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Interest Rate Risk in Kenya: The Banking Sector Stability and Fiscal Risks Nexus

Camilla Talam* & Samuel Kiemo**

Abstract

The study sought to examine the effect interest rate risks on banking sector stability through disentangling the effect of interest rate risk on both fiscal and banking sector stability conditions in Kenya. We applied annual macroeconomic and bank-level data for the period 2001 – 2022 across 37 banks. The study also developed a banking sector stability index to examine evolution of banking sector stability , undertook sensitivity analysis on interest rate sensitive assets k and applied panel fixed effects model to examine the effect of interest rate and fiscal policy risks on banking sector stability . The study found that overall, the banking sector has remained resilient over the study periods, despite experiencing some periods of financial instability. The study also found monetary policy stance has implications on fiscal and banking sector stability whereby contractionary monetary policy raises fiscal and banking sector stability risks when public debt is elevated due to a tight sovereign-bank nexus. Increases in interest rate and credit risks were found to lower banking sector stability while bank capital accumulation strengthened banking sector stability . A high sovereign-bank nexus increases banking sector stability through repricing risks reflected via interest rate and liquidity risks. On other hand banks' portfolio diversification and trading strategies help to mitigate and lower repricing risks from market and interest rate changes. The paper proposes tracking of sovereign-bank nexus overtime to cover multiple business cycles to enhance understanding of sovereign-bank nexus dynamics towards coordinating monetary, fiscal and macroprudential policies.

Key Words: Banking sector stability , Fiscal Risks, Monetary policy.

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1.0 Introduction

Globally, the 2020-2023 steep interest rates hikes, and other tightening liquidity conditions occasioned by policy measures adopted to contain both the adverse effect of covid-19 pandemic and persistent high inflation led to elevated banking sector stability and fiscal risks in both developed and emerging economies. As of June 2022, thirty seven (37) developing economies globally had tightened their monetary policy rates to curb elevated and rising inflation, with 45.6 percent of global economies facing double digit inflation.

Rapidly rising inflation was driven by several factors including geopolitical tensions, increasing energy and food prices, unfavorable weather shocks and persistent supply chain disruptions. Despite the supply-driven nature of inflation, the majority of economies, particularly in developing economies tightened policy rates to lower inflation. More importantly, these economies may have tightened to prevent interest rate differentials that would significantly affect their debt positions (World Bank, 2022).

Bonilla (2011) brought attention to the impact of elevated public debt on the interaction and formulation of both monetary and fiscal policy. The study also provided considerations for varying the relationship between monetary and fiscal policy based on the presence or lack of shocks. Since 2020, global shocks such as tightening/normalizing of monetary policy, limitations on fiscal space and elevated public debt globally and domestically have renewed the focus on Bonilla study discussions and considerations. The International Monetary Fund (IMF) (2023) also highlighted the importance of examining the intersection between monetary policy, sovereign debt and financial stability more closely. Moreover, interest rate hikes in the 2020-2023 period had clear adverse effects on bank stability in Advanced Economies as evidenced by the financial crises of Credit Suisse in Switzerland and, Silicon Valley Bank and several regional banks in the USA in 2023. However, domestically, the profitability, net interest margins, and liquidity conditions have been positive for banks in Kenya during the similar period, as evidenced by 22 percent rise in profitability, with government securities in the bank's asset portfolio rising also by 28.6 percent (Central Bank of Kenya, 2022).

In the past decade, debt in developing economies has risen significantly to fund large infrastructure projects drawing on commercial debt from financial markets. Developing countries have been steadily accumulating debt reaching \$2.5 trillion in debt in 2022 (Bloomberg, 2022). As the United States (US) dollar strengthens, coupled with high interest rates in advanced economies and liquidity tightening leading to increased debt distress, developing economies may have been incentivized to implement inappropriate policies in 2022 to prevent debt defaults and the cost of sovereign defaults in 2023 (IMF, 2023). These inappropriate debt policies include governments shifting to external commercial financing through issuance of Eurobonds. However, external financing has compounded economic challenges making financial markets more interconnected and solidifying macro-financial linkages in the economy (Mark and Amy,2023). As a result, external conditions such as foreign inflation, risk perception, interest differentials and foreign exchange (FX) significantly affect developing countries' debt positions in addition to domestic factors such as domestic growth, and fiscal stance. In 2022, 35 developing economies were at a high risk of debt distress, a spike from 15 countries at the beginning of COVID-19 pandemic. The effect of rising government bond yields of emerging market sovereign bonds amidst rising global interest rates, strengthening dollar and elevated levels of public debt illustrate the impact of monetary policy on international capital markets and the macro-financial linkages between monetary policy, fiscal policy and financial stability (Powell, 2018).

Heightened debt distress and high interest rates due to monetary policy tightening to contain inflationary pressure, has exacerbated banking sector instability concerns. Monetary policy rate hikes globally coincided with rising government bond yields due to perceptions of higher risk in the financial sector (Bruinnermeieir, et.al., 2023). Banking sector stability concerns emerged from banks holding a large proportion of government securities in their asset's portfolio. Government securities are largely prone to interest rate risk through revaluation losses. As interest rate prices increases, assets which are interest-sensitive such as government securities held for trading record losses, hence eroding banks earnings and capital (Dell'Ariccia, et al, 2018). For example, the failure of four United States regional banks (Federal Deposit Insurance Corporation, 2023) and failure of Credit Suisse in Europe in the early 2023 is evidence of banking sector stability vulnerabilities largely attributed to the rising interest rate. In Kenya, the domestic interest rates have also increased in the recent past, which is expected to elevate interest rate, credit and liquidity risks in the banking sector. Therefore, sustained high interest rates amidst heightened debt distress risk, remains a key concern for financial and banking sector stability in emerging and frontier economies like Kenya.

