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**Impact of Financial System Development on Macroeconomic
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Abstract

The study sought to examine the impact of financial system development on macroeconomic stability in Kenya using quarterly data from 2005Q2- 2021Q2. A composite macroeconomic stability index (MSI) is developed using key macroeconomic variables to measure the evolution of macroeconomic stability conditions. Four measures of financial developments, that is, financial depth, financial intermediation, market capitalization, and money multiplier are regressed on the MSI using ARDL models. Analysis of the trends of MSI indicate that Kenya's macroeconomic environment has been stable with short-lived intermittent periods of instability. The findings also show that both a short-run and a long-run relationship exists between selected financial sector development indicators and macroeconomic stability. Mobile money innovations positively influence macroeconomic environment in the long run, whereas bank lending weakens macroeconomic stability in the short-run. The study recommends that policy makers implement policies to support financial sector development such as mobile money innovations that increase productivity, and competitiveness in the productive sectors of the economy, while supporting longer-tenure credit provision to the productive sectors of the economy to support investment and thus drive economic growth and macroeconomic stability.

Key Word: *Macroeconomic stability, financial sector development, ARDL*

I. Introduction

Financial systems play an important role in promoting economic development through transforming savings into long-term investments via financial intermediation. Financial systems comprise of institutions, various market players and sets of rules and practices that facilitate intermediation of funds between entities and investment by economic agents. Efficient financial systems comprise of different players including: deposit-taking institutions namely commercial banks, mortgage finance companies, microfinance banks and deposit-taking saving and credit co-operatives (Saccos); non deposit-taking institutions namely insurance, pensions, capital markets, development finance institutions and financial markets infrastructure providers. Intermediation efficiency ensures that financial sector participants are able to access resources and other financial services affordably through maturity transformation of financial assets, facilitating investments and hedging risks (Štreimikienė, 2012). A sound and efficient financial system is a significant driver of economic development and macroeconomic stability through allocation of resources to enhance productivity. This may be achieved; by matching long-term savings to support long-term investment products; facilitating market confidence through efficient legal and institutional frameworks; expanding financial services and products; and having efficient payments systems to facilitate financial transactions. The financial sector mobilizes savings, allocate capital, offers risk management tools and general oversight of investments.

Theoretically, financial system development underpins macroeconomic stability and sustainable economic development.² A well-functioning financial sector provides liquidity, to firms and households, smoothening their expenditure and savings and ultimately suppressing adverse macroeconomic volatility during shock periods (Levine, 1997; Beck & Demirguc-Kunt, 2006). A well-developed financial system has also been found to be resilient to economic shocks hence reducing economic volatility, leading to stable economic development. On the other hand, a less developed financial system has been found to be susceptible to economic shocks and macroeconomic instability leading to slower economic development (Aghion and Howitt, 1997).

No consensus exists in the literature regarding the impact of financial development on macroeconomic stability. On the one hand, empirical evidence reveals a positive link between financial sector development and macroeconomic stability. However, the 2007-09 global financial crisis led to intense debates on this positive linkage. On the other hand, some studies indicate negative linkages between the two variables in which case, rapid financial sector development is found to trigger macroeconomic instability. Further, some studies show that as the financial sector deepens, its contribution to reducing volatility declines thus increasing the propagation and amplification of shocks (Cecchetti & Kharroubi, 2012; Sahay et al., 2015). Other studies suggest that the level of financial system development is positive only up to a certain point, after which it becomes a hindrance to macroeconomic stability, (Aghion et al., 2005; Arcand et al., 2012; Dabla-Norris & Srivisal, 2013). These studies therefore show that the link between the financial system development on macroeconomic stability is still inconclusive.

Additionally, the direction of causality between financial sector development and macroeconomic growth remains inconclusive. There is general consensus that the level of financial sector development drives economic growth, where an efficient financial sector optimally allocates resources to the various

² Indicators of macroeconomic stability include GDP, stable inflation, sustainable fiscal deficit and stable exchange rate

economic agents hence increasing productivity, and ultimately leading to higher economic growth. There is evidence that the financial sector positively influences growth (King & Levine, 1993). However, there are counter arguments that sustainable economic development drives financial sector development, where economic development supports firm's employment and boosts households' incomes. The rise in income levels smoothens consumption and saving patterns for both firms and households ultimately promoting financial sector development. This argument contradicts the premise that financial sector development promotes macroeconomic development but supports the view that the finance-growth nexus causality runs from economic development to finance sector development. Therefore, financial sectors players have called for close monitoring on the expansion of financial services, tracking of vulnerabilities emanating from financial sector development and closely examining the link between the financial sector and the real economy.

There is a dearth of literature on the financial sector development and macroeconomic nexus based on Kenyan data despite the relatively advanced financial sector. In the last three decades, Kenya has undergone a unique financial sector development experience in which significant reforms to improve efficiency and deepen the financial sector have been undertaken. These reforms were mainly institutional, legal and market-based and they have supported both financial sector development and macroeconomic stability, through promoting competition, increasing access to financial services and fostering financial sector stability. Despite these positive outcomes, significant vulnerabilities still exist as evidenced by low economic growth, a segmented banking sector, exchange rate volatility, an elevated fiscal deficit leading to a rise in public debt and depressed private sector credit growth. These vulnerabilities raise policy questions on the financial sector development and macroeconomic stability nexus. The main objective of this study, therefore, is to address these policy gaps by re-examining the link between financial sector development and macroeconomic stability in Kenya.

The rest of the paper is organized as follows; section 2 describes the financial sector development and macroeconomic development in Kenya. Section 3 highlights the theoretical and empirical literature underpinning the study. Section 4 presents data and the research methodology. Section 5 discusses the empirical findings, and finally section 6 concludes with policy recommendations.

