reveals jointly the explanatory variables CRR, the proxy for liquidity-related macroprudential regulation and the explanatory variable LTV, a proxy for asset-based macroprudential regulation; both maintained a negative and statistically significant at 5 percent as indicated by Equation 2^f, this reveals asset-based, and liquidity-related macroprudential regulations jointly are ineffective in promoting bank stability.

5.3 Empirical Results: Evaluating the Effect of Macroprudential Regulation on Bank Credit Market

To achieve the second study objective of evaluating the effect of macroprudential regulation on the credit market, we estimated Equation 3 and the regression results presented in Table 7.

Table 7: Regression Results: The Effect of Macroprudential Regulation on Bank Credit Market

Dependent Variable	Log_bga				
	3[a]	3[b]	3[c]	3[d]	3[e]
Intercept					-0.2254*** (-6.2888)
CCB		-6.9563*** (8.3036)			
DSI			-0.3573*** (-3.2463)		
CRR	-0.1322*** (-6.9014)				
LFE				-2.1440*** (-3.2463)	
LTV					-0.0284*** (-2.6553)
GR	-0.5164*** (-4.6239)	-0.0603 (-0.7180)	-0.3631*** (-15.1065)	-0.0497 (-0.7075)	0.1816*** (8.9003)
GDPR	0.0340** (2.0298)	-0.0010 (-0.0757)	0.0035 (0.3682)	0.0035 (0.3682)	0.0035 (-2.6553)
LR	-0.4015*** (-3.5415)	-0.3396*** (-12.1560)	-0.3631*** (-15.1065)	-0.3631*** (-15.1065)	-0.4147*** (-20.7063)
LOG_TA		1.0294*** (89.4640)	1.0267*** (11.1361)		1.0288*** (13.2325)
Statistics					
Adjusted R-squared	0.6575	0.8188	0.8275	0.6275	0.7530
Durbin-Watson stat	0.4782	0.4131	0.3862	0.4862	0.6960
Prob(J-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000

NB: t-values in parentheses; *** 1% level of significance; ** 5% level of significance; * 10% level of significance.

As expected in the *a priori*, the coefficient of bank-specific variable log_TA the proxy of bank size, was positive and statistically significant. This indicates as bank increases in size, its log_BGA a proxy for loan and advances expands also. This results from the fact as bank increase in size, more resources are available for its loan book expansion. Additionally, it also reflects the unique nature of banking business where loans and advances form a significant position of banks assets.

Table 7 also reveals other bank-specific variables GR and LR representing the bank long-term and short-term liquidity conditions, respectively had a negative coefficient as in *a priori*. The GR and LR coefficients were on overall also statistically significant at 1 percent. These results suggest that an increase in both long-term and short-term liquidity reduces the ability of banks to expand loan book portfolios. High liquidity levels indicate banks are holding large volumes of cash and other liquid assets at the expense of long-term assets categories such as loans and advances.

Table 7 also reveals the study explanatory variables CRR, CCB, DSI, LFE and LTV the proxies for liquidity-related, capital-based and asset-based macroprudential regulation presented in the Equations 3^a, 3^b, 3^c, 3^d and 3^e respectively, had on overall negative and statistically significant coefficients at the 1 percent significance level. This implies that during the study period, the introduction of capital-based, liquidity-related, and asset-side macroprudential regulations led to a reduction of the bank credit market. This is based on the fact, increase in capital and liquidity-based tools such as counter-cyclical capital buffer and cash reserve ratio respectively, as expected reduced the bank capitalization levels available for credit creation hence leading to a negative effect on loan and advances growth.

Table 7 also reveals the asset-side macroprudential tools such as the limit on debt-to-income ratio and the loan to value ratio had a significant adverse effect on bank lending during the study period in Kenya. This study results support Dapher *et al*. (2016) who also found macroprudential regulations had a dampening effect on credit growth. Lim *et al.* (2011) also found liquidity-related macroprudential regulations moderated credit growth. Other studies such as Giovanni *et al*. (2012) have similar findings. They explored historical credit booms to assesses the effectiveness of macroprudential policies in reducing the risk of a crisis. They find that macroprudential policies are effective in containing booms and in limiting the consequences of busts.

Table 7 also reveals jointly the explanatory variables CRR, the proxy for liquidity-related macroprudential regulation and the explanatory variable LTV, a proxy for asset-based macroprudential regulation; both maintained a negative and statistically significant at 5 percent as indicated by Equation 3^f, this reveals asset-based, and liquidity-related macroprudential regulations jointly had a dampening effect on credit growth.

5.4 Evaluating the Effect of Macroprudential Regulation on Domestic Leakage

To achieve the third study objective of evaluating the role of macroprudential regulation on domestic leakage, we estimated Equation 4 and the regression results presented in Table 8.

Table 8: Regression Results- The Effect of Macroprudential Regulation on Domestic Leakage

Dependent Variable	Log_nbc			
	4^a	4^b	4^c	4^d
Intercept	6.6164*** (41.1737)			
CCB	0.21069*** (7.5528)			
DSI		7.9722*** (7.7481)		
CRR			2.2119*** (1.5429)	0.8971*** (5.5165)
LTV			0.3877*** (2.8110)	0.5841*** (1.1879)
GDPR	0.0479*** (5.5095)	0.1322*** (11.8734)	0.9289*** (50.3075)	0.0397*** (2.2929)
Statistics				
Adjusted R-squared	0.3159	0.3883	0.6658	0.6778
Durbin-Watson stat	0.5481	1.3183	1.0932	1.2932
Prob(J-statistic)	0.0000	0.0000	0.0000	0.0000

NB: t-values in parentheses; *** 1% level of significance; ** 5% level of significance; * 10% level of significance.