Developing economies faces challenges on balancing economic malaise such as heightened domestic inflation with structural challenges of debt sustainability. Monetary policy and fiscal policy are becoming more interdependent as the monetary policy stance affects debt sustainability and the ability to implement fiscal policy appropriately i.e., countercyclically. Limited fiscal space due to high holding of public debt and limited fiscal consolidation constrained countercyclical fiscal policy in response to the supply-driven shocks in 2022, pushing developing economies to tighten monetary policy to anchor inflationary expectations. Managing inflation is important as it is likely to support medium-term growth and thus promote debt sustainability in the short-term. However, the cost of managing inflation may adversely affect the debt sustainability trajectory of developing economies through increasing interest rates, restraining economic growth and reducing FX reserve buffers leaving developing economies susceptible to external shocks.

Monetary policy implemented to minimize exchange rate volatility limits external debt from rising due to Foreign currency (FX) depreciation. This in turn limits rise in debt service to cover debt increases due to FX depreciation, creating fiscal space for expenditure that would be dedicated to higher debt service to be allocated to development project. In the short-term, this may also be the only policy option for fixed exchange rate regimes to create adequate fiscal space to support medium term economic objectives considering that fiscal policy is likely to be more effective in such regimes and thus more vital to meet the medium-term objectives.

The consequences of tighter monetary policy and limited fiscal policy is likely to sustain the pressure on debt, making developing countries susceptible to debt defaults in the event of marginal shocks. Higher interest rates increase domestic debt service and puts pressure on the fiscal position depending on the debt structure. Nonetheless, revenue remaining the same, higher debt service is likely to raise fiscal deficits and lead to further accumulation of debt. As demand and economic growth is likely to be subdued, marginal changes such as volatile revenue or revenue shortfalls or changes in credit ratings may push developing countries with a high debt distress to debt default, further worsening debt sustainability as this constrains their ability to roll-over debt, reduces the demand for their debt in secondary markets and may have other macro-financial implications such as reinforcing sovereign bank nexus and hindering capital market development that affect domestic financial markets.

Domestically, at first glance, the banking sector stability position in Kenya may be strengthening from increased lending to the government helping to ease liquidity fiscal risks. However, structurally the higher risk-free rates occasioned by a tighter monetary policy stance and increased appetite for domestic borrowing by the government is increasing banking vulnerability by incentivizing the banking sector to increase its holding of the government bonds. This vulnerability may increase the impact of interest rate risks should the government bond market be adversely impacted leading to significant losses from bond repricing should interest rates continue to rise especially on interest-sensitive assets or those marked to the market. Losses due to asset repricing lower profits reducing capital accumulation in the medium to long-term. With the banking sector risks and fiscal risks alleviated by a stronger sovereign-bank nexus, a trigger event that would compromise either the banking sector or the fiscal position will exacerbate banking sector stability and debt sustainability risks.

On the other hand, tighter monetary policy is expected to appreciate the domestic currency thus easing debt sustainability concerns. However interest rate differentials between developing country like Kenya and global markets coupled with higher risk premium due to weaker sovereign credit rating may offset the effect of the currency appreciation and leading to greater risks as interest rates increase domestically.. Thus rising interest rates coupled by volatility in the exchange rate markets continue to shape banking sector risks through banking sector credit and bond repricing channels. Against this background, this paper aims to examine interest rate risk dynamics in the Kenya banking sector through sensitivity analysis and quantitative methods, to determine the magnitude of repricing risks on overall banking and banking sector stability

1.1 Research Objectives

The general objective of this study was therefore to examine the effect interest rate risks on fiscal and banking sector stability risks in Kenya. To achieve this objective, we investigated the following specific objectives.

- First, examine the evolution of banking sector stability conditions in Kenya.
- Secondly, evaluate the impact of interest rate and fiscal risks on banking sector stability in Kenya.

1.2 Significance of the Study

The relevance of current macroeconomic, financial conditions and impact on monetary, fiscal and banking sector stability motivate the study, as interest rate risk has become a concern globally in 2023. The varied interest rate effect on banking sector in Kenya relative to other banking sectors also motivates this study.

This paper contributes to empirical literature by adding to the scarce body of knowledge on the effect of monetary policy on the nexus between and fiscal risks and banking sector stability,. This paper also contribute to empirical literature on measurement of interest rate risks in the banking sector and its link to banking sector stability, through bring new datapoints covering recent study period The rest of the paper is organized as follows: section 2 presents stylized facts on interest rate risks , fiscal risks and banking sector stability development, section 3 presents the literature review, section 4 discusses the data and methodology, section 5 presents the study findings and section 6 present conclusion and policy recommendations.

2.0 Stylized Facts

2.1 Interest Rate Risks Development

Kenya's banking sector vulnerabilities related to interest rate risks are two-fold, a strong sovereign-bank nexus and dynamic policies on banking sector interest rates. The interest risk development exacerbates Kenya's macroeconomic vulnerabilities including fiscal risks due to high debt, high ratio of debt service to revenue and depreciating exchange rate. Continued fiscal risks affects private sector activities through weakened household and corporate demand, leading to rise in unemployment which ultimately reduces household income. Additionally, fiscal risks reduces public sector spending on both recurrent and development budget, leading to increases in NPLs and dampen credit uptake.