II. Financial Sector and Macroeconomic Development in Kenya

Kenya has undertaken numerous financial sector reforms to deepen the financial sector while promoting macroeconomic stability. This section provides a summary of the reform outcomes.

Financial Sector Development in Kenya

Kenya has a well-developed financial system comprising of a wide variety of institutions, markets, products, services and financial infrastructure. The sector plays an important catalytic role of facilitating the growth of all other sectors of the economy. Though the degree of financial intermediation is relatively high with domestic bank credit as a percent of GDP at about 32 percent in Kenya compared to the continental average of 20 percent in 2021, pockets of weaknesses still exist such as; financial services access gaps along gender, wealth, rural-urban dimensions; and wide fiscal deficits as well as rising public debt.

The Kenyan financial system is complex, highly interconnected and diversified with increased cross border operations. The adoption of FinTech has transformed the sector in terms of products and services through innovations. The complexity of the financial sector led to the establishment of non-operating holding companies to manage operations across these complex financial institution entities. Although the financial sector transformation and growth has improved efficiency and synergies in resource use and profit maximization, it has also become a growing source of potential risks, including incidents of fraud and cyber security attacks (CBK, 2019).

Private sector credit to GDP is a standard indicator of financial depth in empirical literature. Kenya's private sector credit to GDP is higher than its East Africa peers only surpassed by South Africa, Cape Verde and Mauritius (**Table 1**). This indicates that Kenya's financial sector is bank-led rather than market led, though not the extent of South Africa, Cape Verde and Mauritius whose banking sector assets are larger than the size of their respective economies. It also important to note that despite large banking sectors in South Africa, Cape Verde and Mauritius, their mobile financial services penetration is not as prominent or as developed as Kenya's (Kiemo & Kamau, 2021).

Table 1: Banking Assets and Private Sector Credit as % of GDP, 2020

	Banking sector assets to GDP (percent)	Domestic private sector credit to GDP (percent)
Kenya	65.7	32.0
Nigeria	29.9	11.2
Tanzania	25.8	13.1
Uganda	31.2	13.0
Egypt	65.8	27.1
South Africa	136.5	62.4
Cape Verde	171.5	72.6
Mauritius	408.1	95.9

Source: Kiemo & Kamau, (2021)

Kenya's financial system comprises of the banking, insurance, capital markets, pensions, and Sacco societies sub-sectors and digital financial services providers. The developments and risks across these sub-sectors, are monitored, regulated, and supervised by independent government agencies namely; Central Bank of Kenya (CBK), the banking industry regulator; Capital Market Authority (CMA), the capital markets regulator; Insurance Regulatory Authority (IRA), the insurance industry regulator; Retirement Benefit Authority (RBA), the pension industry regulator and Sacco Societies Regulatory Authority (SASRA), the Sacco societies regulator. Additionally, the Kenyan financial system is supported by a robust financial markets infrastructure that facilitates payments, settlement, and custodial services. The development in these sub-sectors can be classified into three broad categories namely; depository corporations, non-depository corporations and, market infrastructure featuring mobile money and payment platforms as discussed below.

Depository Corporations

The key depository corporations in Kenya include commercial banks, microfinance banks, and Savings and Credit Cooperative Organizations (SACCO). Kenya's financial sector is bank-led rather than market based as the banking sub-sector is the dominant depository corporation. Banking industry assets accounted for 49.51 percent of nominal GDP while SACCOs assets accounted for less than 10 percent in 2018.

In 2021, the CBK Annual Bank Supervision Report showed that total banking sector assets recorded significant growth of approximately 359 percent in the period 2008-2020, to close at KSh. 6.1 trillion in 2020. The growth in assets have largely been driven by a three-fold rise (365 percent growth) in loans and advances over the same period, reaching KSh. 3.0 trillion in 2020. Mobile money has also significantly driven banking sector assets since banks act as custodians for mobile money trust account balances. The value of mobile money transactions has grown from KSh. 166.6 billion from 2008 to KSh. 5.2 trillion in 2020 (**Annex 1**).

Market share of microfinance banks has remained low relative to other depository corporations, with microfinance banks' total assets reaching KSh. 75.4 billion in 2020, translating to an 83 percent growth since 2013. The growth is largely driven by total loans that rose from KSh 28.1 billion in 2013 to KSh 49.5 billion in 2020.

Kenya's Sacco industry is among the largest in Africa with a total asset to GDP ratio of 5.7 percent, followed by Rwanda and Ethiopia, with 3.0 percent and 0.7 percent, respectively. Growth of the Sacco industry has leveraged on rapid adoption of technology and innovations in the provision of financial services and products, coupled with the opening of the common membership bond. In addition, the enhanced legal and regulatory environment has helped the Sacco industry to grow and increased access of the adult population by 28.4 percent as at December 2019, the highest in Africa (CBK, 2020).

Non-Depository Corporations

Non-depository corporations in Kenya comprise of pension, insurance and capital market players. Kenya's insurance penetration rate, measured by the ratio of insurance premium to GDP, has remained low at 2.3 percent between 2019 and 2020, below the 7.4 percent global average. Consequently, IRA and stakeholders have taken strategic policy measures to increase the insurance penetration rate. Similarly, pension coverage, is also low at 22 percent of the total labour force in 2019, with majority of those covered being in the formal sector. The low level of pension penetration across the informal sector has necessitated a shift in industry focus to boost pension savings among informal sector workers (CBK, 2019). The industry has been relatively stable with the overall risk score at 3.09 in 2019, though above the desired overall risk score of 2.88 **(Annex 1)**.