From the Table 8, it is evident that the coefficients of the explanatory variables CCB, DSI, CRR and LTV the proxies for macroprudential regulations were on overall positive and statistically significant at 1 percent as indicated by Equations 4^a, 4^b, 4^c and 4^d respectively. This shows that macroprudential regulations like counter-cyclical capital buffer, cash reserve ratio and loan restrictions measure such loan to value, foreign exchange exposure and debt to income ratio has led to increase in non-bank credit the proxy for domestic leakage. This may be attributed to the fact that loan access restrictions based on the customers' income levels and security, has resulted in customers seeking an alternative source of credits. The alternative sources may include microfinance banks and deposit taking SACCO's who are outside the purview of macroprudential regulations in Kenya.

Table 8 also reveals jointly the explanatory variables CRR, the proxy for liquidity-related macroprudential regulation and the explanatory variable LTV, a proxy for asset-based macroprudential regulation; both maintained a positive and statistically significant at 1 percent as indicated by Equation 4^f, this reveals asset-based, and liquidity-related macroprudential regulations jointly led to domestic leakage.

Our findings support Cizel et al. (2016) who found that capital-based macroprudential tool led to domestic leakages in Croatia as evidenced by increased lending by non-bank companies. Similar findings by Horvah and Wagner (2016) led them to caution regulators when introducing new macroprudential measures which might cause banks to adjust their behaviour, leading to leakages and cross border spillovers.

6.0 Conclusion and Policy Recommendations

The focus of this paper was twofold; first, the paper sought to examine the effectiveness of macroprudential regulations in promoting bank stability and, secondly the paper sought to examine the impact of macroprudential regulations on credit market in Kenya while exploring any evidence of domestic leakage. This was achieved by exploring the evaluation of bank stability conditions using bank-level and peer-level annual data from 2001 to 2019. We constructed Bankometer S-Score to assess stability conditions which revealed the Kenya banking sector stability condition was sound and resilient throughout the study, though on a downward trend.

On the effectiveness of macroprudential regulations in promoting bank stability, the paper findings reveal during the study period, the capital-based and asset-side macroprudential regulation namely CCB, DSI and LFE had a positive and significant effect on banking stability in Kenya. This indicates these macroprudential regulations in Kenya have increased banking sector resilience; hence the banks are less likely to experience financial instability. However, liquidity-related macroprudential regulation proxied by CRR, which complements other liquidity based macroprudential regulation and asset-based macroprudential regulation proxied by LTV were found to have a negative and significant effect on bank stability in Kenya. This indicates, during the study period, CRR and LTV were ineffective in promoting bank stability in Kenya. On the effect of macroprudential regulations on the bank credit market, the findings show that during the study period, all the capital-based, liquidity-related and asset-side macroprudential tools have a negative and significant effect on bank credit in Kenya. This indicates, to some extent, macroprudential regulations in Kenya have dampened the bank credit market in Kenya.

In examining any evidence of domestic leakage attributed to macroprudential regulations, the paper finding reveals during the study period, capital-based, liquidity-related and asset-side macroprudential regulations had a positive

and significant effect on non-bank credit market in Kenya. This indicates, to some extent, macroprudential regulations in Kenya may have led to domestic leakage as financial intermediaries seek an alternative source of financing outside the macroprudential regulation purview. The paper concludes the adoption of capital-based and asset-side macroprudential regulations except for loan to value ratio has led to improved stability conditions for banks in Kenya. However, liquidity-related macroprudential regulations have been ineffective in promoting banking stability. On the other hand, these macroprudential regulations have dampened the bank credit market and also led to domestic leakage. This calls for policymakers to take caution when implementing macroprudential conditions to balance out the public policy objectives of bank stability and access to finance. Additionally, the policymakers should note that implementing the new macroprudential measures may cause banks to adjust their behaviour, leading to leakages and cross border spillovers.

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Annexes

Appendix 1: Unit Root Test Results

	Levin, Lin & Chu t *Statistic	Prob.**	Cross-Sections	Obs
S-Score	-4.51	0.00	32.00	544
CRR	-46.64	0.00	32.00	544
GDPR	-21.31	0.00	32.00	544
GR	-2.06	0.02	32.00	544
LR	-4.73	0.00	32.00	544
Log_bga	-9.13	0.00	32.00	544
Log_ngt	-6.63	0.00	32.00	384
Log_ta	-6.23	0.00	32.00	544

Appendix 2: Descriptive Statistics

	CCB	CRR	DSI	LFE	GDPR	GR	LR	Log_bga	Log_ngt	Log_ta	LTV	S-score
Mean	0.01	5.30	0.30	0.05	5.09	0.21	0.43	4.25	5.29	4.49	0.50	158.24
Median	0.00	5.25	0.30	0.05	5.54	0.20	0.40	4.18	5.35	4.42	0.50	147.76
Maximum	0.03	6.00	0.60	0.10	6.99	1.06	1.04	5.70	5.67	5.83	1.00	420.66
Minimum	0.00	4.50	0.00	0.00	1.53	(0.21)	(0.72)	2.98	4.83	3.16	0.50	(25.89)
Std. Dev.	0.01	0.45	0.30	0.05	1.43	0.11	0.19	0.62	0.27	0.61	0.50	50.15
Skewness	0.60	(0.02)	(0.00)	0.00	(1.11)	2.85	(0.37)	0.19	(0.32)	0.14	0.00	1.84
Kurtosis	1.36	2.80	1.00	1.00	3.65	18.57	7.74	2.06	1.72	1.98	1.00	9.42
Obs	448	448	448	448	448	448	448	448	448	448	448	448

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