Kenya have undertaken various policy interventions in attempts to address interest rate risk including lowering interest rate spreads between lending and deposit rates and improvement of the monetary policy transmission.. These interventions include first, introduction of the Kenya Bankers Reference Rate (KBBR) in 2014, which provided a reference base-rate for banking lending to customers. KBBR which was repealed in 2016. Secondly, the introduction interest rate caps of banking lending in 2016, this was also repealed in 2019 in attempt to maintain market driven interest rates development in Kenya. Third policy intervention included launch of cost of credit website, supported by cost of credit code agreement by banking industry members. The cost of credit website provide a platform for borrowers to compare cost of loans products across various banking sector members. Fourth policy intervention was the introduction of risk-based pricing models for banks in 2022. Risk-based pricing methodologies allows banks to provide credit at interest rates based on the customer risks profiles. These policy interventions such as KBRR and interest cap moderated a rise in lending rates even during period of increases in the CBR policy rate. While the stable lending rates minimized interest rates risks within the banking sector, they contributed to slow down in credit provision by the banking sector to the private sector. The repeal of the interest rate cap in 2019 contributed to rebound in credit growth to double digit levels though the rise was adversely impacted by monetary and financial policies to mitigate the effects of the COVID-19 pandemic in 2020. Monetary and financial policies measures adopted to mitigate adverse economic effect of COVID-19 pandemic such as such as lowered key policy rates to increase liquidity provision for banks to support lending. These polices contributed to low and stable interest rates in the banking sector during the pandemic period (Ramos & Gallagher, 2022).

Globally, policy makers begun to unwind the COVID-19 pandemic mitigation policy measures as infections moderated in 2022. Additionally, increased global inflationary pressure due to the geopolitical conflicts such as Russia-Ukraine war and anticipated adverse second round effects of these macro shocks led to further monetary policy tightening. The tightening led to rising key interest rates globally and domestically. Against this background, banking sector and other lenders adopted and implemented risk-based pricing of credit enabling banks to introduce higher lending risks to consumers with higher perceived credit risk. This policy shift coupled with higher policy rates and higher government securities rates on account of fiscal pressures tightened liquidity and interest rates domestically contributing to elevated banking sector stability risks. Rising interest rates not only caused significant losses to banks that are highly exposed to interest rate-sensitive assets like government bonds, but it also made it difficult for banks to raise funds in the market to meet maturing obligations (Jha, 2023).

In Kenya, domestic interest rates also increased significantly since the second half of 2022. The average interest rate on the 3-month treasury bill yield increased from 7.8 percent in 2018 to 10.1 percent as at June 2023, while 10-year treasury bond yield increased from 12.7 percent to 14.24 percent during the same period. During the two periods, international yields for advanced economies UK, USA and Euro area were also on rise with the average US 3-months treasury bill rate and the 10-year treasury bond yields rising by 277 and 76 basis points, respectively. Treasury bills rates recorded the fastest increase domestically and in the advanced economies characterized by higher volatility compared to 10-year treasury bond yield. Between 2020 and June 2023, short term interest rates in the advanced economies such as United Kingdom also increased by over 375 basis points, while long term interest rates increased by 316 basis points, compared with 5.6 and 88 basis points decline previously recorded between 2017 and 2020. This indicates increased volatility in the interest rates that is likely to lead to rising banking sector stability concerns. Therefore, rise on interest rate risks globally elevate Kenya's banking sector fragility. This is evidenced by 320 basis points hike in short-term interest rate (3-month treasury bill rate) and over 200 basis points hike in long term interest rates (10-year bond) from 2020 to June 2023. This interest rate volatility is higher compared to 152 basis points decline in short term interest rates and 123 basis point decline in long-term interest rates of similar tenor recorded between 2017-2020 (**Table 1a & b**). In three and a half years from 2020, short term interest rates domestically have increased by 200 basis points, while long term interest rates have increased by 150 basis points, compared with less than 100 basis points movements previously, indicating increased volatility in interest rates that is likely to increase banking sector stability concerns on interest rate risks in Kenya's banking sector.

Table 1(a): Trends in Kenya's Key Interest Rates (Annual Average Yields/Rates)

Treasury Bills (%)				Treasury Bonds (%)				Others (%)	
Year	91-days	182-days	364-days	5-year	10-year	15-year	20-year	CBR*	LR**
2015	10.87	12.17	12.93	13.08	13.32	13.51	13.67	10.13	16.16
2016	8.63	10.91	11.69	13.66	14.08	14.25	14.32	10.67	16.57
2017	8.37	10.43	10.95	12.75	13.22	13.46	13.68	10.00	13.67
2018	7.77	9.54	10.45	12.02	12.71	12.92	13.08	9.33	13.06
2019	6.84	7.82	9.48	10.77	11.95	12.48	12.80	8.92	12.44
2020	6.85	7.50	8.55	10.90	11.99	12.59	13.02	7.23	12.00
2021	6.96	7.58	8.54	10.97	12.28	12.88	13.28	7.00	12.08
2022	8.21	9.01	9.89	12.54	13.37	13.75	13.91	7.63	12.34
2023*	10.09	10.46	10.93	13.68	14.24	14.24	14.26	9.42	13.01

Source: Central Bank of Kenya. **Central Bank Rate; ** Bank Lending Rate, 2023 numbers were as at June 2023*

Table 1(b): Annual Average Interest Rates/Yields on Treasury Securities (percent)