Kenya has emerged as East and Central Africa's financial service hub, with the Nairobi Stock Exchange (NSE) ranked 4th in Africa in terms of market capitalization. The robustness in Kenya's capital market is evidenced by the 174 percent growth in market capitalization from 2008 to close at KSh. 2336.7 billion in 2020. Additionally, as M-Akiba bonds offer tax-free fixed coupon of 10 percent per annum, an upsurge has been recorded in the secondary market by retail investors, reflecting flight to quality and safety following improved disposable incomes by low-income earners **(Annex 1)**.

Market Infrastructure - Mobile Money and Payment System

Robust market infrastructure has underpinned Kenya's financial sector development. The M-PESA mobile phone account was licensed in April 2007, which marked the advent of mobile money in Kenya and made domestic and international money transfer and payments easier. Kenya continues to register growth in the adoption of Mobile Financial Services (MFS), which is largely propelled by the ease of access and existence of convenient delivery channels. More people are embracing technology and the use of mobile phones for day-to-day activities, driving the growing demand for convenient financial services as evident from the increasing number of active mobile subscriptions to approximately 61.4 million in 2020. The growth in mobile money usage was accelerated by a growth of over 4000 percent in the number of active mobile money agents to 282,929 in 2020 as the government introduced a number of measures during the Covid-19 pandemic. Some of the measures included, a waiver on mobile money charges, and encouragement of the public to use mobile money instead of cash, habits that were entrenched even in subsequent periods. **(Annex 1)**.

A well-functioning financial market infrastructure (FMI) plays a critical role in ensuring effective, efficient, safe and reliable financial transactions and transfer of value by households, firms, public entities and the Government within and across borders. These transactions include transfers of value/ payments, trading, settlements and custody through retail, wholesale, trading and custodial payments systems. FMI is the nerve center of the financial system, which connects financial markets and financial institutions to the economy. The close interconnectedness and partnership arrangements between financial institutions and markets means that FMIs can easily propagate shocks and risks quickly across the financial system, that ultimately trickle down to the rest of the economy. Therefore, financial market infrastructure players and regulatory authorities should institute measures to mitigate disruptions and manage risks, for efficiency, effectiveness, safety, reliability and availability. Kenya's sound and efficient payments ecosystem comprises of both retail and wholesale platforms that serve individuals, firms and

Government. Retail payments and settlement systems include; mobile money service platforms, automated cheque clearing houses, Automated Teller Machines (ATMs) and point of sale (POS) devices. Other systems include wholesale and trading platforms such as the Real Time Gross Settlement (RTGS) system, also known as the Kenya Electronic Payment and Settlement System (KEPSS) and the Nairobi Securities Exchange Trading System (CBK, 2020).

Macroeconomic Sector Development in Kenya

Kenya's economic growth has been resilient with the real GDP growth rate averaging about 5 percent annually in the last two decades. This has largely been driven by appropriate government and monetary policy measures to promote stability. However, Kenya's growth lags behind its East Africa peers such as, Uganda, Rwanda and Ethiopia. Rising government expenditure coupled with constant government revenues have led to an average fiscal deficit to GDP of 3 percent between 2005-2020. Similarly, higher net imports drove Kenya's relatively wide current account deficit to GDP that averaged 6 percent in the period 2005-2020. Domestic prices have been low and stable as indicated by the single digit annual inflation rate that averaged 5 percent over the period 2005-2020, which is within the Government target band (**Annex 2**).

III. Theoretical and Empirical Literature

Theoretical literature has focused on how financial intermediation and development through financial markets and intermediaries promote growth. Growth is driven by the financial accelerator via financing household consumption and business investment, particularly in advanced countries where growth is driven by private consumption and investment (Levine et al., 2000; Levine, 1997). Due to the significance of the financial accelerator particularly, the relationship between economic growth and financial development remains an important issue of debate among academics and policy makers (De Gregorio & Guidotti, 1995). Three prominent economic growth theories have emerged to attempt to explain the finance-growth nexus namely; the neoclassical growth theory, the endogenous growth theory and the intermediation theory. The neoclassical theory developed by Solow and Swan in 1956, attempts to explain long-run economic growth by looking at capital accumulation, labor and population growth, and increases in productivity, commonly referred to as technological progress. The model focuses on four variables: output/GDP, capital, labor, and knowledge/technological progress. The model estimates the separate effects of technological change, capital and labor on economic growth.

On other hand the endogenous growth theory argues that financial or economic growth is generated from internal (rather than external) procedures and inputs. The endogenous theory is built on the concept that improvements in innovation, knowledge, and human capital leads to increased productivity, which positively affect economic growth. This theory notes that productivity can be improved using technology to improve the efficiency of skilled labor force. Additionally, the endogenous theory states that in the long run, economic growth will depend on the policy measures taken by different governments, implying that policies that embrace openness, competition and innovation will promote growth (Aghion and Howitt, 1997). Lastly, intermediation theory proponents (Goldsmith, 1969; Shaw, 1973; Mckinnon, 1973), argue that financial markets (both money and capital markets) play a pivotal role in economic development, attributing the differences in economic growth across countries to the quantity and quality of services provided by financial institutions. In this regard, credit is an important aspect of financial intermediation as it funds economic entities that can

allocate credit to the most productive uses, (Gwilym, 2011).

Largely based on the direction of causality, two major strands of empirical literature have emerged in regard to the link between the financial sector and macroeconomic stability. The first strand of literature supports the argument that financial sector drives macroeconomic outcomes. This argument supports the widespread belief that financial development enhances productivity which promotes growth. However, despite the general agreement on the direction of causality, conflicting evidence has been found on the nature of causality. For example, Kar & Pentecost (2000) and Boulika & Trabelisi (2002) found that financial development has a positive effect on economic growth, while others arrive at an opposite conclusion (Lucas, 1988; Stern, 1989). On the other hand, Joseph et al (1998) showed granger causality from financial development to economic growth in five SSA countries (Benin, Cameroon, Cote d' Ivoire, Mali and Senegal), and reverse causality in two SSA countries (Burkina Faso, and Togo).

In a study examining the role of financial globalization, institutions, and economic growth on financial sector development in the European Union between 1989 – 2016, Nasreen, et al. (2020) found a positive association between economic growth and financial sector development. Zarrouk, et al. (2020) using the ARDL technique (1960-2014) found that credit to the private sector, an indicator financial development has a positive effect on growth in Kenya in both short and long-run periods. In a bibliometric analysis of the financial and real economy, Zabavnik & Verbic (2021) highlighted how the interlinkages between the financial development and the economy strengthen as the financial sector develops. Their analysis reveals that as the financial sector develops and becomes more complex, transmission channels between the macroeconomic environment deepen the impact of macroeconomic stability on the financial sector and the stronger the interdependencies between the two. Puatwoe & Piabuo (2017) study on Cameroon found a short-run positive relationship between the monetary base (M2), government expenditure and economic growth, as well as a short run negative relationship between bank deposits, private investment, and economic growth. However, in the long run, all indicators of financial development suggested a positive and significant impact on economic growth. Ndikumana (2000) found similar results in the case of the Southern African Development Community (SADC). The findings suggest a positive and statistically significant link between real per capita GDP growth and indices of financial development. Phillips (1977) study found that high and sustained economic growth leads to business cycles and financial sector development that contribute to greater optimism and higher risk tolerance by financial sector intermediaries whose actions lead to financial instability.

The negative effects of financial sector on economic growth have been attributed to the financial crisis including, the low financial sector operations below the threshold point and a lack of efficient resource allocation by banks together with absence of a conducive environment to support investment. For example, Koivu (2002) found declining private credit in 25 transition economies (1993-2000). Similarly, Gillman, et al. (2004) study on 13 transition countries found a negative and significant relationship between Money supply (M2) and growth. Other studies found no relationship between financial sector development and macroeconomic stability. Demetriades & James (2011) study on a sample of 18 SSA

countries for a period 1975-2006 using multiple variables as instruments of financial development including bank deposit, liquid liability, and credit by bank (share to GDP), found no link between financial development and growth in SSA countries. SSA banking systems appear to be unable to extend growth enhancing credit to the private sector despite the banking sector growing in tandem with economic growth in SSA, thus the conclusion that finance does not promote economic growth in the long run in SSA. Fisher (1933) and Bernanke & Gertler (1989) find a positive association between financial sector imbalances and worsening economic contractions, due to high household leverage, high debt in banks and lower consumption and investment.

The other strand of literature postulates that macroeconomic variables drive financial sector development. This strand of literature show that macroeconomic indicators such as public debt, fiscal balance, current account balance, inflation, and economic growth influence the stability and development of the financial sector. However, empirical finding on this link is inconclusive as some studies find a positive relationship while others find a negative relationship. Fiscal balances and rising public debt have been linked to financial sector development mainly through the crowding out effect and the sovereign bank nexus.

Literature on external sector pressures including high current account balances, high external debt and unstable exchange rates have been linked to the financial sector stress through twin banking and current account crises (Kaminsky & Reinhart, 2000). Other studies linking economic growth and financial sector development revealed negative effects of rapid economic growth on financial sector stability. Afanasyeva et al., (2020) study which examined financial imbalances and economic growth in the US in 1960s using a national financial conditions index and a structural Vector Autoregression (VAR), found that rapid economic growth raised private debt and led to a build-up of financial imbalances. Gorton & Ordonez (2020) illustrated how a rise in productivity that increases economic growth could trigger a credit boom that exacerbates the asymmetric information and moral hazard problem between lenders and borrowers and result in a crisis triggered by a rise in NPLs if asset quality remains unchecked. Bordalo, et al. (2018) study focused on how optimism during good economic times may lead to financial intermediaries overweighting good information and thus mispricing risk leading to financial instability.

Other empirical literature illustrates various macroeconomic interlinkages with respect to financial sector development. In a study examining the finance-inflation nexus in Low Income countries (LICS) Khan et al., (2006) found that rising inflation slows growth and impedes financial deepening. Barajas, et al. (2011) and Klein (2010) highlight other macroeconomic interlinkages such as the Dutch Disease phenomenon that affect financial depth, where negative externalities from oil-export dependence increase external and internal imbalances (lack of fiscal discipline and real exchange appreciation). Nili & Rashad (2007) find that low growth was driven by lower financial development for oil-importing countries, implying a financial channel of the finance-growth nexus in explaining external sector weaknesses.

IV. Data and Econometric Methodology

Data

The paper used quarterly time series data for the period 2005Q2 to 2021Q2. The 66 quarters selected provide a pool of data covering different period of major reforms and economic shocks in Kenya's

economy. The variables were extracted from Central Bank of Kenya, Kenya National Bureau of Standards and The National Treasury publications. A range of indicators were used to measure financial sector development, which are the independent variables namely; broad money (M3) as percent of nominal GDP as measure of financial depth and domestic private sector credit (PSC) as percent of nominal GDP to measure level of credit intermediation to the private sector. Total banking assets (TA) as percent of nominal GDP to measure size of the banking sector; Market capitalization (MktCap) as percent of nominal GDP to measure the depth of capital markets; and the Money Multiplier (MM) to capture the rate of money circulation/creation to capture the role of mobile money.