	3-Months Ave. T-Bill Rate			10 Year T-bond Ave Yield		
Year	US	UK	ECB	US	UK	ECB
2015	0.052	0.460	-0.316	2.132	1.825	0.509
2016	0.320	0.354	-0.670	1.833	1.222	0.104
2017	0.950	0.235	-0.824	2.327	1.204	0.382
2018	1.974	0.574	-0.688	2.911	1.409	0.438
2019	2.106	0.734	-0.586	2.138	0.882	-0.242
2020	0.360	0.179	-0.619	0.884	0.317	-0.519
2021	0.045	0.063	-0.696	1.440	0.739	-0.275
2022	2.068	1.652	0.142	2.950	2.387	1.274
2023*	4.750	3.935	2.476	3.670	3.479	2.400

Source: US Department of the Treasury & Reuters. * June 2023

On the other hand, banks in Kenya remained resilient, characterized by adequate capital. However, bank resilience could be impaired by the evolving global and domestic developments that could impact banks' assets quality and in turn, capital erosion. The rising interest rates domestically and globally in view of monetary policy tightening, amidst limited fiscal scope poses banking sector stability to banks in two aspects. First is through tightening of lending standards as banks fully implement risks-based pricing leading to dampening credit growth and reduced profitability due to reduced earnings from credit advances. Secondly as interest rises, banks holding significant proportions of government bonds are likely to experience losses through bond repricing. Banks holding of long-term government securities has remained relatively high over the last decade averaging at 24 percent. Continued monetary policy tightening to stem inflationary pressures pushes interest rates upwards leading to banks experiencing losses due to bonds repricing (**Table 2**).

Table 2: Exposures of Banks to Sovereign Debt

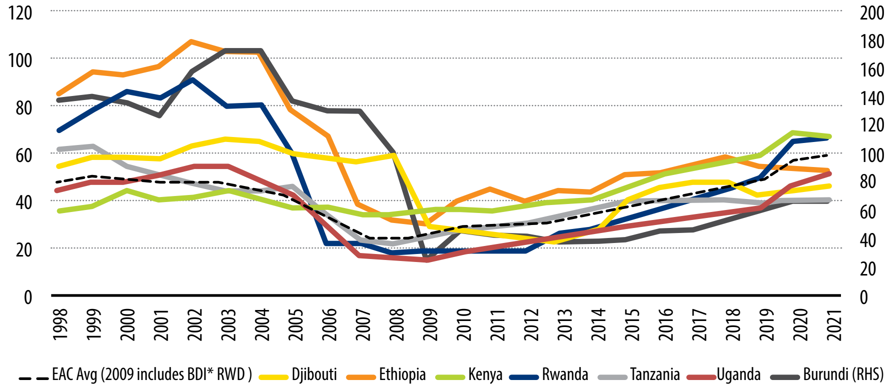
As a % of Total Assets	Dec '10	Dec '13	Dec '16	Dec '19	Dec '20	Dec '21	Dec '22
Gross Loans	52%	57%	59%	53%	50%	51%	51%
Government Securities	26%	21%	23%	27%	52%	27%	26%
Other Assets	22%	22%	18%	20%	20%	22%	23%

Source: Central Bank of Kenya.

2.2 Fiscal Risks Development

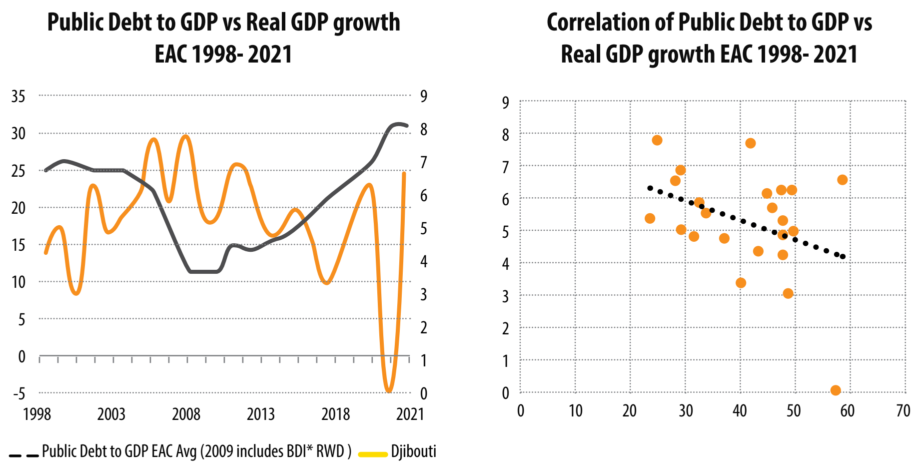
Kenya public debt as a proportion of GDP has been rising in the past ten years with the fastest growth recorded between 2013 to 2019. The rising trend mirrors the growth in public debt recorded over the past decade in many developing economies. While Real GDP growth in the EAC region has been heterogenous and volatile, over the past two decades, there is an inverse relationship between public debt and Real GDP growth (**Figures 1 & 2**). This inverse relationship suggests a reduction in debt-carrying capacity as the growth of public debt outpaces Real GDP growth in EAC. Domestically, Kenya economic growth has been resilient averaging at 5 percent over the past 5 years. Growth rebounded quickly to 7.5 percent in 2021 from a contraction of 0.3 percent in 2020 and is projected to grow at 5.8 percent for 2023 (CBK, 2023). Notwithstanding, public debt has doubled from 39 percent of GDP in 2013 to 67 percent of GDP in 2022

Figure 1: Public Debt to GDP; EAC 1998 – 2021 (%)