Macroeconomic Stability Index

In this study, a macroeconomic stability index (MSI) based on four key macroeconomic variables was constructed to capture the multi-dimensional nature of various macroeconomic indicators.³ The composite indicator-MSI, comprises of inflation rate (Inf) to capture the stability in the general prices; real GDP growth rate (GDP) to capture expansion rate of the real sector; public debt (PB) to capture the level of sovereign debt, which is an element of an internal imbalance; and current account balance (CA) to capture effect of the external imbalances on Kenya's economy. The main benefit of using a composite index is to capture the dynamic and multi-dimensional aspect of macroeconomic stability as an outcome of various macroeconomic indicators as no one indicator adequately captures macroeconomic stability.

Real GDP growth is included in the index based on theoretical and empirical literature (McKinnon, 1973; Levine 1997) on the finance-growth nexus. Inflation rate is included in the index as guided by Otieno et al., (2017) study which reveals that Kenya's stock market has been sensitive to changes in inflation rate particularly during periods of financial stress. The current account balance as a proportion of GDP in the index proxies for external imbalances and external sector vulnerability. This is evidenced empirically by Kaminsky & Reinhart, (1999) study which revealed the link between currency and banking crises and the interlinkages between growth, capital flows and currency overvaluation that coincide with financial crises. The constructed MSI is thus used as the dependent variable to assess the link between financial sector development and macroeconomic stability.

The index is constructed based on two key stages. The first stage involves standardization for comparability and the second stage involves weighting the score into one composite index. Applying the z-score standardization method, all variables are transformed into a z-score by differencing each

³The analysis of the trends of the macroeconomic stability index (MSI) is reported in Annex 5

observation from its mean value and the result is divided by the standard deviation as shown in equation 1.

$$Z_{(i,t)} = ((X_{(i,t)} - \mu_{(i,t)}) / \sigma_{(t)}) \quad \forall i=1,2, \dots, i \text{ and } t=1,2, \dots, n \quad [1]$$

The standardized variables are then scored between 1 and 10 and the MSI is generated as an equally weighted average of all four variables. The index ranges from 1 and 10, increasing values (towards 10) denote strengthening stability and lower values (toward 1) denote weakening stability. This methodology is preferred to isolate the variables that have the biggest effect on macroeconomic stability, as larger values have a greater effect on the composite index. It also enables us to objectively determine the dynamic effect of different variables on macroeconomic stability over time. To achieve the overall MSI index, summation of z-score is done as shown in equation 2.

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

Where: X = Value of indicator X , μ = Mean Value; σ = Standard Deviation; Z = Normalized Value for indicator X of indicator, while t and i represent time and cross-sections respectively. Table 2 describes all the variables used in both in index construction and the estimation.

Table 2: Description of Variables and Measurement

Symbol	Variable	Description
Variables for Estimating of Macroeconomic Stability Index (MSI)		
<i>GDP</i>	Real gross domestic product	The Gross Domestic Product (GDP) is based on the constant at the aggregate level (%).
<i>INF</i>	Annual Inflation Rate	Annualized changes in consumer price index (%)
<i>FB</i>	Public Debt	The Public Debt stock as a proportion of GDP (%)
<i>CA</i>	Current account balance	The difference between international financial inflows and outflows as proportion of GDP (%)
Independent Variables		
<i>M3</i>	Financial depth	The broad money (M3), measuring money supply in an economy expressed as percentage of nominal GDP (%)
<i>PSC</i>	Private sector credit	The private sector credit provided by domestic financial intermediaries expressed as percentage of nominal GDP (%)
<i>MrkCap</i>	Market capitalization	Total market shares of all companies listed at NSE expressed as percentage of nominal GDP (%)
<i>MM</i>	Money Multiplier	Capture the rate of money circulation/creation to capture the role of mobile money.
<i>TA</i>	Total banking sector assets	Total banking assets (TA) as percent of nominal GDP to measure size of banking sector development.

Descriptive Statistics

Based on descriptive analysis in table 3, the descriptive statistics reveal that financial variables meet the normality criteria such as the skewness is between -2 and +2, while the kurtosis is between -7 and +7.

Table 3: Descriptive Statistics

	MSI	M3	MKT_CAP	MM	PSC	TA
Mean	-0.017872	0.339149	0.025957	6.914255	0.254255	0.497660
Median	-0.030000	0.360000	0.030000	6.780000	0.290000	0.520000
Maximum	0.090000	0.460000	0.040000	9.200000	0.330000	0.710000
Minimum	-0.090000	0.200000	0.010000	5.510000	0.140000	0.280000
Std. Dev.	0.036945	0.072647	0.006136	0.956956	0.055315	0.119986
Skewness	0.566820	-0.149715	-0.655443	0.810927	-0.561447	-0.033490
Kurtosis	3.493709	1.990659	3.074287	2.882620	1.968944	1.947270
Jarque-Bera	2.994072	2.170669	3.376053	5.178204	4.551104	2.179089
Probability	0.223793	0.337789	0.184884	0.075087	0.102740	0.336370
Sum	-0.840000	15.94000	1.220000	324.9700	11.95000	23.39000
Sum Sq. Dev.	0.062787	0.242766	0.001732	42.12515	0.140749	0.662243
Observations	47	47	47	47	47	47

Estimation Method

Consistent with previous studies, this paper utilized the Autoregressive Distributed Lag (ARDL) model, (Pesaran & Pesaran, 1997; Pesaran et al., 2001). The ARDL model is preferred due to its usefulness in capturing the dynamic short-run and long-run effects of regressors on the dependent variable simultaneously and performs well with small samples. The ARDL is the appropriate model due to the nature of data available in terms of size of sample, the relationships to be investigated in the model and literature that has applied similar methodology to investigate the same phenomenon (Kar & Pentecost, 2000; Zarrouk, et al., 2017; Puatwoe & Piabuo, 2017).

The ARDL model to be estimated is characterized in equation 3, assuming errors are normally distributed as $et \sim \text{IID}(0, \sigma^2)$, where the dependent variable is MSI, while the regressors include market capitalization as a proportion of GDP, the money multiplier, and private sector credit as proportion of GDP. Broad money, a potential regressor is excluded from the estimation as it has a high correlation with private sector credit based on correlation matrices and given that private sector credit forms a significant proportion of broad money. The relationship between broad money and private sector credit could create an issue of multicollinearity in the model which would bias the coefficients making them sensitive to small changes and the coefficients would also be less reliable in predictive power.

$$\phi(L)y = \delta + \beta(L)x_t + \mu_t \quad [3]$$

The autoregressive component of the model, that is isolated by using lagged values of the regressors and independent variables to lags p, q is a desirable quality of the model as it reduces autocorrelation in the model thus yielding unbiased estimates of coefficients. Given the normality conditions of the data as determined above, the ARDL model can therefore be run in ordinary least squares as it meets the Gauss-Markov 'blue' assumption of consistency. The unit root tests reveal that all the variables are either stationary or integrated of order 1(0). MM and PSC/GDP are all integrated of order 1(0) as they all become stationary after first differencing, while MSI and Market cap/GDP are stationary as per the results of the unit root tests (**Annex 3**).

An ARDL of the order ARDL (2, 0, 3, 4) is selected as the most suitable model based on the Akaike information criteria (**Annex 4**). Diagnostic tests such as the collerogram of the squared residuals, the Durbin Watson test of autocorrelation in the first lag and the Breush-Godfrey serial correlation test suggest that the model estimations are serially uncorrelated and thus the estimates are reliable. The CUSUM test confirms that the model is dynamically stable as the cusum line lies within the 5% upper and lower significance levels.

The bound tests confirm a long run relationship between the regressors and the independent variable as the F-test statistic is above the upper bounds of the I(I) critical values indicating cointegration between the regressors and the independent variable. An Error Correlation Model (ECM) is then estimated characterized as equation 2 to obtain the long-run estimates of the model.

V. Empirical Findings and Discussion

The ARDL model results reveals three findings. Firstly, there is a long-run relationship between the financial sector development and macroeconomic stability. The long-run equation suggests that macroeconomic stability is explained by its own lag and the money multiplier and private sector credit which have positive and significant effects on macroeconomic stability. Specifically, increases of 1 percentage point in the second lag of money multiplier and the fourth lag private sector credit as a proportion of GDP strengthen macroeconomic stability by 0.3 and 1.01 percentage points respectively in the long run.

Secondly, in the short-run the first and second lags of money multiplier both have a positive and significant effects on macroeconomic stability, such that when the money multiplier increases by 1 percentage point, macroeconomic stability strengthens by 0.01 percentage points in the next quarter and 0.3 percentage points two quarters after.

The third finding is that in the short-run private sector credit weakens macroeconomic stability as indicated by the negative and statistically significant effect of private sector credit to GDP on macroeconomic stability. When private sector credit to GDP increases by 1 percent, macroeconomic stability weakens to a large proportion by 1.02 percent. This finding reveals that private sector credit though the banking sector has stronger short-run effects on macroeconomic stability than mobile money innovations, despite their negative effect on macroeconomic stability that may be due to other reasons such as the tenure of private sector loans, high non-performing loans associated with rapid credit growth, etc. (**Table 4**).

Table 4: ARDL Estimation Results

Dependent Variable	Independent Variable	Coefficient	Standard Error
MSI	MSI(-1)	0.718*** (5.430)	0.132
	MSI(-2)	-0.43*(-3.586)	0.119
	BM	-0.006 (-0.031)	0.208
	MKT_CAP	1.03 (1.260)	0.813
	MM	-0.009 (-0.854)	0.01
	MM(-1)	0.029*** (2.838)	0.01
	MM(-2)	0.008 (0.643)	0.012
	MM(-3)	-0.027 (-2.190)	0.012
	PSC	0.191 (0.455)	0.419
	PSC(-1)	-0.577 (-0.778)	0.741
	PSC(-2)	-0.367 (-0.473)	0.774
	PSC(-3)	-0.361 (-0.497)	0.727
	PSC(-4)	1.017** (2.187)	0.465
	C	-0.017 (-0.384)	0.043

Number of observations 50; R-Squared 76.7% ; Adj.R-Squared 68.3% ; Durbin Watson 1.09; AIC -4.571

VI. Conclusion

This study sought to examine the links between financial sector development and macroeconomic stability based on an ARDL model and quarterly data covering the period 2005Q2 to 2021Q2. The study constructed a macroeconomic stability index-MSI, which revealed that Kenya's macroeconomic environment has been largely stable safe for short-lived intermittent periods of instability. The MSI also captures economic, political, and financial shocks that have affected macroeconomic stability in Kenya. The analysis also shows that Kenya's macroeconomic environment responds to both positive and negative shocks in the financial sector landscape. Nonetheless, the Kenyan macroeconomic environment appears to be dynamic.

Findings from the econometric model shows that financial sector development through both mobile money innovations and bank lending strengthen macroeconomic stability in the long run. In the short-run, empirical findings reveal that mobile money innovations strengthens macroeconomic stability while bank lending weakens macroeconomic stability, and the effects of bank lending are stronger and greater than proportionate indicating the importance of banking sector development on macroeconomic stability. The negative impact of bank lending on macroeconomic stability in the short-run maybe due to high non-performing loans and the tenure of bank lending that may be medium to short term thus may limit long run macroeconomic stability. Moreover, a large proportion of bank lending funds household consumption though some is channeled to Small and Medium Enterprises (SMEs), thus funding consumption rather than investment which may adversely impact macroeconomic stability possibly through increasing inflationary pressure. Furthermore, bank lending only comprises a third of GDP thus the limited scope of bank lending may not support growth adequately thus weakening macroeconomic stability in the short run.