Source: Author's calculations; Public Finances in Modern History, IMF

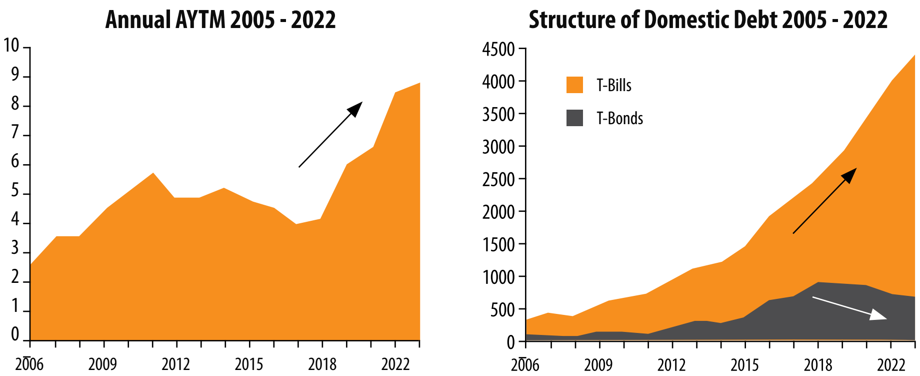
Figure 2: Public Debt to GDP and Real GDP growth; EAC 1998- 2021



Source: Author's calculations; Public Finances in Modern History, IMF

Domestic debt has remained skewed to bonds in the past two decades. Since 2015 the proportion of government bonds has increased significantly by 10 percentage points in 7 years, relative to an average increase of 1 percent in the past decade. The extension of tenure of government debt reduces roll over and liquidity risks. Yield to maturity has increased sharply in the last 3 years which may indicate rising cost of debt (**Figure 3**).

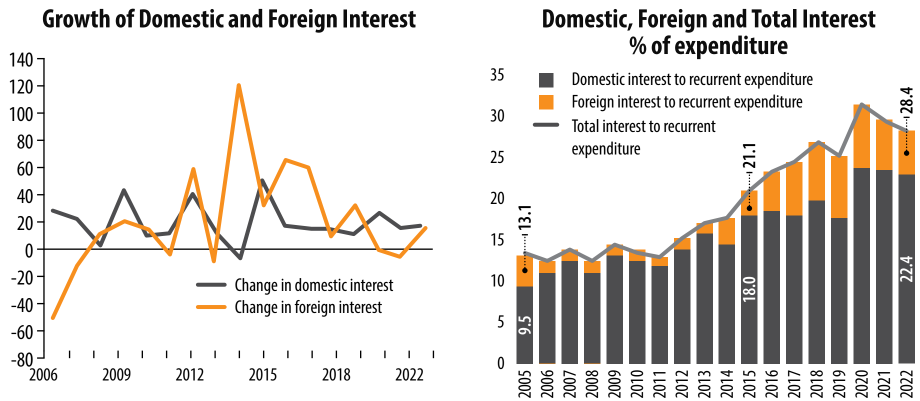
Figure 3: Tenure and Structure of Domestic Debt



Source: Author's calculations; CBK

Although interest rates have been declining since 2015, the total expenditure on interest rate portion of debt as a share of total debt expenditure has been rising over the similar period largely driven by domestic interest, indicates rising cost of domestic debt (**Figure 4**). The implications from both the trends in longer tenure debt and rising interest cost appear to indicate that liquidity risks e.g. roll over risks have likely been declining while solvency risks remain elevated as cost of debt is rising faster than debt carrying capacity. Debt service has increased to 9 percent of GDP as of 2022, while over 50 percent of revenue is allocated towards debt service of which 27 percent comprises interest payments.

Figure 4: Growth and Distribution of Interest



Source: Author's calculations; CBK

2.3 Banking Sector Stability Risks

Despite Kenya's conservative debt structure, the strengthening dollar since 2022 contributed to a rise in external debt stock as well as rise in debt service. Lower forex reserves on account of lower Foreign currency (FX) earnings due to declining exports revenues, limited growth of tax revenue and a 175-basis point rise in the policy rate, led to higher short term risk-free rates domestically. This increased the cost of debt and fiscal risks. . As liquidity risks in public debt have been elevating, banking sector liquidity risks have been declining and interest margins rising due to higher interest rates on government securities and higher appetite for short-term government securities due to higher risk-free rates. The rising banking sector liquidity is largely driven by accumulation of government securities which are considered to be liquid assets.

The data shows, Kenya banking sector has been resilient despite periods of instability experienced over the last two decades. This is evidenced by strong capital buffers with total Capital Adequacy ratio (CAR) remaining above minimum requirement of 14.5 percent. Additionally, the bank liquidity conditions have also remained high, with liquidity ratio remaining above the minimum requirement of 20 percent. However, elements of instability have been building up as evidenced by the high level of non-performing loans to reach double digits since 2017 and stagnation of profitability measured by return of asset (ROA) at 3 percent since 2014 (**Table 3**). There are expectations of further deterioration in bank assets quality and deceleration in credit growth as banks tighten their lending standards to minimize further credit risks currently.

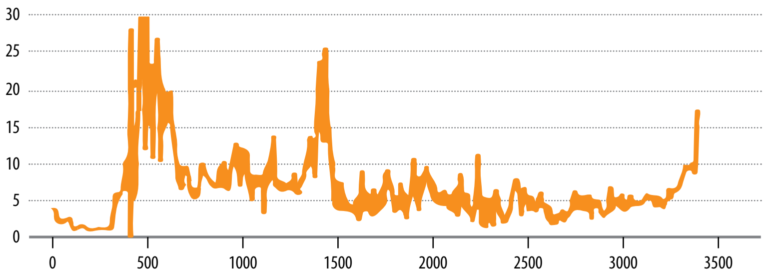
Table 3: Selected Banking Stability Indicators

Figures in Percent	2010	2008	2010	2012	2013	2014	2016	2017	2018	2019	2020	2021
CAR (Total Capital)	17	18	21	22	X	X	X	18	19	19	19	20
CAR (Tier 1)	16	16	19	19	19	16	16	16	17	17	17	17
Gross NPLs to Gross Loss	21	8	6	5	5	5	9	11	12	12	15	14
Return on Assets (ROA)	3	3	4	4	4	3	3	3	3	3	2	3
Return on Equity (ROE)	29	29	31	34	29	27	25	21	23	21	14	22
Liquidity Ratio	45	37	45	42	39	38	41	44	49	50	55	56
Private sector Growth	12	29	20	11	20	22	5	3	2	7	8	9
Credit to Government Growth	53	3	13	64	(21)	15	30	8	(2)	9.7	43	28
Total Bank Credit as a % to GDP	N/A	N/A	29	32	34	36	36	32	30	31	28	30

Source: Central Bank of Kenya.

The interest rate hike since 2020 has led to liquidity tightening in the interbank bank market in Kenya as evidenced by sharp rising in the interbank market rate since 2016. (**Figure 5**). The tightened interbank market may elevate the segmentation within the interbank forcing banks perceived to be risky facing liquidity risks, heightening banking sector stability concerns. Continued elevation of domestic interest poses liquidity crisis in Kenya sector witnessed in 2011 and 2015 occasioned by FX crisis and failure of three banks around the two period respectively.

Figure 5: Tightening Liquidity conditions – Interbank Rate (%)



3.0 Literature Review

Review of both theoretical and empirical literature shows globally, the government and banking sectors are interconnected through four main channels. First, banks hold sovereign bonds as collateral to the funding supplied by banks to the government. Secondly, sovereign bonds are part of banks assets contributing to the net worth of banks in balance sheets. Thirdly, government securities are risk-free instruments that set the benchmark for pricing of financial instruments in the financial sector and fourthly, in countries with deep and well-developed financial markets, sovereign bonds credit ratings more closely affect the equity value of banks holding sovereign bonds in the respective countries thus affecting the banking sectors credit ratings (Davies and Ng, 2011). These linkages between the government and the banking sector expose both entities to various risks that could have implications either way.

However, the linkage between the government and the banking sector in some developing countries is limited, due to shallower financial sector development. The less strong linkages between the government and bank sector may contribute to a lower probability of sovereign risks affecting the banking sector but this may not necessarily mean the magnitude of impact of sovereign risks to the banking sector is lower.

El-Erian (2012) study examining western countries sovereign risk during the 2007-2008 Global Financial Crisis found that, developing economies averted solvency sovereign risks but were impacted by market risks due to lower contagion and interconnectedness of the financial sector to the sovereign. Less developed secondary markets in developing economies limit contagion and adverse effects on asset prices of banking sector and bond yields, which may contribute to lower correlation of risks that typically contribute to systemic and financial stability risks. Other studies (Caruna and Avdjiev, 2012; Feyen and Zuccardi, 2019) found countries with high public debt tend to have banking sectors where the ratio of government securities to total bank capital is high, a sign of significant exposure to sovereign risks. Similarly, countries with high sovereign debt are more likely to face a stronger sovereign bank nexus.

Literature (Gopinath and Gourinchas, 2021; Deghi et al, 2022) also reveals that, the two main factors attributed to the high risk of debt distress and concerns for banking sector stability. These factors , are, policies response to contain both rising interest rate and adverse effect of COVID-19 pandemic on the economy. First, the rising interest rates driven by tighter monetary policy in Advanced Economies (AEs) lead to increased debt service and debt distress in the developing economies. Specifically, higher fiscal deficits, off-track fiscal consolidation paths and adverse credit risk rating increased risk perceptions leading to higher yields in the developing economies debts instruments.

A shift towards higher interest rates in AEs and lower risk perceptions moved capital flows mainly debt away from developing economies. All these trends worsen the debt dynamics of developing economies making it costly to roll over debt, harder to obtain financing and increased the probability of debt default on the accumulated debt in the near-term. Due to a rising sovereign-bank nexus, increasing debt vulnerabilities are increasing banking sector stability risks through its adverse effects on banking sector funding and distorting credit supply. Banking sector stability , rollover risks for debt instruments and lower access to international debt/capital markets means a tighter sovereign-bank nexus as the sovereign relies on domestic public debt typically mobilized from the banking sector.

Rogoff (2023) study also revealed that, Covid-19 pandemic related expenditures by developing economies amidst high debt levels and elevated global inflation, heightened debt sustainability concerns. The pandemic significantly reduced developing economies' fiscal space thus limiting the use of countercyclical policy and narrowing policy options to respond to economic shocks in favour of monetary policy.

This significantly increased the debt stock of developing economies and lowered international reserves of those that attempted to mitigate depreciation pressure on exchange rates. As a result, external positions of developing countries weakened as FX depreciated significantly, current accounts widened, and international reserves narrowed. Other literature such as (World Economic Outlook, July 2023; Gopinath and Gourinchas, 2021) reveals external financial conditions have worsened debt sustainability concerns that were present due to underlying structural debt vulnerabilities.

Structural debt vulnerabilities in developing economies include a substitution for external debt relative to domestic debt to prevent crowding out of private investment, rapid accumulation of external debt at high interest rates, and lower returns or delayed returns from long-term infrastructure projects thus limited revenue growth. In addition, volatile risk perceptions due to other economic vulnerabilities in these economies including undiversified growth, delayed progress on fiscal consolidation, and high twin deficits have limited the ability of developing economies to manage their external debt.