With regards to mobile money, findings suggest that growth of mobile money innovations support macroeconomic stability, and this may support the theory of leapfrogging proposed in the literature where mobile money enables developing countries such as Kenya to leapfrog via mobile money technologies that pave the way for digitalization to increase the economies productivity, efficiency and competitiveness. These innovations therefore enhance total factor productivity as suggested by the Solow model thus strengthening GDP and increase the economy's dynamism.

Given these considerations, this study concludes that financial sector development promotes macroeconomic stability through the banking sector and mobile money innovations. Consolidating the positive effects of mobile money innovations in the long-run and bank lending in the short-run, this study recommends that policymakers implement policies to support mobile money innovations that increase productivity and competitiveness in the productive sectors of the economy while supporting

longer-tenure credit provision to the productive sectors of the economy to support investment and thus drive growth and macroeconomic stability.

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ANNEXES

Annex 1: Select Performance Indicators

	Capital market indicators		Banking Sector Indicators			Mobile Money Indicators			Insurance Indicator	
	Mkt Cap Kshs (B)	NASI All Share Index	Total Deposits (KSh.B)	Total Assets(KSh. B)	Loans Advanced (KSh.B)	Number of Agents	Customers In (Millions)	Number of Transactions (Millions)	Transactions in Value (KSh. Billions)	Insurance Penetration Ratio (%)
2008	853.9	73.4	909.7	1,330.2	661.7	6,104	3.1	62.7	166.6	
2009	825.8	97.0	1,040.6	1,509.5	737.5	23,012	8.9	193.5	473.4	
2010	1133.2	97.0	1,252.8	1,745.9	901.3	39,449	16.4	311.0	732.2	
2011	868.2	68.0	1,524.8	2,114.1	1,174.5	50,471	19.2	433.0	1,169.2	
2012	1272.0	94.9	1,738.7	2,433.8	1,324.2	76,912	21.1	575.0	1,537.5	
2013	1920.7	136.7	1,958.9	2,832.5	1,561.8	113,130	25.3	733.0	1,901.6	2.7
2014	2300.1	162.9	2,310.4	3,375.6	1,916.6	123,703	25.2	911.0	2,371.8	2.9
2015	2049.5	145.7	2,672.3	3,923.1	2,298.4	143,946	31.6	1,114.0	2,816.1	2.7
2016	1931.6	133.3	2,767.8	4,177.8	2,439.6	165,908	34.9	1,331.0	3,355.1	2.8
2017	2521.8	171.2	3,061.9	4,509.8	2,552.7	182,472	37.4	1,543.0	3,638.5	2.6
2018	2102.0	140.4	3,395.7	4,931.2	2,643.6	223,931	47.7	1,740.0	3,984.4	2.4
2019	2540.0	166.4	3,613.0	5,389.7	2,856.4	224,108	58.0	1,839.0	4,346.0	2.3
2020	2336.7	152.1	4,075.1	6,111.8	3,079.3	282,929	65.7	1,863.3	5,213.5	2.3

Source: Compiled from CBK Annual Banking Sector Supervision Reports (2008-2020).

Annex 2 : Kenya Key Macroeconomic and Financial Sector Development Indicators

Year	GDP Growth Rate Q-on-Q (%)	Inflation Rate (%)	Fiscal Balance (%)	Current Account Balance (%)	Mrk Cap/GDP (%)	Banking Assets/GDP (%)	PSC/GDP (%)	M3/GDP (%)	Money Multiplier (%)	GDP (Kshs Billion)
2005	6.0	4.7	-4.1	-1.4	1.5	48.0	30.5	47.5	5.2	1,175.2
2006	6.0	8.0	-4.3	-2.1	1.5	48.0	24.3	37.8	5.1	1,970.4
2007	4.4	5.7	-3.5	-2.5	3.1	48.0	18.1	28.1	5.0	2,765.6
2008	1.2	17.8	-3.5	-5.2	3.1	48.0	23.3	32.5	5.5	2,772.0
2009	1.2	5.3	-1.4	-4.0	3.1	28.2	13.7	19.5	5.7	5,361.5
2010	8.7	4.5	-2.3	-5.4	3.1	30.1	15.3	21.9	5.7	5,793.5
2011	3.9	18.9	-2.6	-8.4	1.4	34.7	19.0	24.9	5.9	6,091.2
2012	4.5	3.2	-2.7	-7.8	2.0	38.2	20.1	27.1	5.9	6,368.4
2013	3.2	7.1	-2.1	-8.8	2.9	42.9	23.3	30.4	6.2	6,595.7
2014	4.3	6.0	-1.6	-9.4	3.0	48.6	27.1	33.7	6.2	6,942.2
2015	5.3	8.0	-2.8	-6.1	2.8	53.8	30.3	37.1	6.9	7,287.0
2016	7.5	6.3	-3.1	-5.4	2.5	54.7	30.1	36.4	6.8	7,644.4
2017	0.8	4.5	-2.2	-6.9	3.2	57.2	29.9	38.4	6.9	7,883.8
2018	6.0	5.7	-3.1	-5.5	2.5	59.2	29.0	40.1	6.8	8,327.6
2019	4.4	5.8	-2.7	-5.5	2.9	61.7	29.6	40.3	7.6	8,742.4
2020	1.2	5.7	-3.2	-4.6	2.7	70.1	32.2	45.8	8.5	8,714.8