Concerns of the tight financial conditions leading to financial instability as was witnessed during the Global Financial Crisis, coupled with accommodative monetary policy that may have increased risk taking in banks as alluded in literature. The issue of the policy responses during the period of elevated public debt risks that pose banking sector stability risks. Based on literature there are various policy prescriptions for the role of monetary policy in safeguarding financial stability in an environment of elevated debt. Athukorala (2013) propose that monetary policy should "lean against the wind" such that by the monetary authority undertaking its core mandate of price stabilizing, a positive consequence will be financial stability particularly in periods of contractionary monetary policy. In determining the role of monetary policy in taking into account banking sector stability considerations as part of the core mandate of price stabilization. Smets (2018) suggests that monetary policy formulation and implementation should account for financial stability when systemic risks are likely to lead to output loss or adverse effects on real economic activity.

Michail (2012) finds a limited link between interest rate policy and financial stability and thus they advocate for monetary policy to only be used for financial stability through price stabilization if there is no risk-taking motive. In the presence of an active risk-taking channel of monetary policy then monetary and banking sector stability goals should be coordinated by monetary policy instruments. Stein (2012) finds that accommodative monetary policy encourages bank's risk taking, while Dell'Aricia et al (2010) findings refute this and find that accommodative monetary policy leads to lower bank risk-taking through changes to short term rates. It is notable that these studies are undertaken in well-developed financial markets with strong price effects/channels of monetary policy transmission. Thus these findings may not reflect the policy prescriptions or trade-offs faced by developing economies with less developed financial markets and asymmetric monetary policy transmission and at times elements of fiscal dominance. This study's findings aim to fill this gap to determine the link between monetary policy actions and banking sector responses in light of public debt dynamics that impact both monetary policy and the banking sector to inform appropriate policy responses.

Additionally, empirical evidence shows, the twin global shocks namely, first elevated global inflation and delayed response of central banks to curb inflation led to faster than anticipated rise in interest rates affecting interest rate differentials in developing economies reflected in global financial markets. As a result of higher interest rates in AEs and elevated inflation in developing economies led to currency devaluations as the US Dollar strengthened significantly across major currencies. The second set of shocks comprises of the raising banking sector stability concerns and tightening financial conditions both in advanced and developing economies due to post 2007- 2009 Global Financial Crisis (GFC) global banking system development and tightening financial conditions during the unwinding of unconventional monetary policy and COVID-19 mitigation policies. The rising banking sector stability concern in all these cases, has been placed on faster pace of rising interest rates attributed to tightening monetary policies in advanced economies. The rising interest rates have led to banks experiencing either losses from investment in bonds (on rising yields) and/or difficulties in funding from the markets. Some banks which had issued bonds opted to pay back to minimize interest cost, thus sending wrong signals that saw a spike in the spreads for the Credit Defaults Swaps. Other banks sold off their bond portfolios, to cut further mark-to-market losses, but also get the much-needed liquidity. The tension between attempts to stabilize the financial system, which calls for support from central banks and reining in inflationary pressures, which calls for tight policy is extreme. This shock in the global banking system lingers on to the first half of 2023, driving banks to hold more capital and liquidity, thus reducing lending credit to the private sector (IMF, 2023).

4.0 Data and Research Methodology

4.1 Data

The study applies both annual bank-level and macro-level data. The bank-level data used was for 37 banks out of a population of 43 banks covering the period 2001 to 2022. The choice of study period is largely based on availability of bank level data sets and period adequately captures different policy regime changes. Secondary data was extracted from the published financial statements of banks. Six banks were dropped from the population due to limited data series as result of consolidation, entrants and exit of commercial banks in the industry. The macro-level data used includes indicators collected from Central Bank of Kenya publications. The definition and measurement of the study variables is summarized in **Table 4**

Table 4: Definition and Measurement of Study Variables

Notation	Definition	Measurement
FS	Financial soundness Index	An index constructed to measure the evolutions of bank conditions in regard to its proper performing banking functions in the economy.
GSreprice	Repricing effects from changes in CBR	Repricing is applied on portfolio of government securities based on assumptions of bonds sensitive to market risks
NIIreprice	Net repricing effects of assets and liabilities from changes in CBR	Repricing is applied on a set of interest sensitive assets by category and interest sensitive liabilities based on assumptions of asset and liabilities sensitive to market risks
BC	Bank Capital	Excess or (deficit) CAR above or below the minimum Basel III CAR requirement of 8 percent (BC-car); and natural log of bank total capital levels (logBC_tc)
Creditrisk	Credit Risk	Ratio non-performing loans to gross loans (creditrisk_nplr); and natural log of volume of non-performing loans (logCreditrisk_nplv).

Notation	Definition	Measurement
ROE	Return on Equity	Ratio of earnings to shareholders funds
Liqr	Liquidity	Ratio of liquid assets to current liabilities
CAR	Capital Adequacy	Ratio of total capital to risk weighted assets
NPLr	Non-performing Loan	Ratio of non-performing loan to total gross loan
Intrisk,	Interest rate risk	Ratio of interest expenses to interest income
bank_Nex	Sovereign Bank Nexus	Ratio of bank holding of government securities to total bank assets
CI	Cost to income ratio	Ratio of bank's overhead costs to income
Macro variables		
GDP	GDP Growth rate	Real GDP growth rate
Inf	Inflation Rate	Annualize month on month changes in consumer price index
STbr	Short term interest rate	91-day treasury bill rate
Debt	Public Debt	Ratio of public debt to GDP
Intebank	Interbank Rate	Average interbank rate
LTbr	Long Term interest rate	10-Year treasury bond rate
Control variables		
RGC	Economic growth rate	Annual percentage growth rate of real Gross Domestic Product
LogTA	Bank size	Natural log of bank total assets

4.2 Econometric Model

4.2.1 Banking Sector Stability Index

To achieve the first study objective, we constructed a Banking sector stability Index (BSI) to monitor the evolution of banking sector stability conditions in Kenya. Empirical literature proposes two main approaches for assessing banking sector stability namely: market-based approach and accounting-based approach. Market-based approach utilizes market value data for firms. However, the market-based values are usually prone to estimation errors since they are not observable (Ohlson,1980; Platt & Platt, 2002; Kiemo & Mugo, 2021; Kiemo & Kamau, 2021; Kiemo, et.al., 2022). On other hand, accounting-based approaches usually utilizes historical values making them the most popular approach 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. This study used accounting-based approach.