Source: Central Bank of Kenya

Annex 3: Augmented – Dickey Fuller (ADF) Unit Root Tests

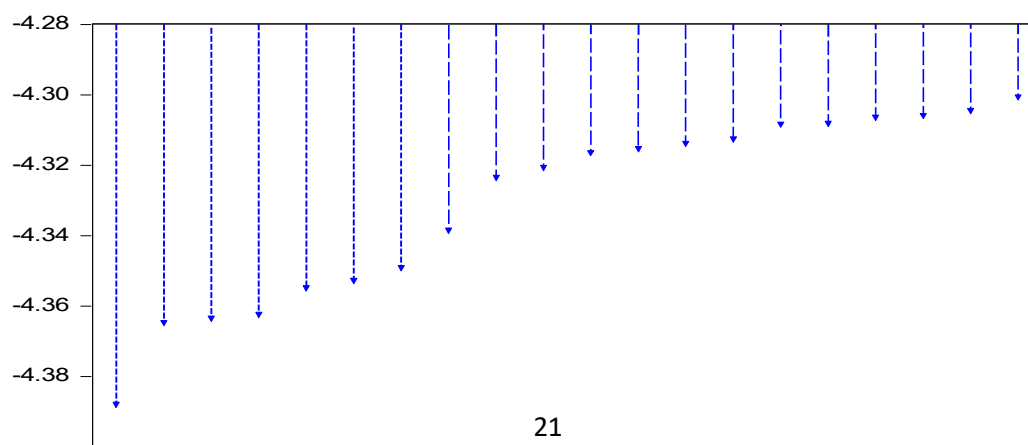
Variable	T-statistic	Probability
MSI	-3.9	0.0038***
MKT_CAP	-2.7	0.0800*
MM	2.2	0.99
PSC/GDP	-1.16	0.69

***Reject the null hypothesis that the variable has a unit root at the 1% significance level

*Reject the null hypothesis that the variable has a unit root at the 10% significance level

Annex 4: Model Selection Summary by Akaike Information Criteria

Akaike Information Criteria (top 20 models)



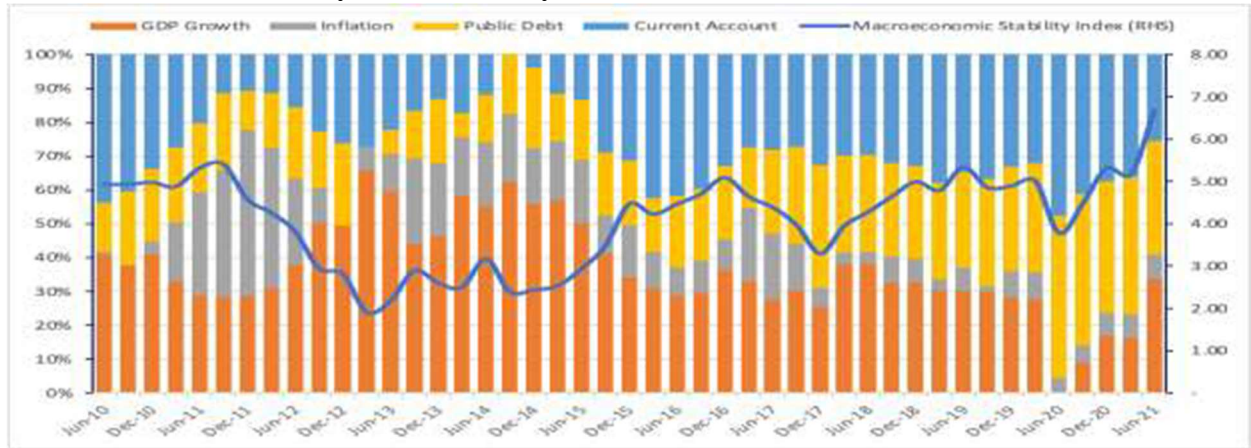
-4.40

ARDL(2, 0, 3, 4)
 ARDL(2, 0, 3, 2)
 ARDL(2, 0, 1, 4)
 ARDL(2, 1, 1, 4)
 ARDL(2, 0, 3, 3)
 ARDL(2, 1, 3, 4)
 ARDL(2, 0, 3, 0)
 ARDL(2, 0, 4, 4)
 ARDL(2, 2, 1, 4)
 ARDL(2, 3, 1, 4)
 ARDL(2, 0, 4, 2)
 ARDL(2, 1, 3, 2)
 ARDL(2, 0, 2, 4)
 ARDL(2, 1, 2, 4)
 ARDL(2, 0, 3, 1)
 ARDL(2, 1, 3, 3)
 ARDL(2, 1, 4, 4)
 ARDL(2, 0, 4, 3)
 ARDL(2, 2, 3, 4)
 ARDL(2, 0, 4, 0)

Annex 5: Macroeconomic Stability Conditions

The MSI index reveals that the macroeconomic environment in Kenya has been stable and stability conditions have been strengthening in the past year as indicated in the chart below. The macroeconomic environment was at its peak stability level between 2010 and early 2011, a period where several financial sector reforms were implemented. The 2010-2011 peak may also be attributed to a rapid narrowing of the current account deficit, high Real GDP growth and moderate debt levels. Since the decline in macroeconomic conditions in March 2020, macroeconomic stability has been strengthening mainly attributed to a recovery in Real GDP growth, a narrowing current account deficit and low and stable inflation (Figure 8). Various events and shocks have affected the macroeconomic environment including, the exchange rate depreciation and high credit growth period in 2011, the interest rate capping introduced in 2016 – 2018, and the Covid-19 pandemic that emerged in Kenya in March 2020. From 2012, Kenya’s economy is characterized by a higher average level of stability and rebounding of macroeconomic stability shortly after each stress period, indicating the dynamism and resilience of Kenya’s economy to external and internal shocks.

Macroeconomic Stability Index and Key Macroeconomic Variables



Source: Authors