Since Kenya's financial system is largely dominated by the banking system and all other financial sub-sector players are interdependent on the banking system, any systemic risk emanating from the banking system poses significant financial stability concerns. Therefore, we constructed BSI with indicators largely drawn from banking sector using (Kiemo, Talam & Rugiri, 2022; Agung et al., 2019; Shijaku, 2017) two steps estimation approach. The first step involved normalization of the multi-attribute variables used in the index, by transforming all data variables needed to the same scale. Using the Statistical Normalization (SN) due to its simplicity, we transformed all indicators into the same scale using the mean of zero and standard deviation of one, implying that standard deviation is a scaling factor. This was achieved by obtaining normalized values indicators (Z), by having the mean value subtracted from each indicator and the result sub-divided by its standard deviation as shown **equation 1**:

$$Z_{it} = ((X_{it} - \mu))/\sigma \quad \text{............} \ [1]$$

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.

The second step involved applying the normalized variables to compute the BSI using equal-weighted approach as follows in **equation 2**;

$$BSI_{it} = \alpha_t + l_{it-1} + \sum_{i=1}^{n} \beta_i x_{it} + \gamma_i \ control \ variables_{it} + \epsilon_{it} \quad \text{............................} [2]$$

Where, BSI – is the measure of Banking sector stability, is the coefficient of the lagged dependent variable, β – is the coefficient matrix of explanatory variables, X – vector of explanatory variables that influence financial soundness such as asset quality, profitability, capital adequacy, liquidity, interest rate risk, foreign exchange risk, ε- error term, Subscript i - denote the cross-sections and, Subscript t -denote the time-series dimension.

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

4.2.2 Sensitivity Analysis and Econometric Estimation Panel model

To achieve the second study objective, we adopted two approaches. First, we undertook sensitivity analysis on interest sensitive government securities, loans and total deposits between 2001 and 2022 held by banks to assess the impact of interest rate changes on bank portfolios. The paper used banks published annual financial statements and relies on assumptions on proportion of government securities, loans and deposits that are susceptible to interest rate changes. Based on each banks' individual holdings of interest sensitive assets and liabilities, the analysis assumes an industry wide average. The analysis made three industry wide specific assumptions as summarized below based on industry averages:

- 30 percent of government securities are interest sensitive
- 70 percent of loans are interest sensitive
- 20 percent of deposits are interest sensitive

The results of sensitivity analysis were analyzed based on overall net gain/losses due to interest rate changes.

The second approach involved estimating a panel model to examine the impact interest rate and fiscal risks on banking sector stability. The paper applies the following panel model to examine the effect of interest rate risks, fiscal risk on bank stability as shown in **equation (3)**.

$$BSI_{i,t}=u_{it}+BSI_{i,t-1}+y_1\ controls_{it}+y_2\ bankvariable_{it}+FsRisk+\varepsilon_{it} \quad .... [3]$$

Where BSI refers to the stability of a bank, bankvariables refers to the bank-specific interest rate risks variables. $FsRisk$ is a measure of fiscal risks, Controls represents bank specific as well as macroeconomic variables that are known to drive bank stability ε_{it} represents white noise disturbance term.

The independent variables comprise bank level indicators including; non-performing loan ratio to capture credit risks; ratio other interest sensitive assets (excluding government securities) to total assets to capture sensitivity of other assets to interest rate risk; ratio of government securities to total assets to capture sovereign-banks nexus; interest income to capture profitability; ratio of total deposits to total funds to capture the bank exposure to market funding; gross loans growth rate to capture credit expansion; growth in loan-loss provision to capture build-up of credit risks. The fiscal risk variables included 91 days treasury bill rate to capture government borrowing conditions, ratio of bank holding of government securities to total asset to capture bank-sovereign nexus and public debt as ratio of GDP to capture debt distress levels, while macroeconomic variables that influence banks stability include interbank rates to capture costs of funds; economic growth rate to capture economic cycles.

The lagged dependent variable in **model (3)** captures the impact of past stability on current stability. Lee et al. (2021) argues that bank stability tends to be persistent, so that if banks were stable, they are likely to be stable in the current period, while fragile banks may be weak in the current period. Thus, an empirical model should take dynamic stability into account. However, the lagged dependent variable acting as an explanatory variable causes endogeneity problems.

First, we estimated three panel models, a pooled panel, fixed effects and random effects model to determine the appropriate model based on bank level annual data. Due to bank specific factors, there is the expectation that some effects specific to banks' that are time invariant are likely to exist, thus *apriori* assumptions point to fixed effects. Due to the various shocks in the external macroeconomic environment both domestically and externally may raise factors that are random and time variant and due to each banks' unique response to these factors, some random effects may exist across the various banks. The *apriori* expectation is that either fixed or random effects are likely to persist across banks. Secondly we estimated Hausman correlated random effects model to determine the most appropriate model.. Based on the Hausman test results, we reject the null hypothesis that the random effects model is appropriate and conclude that the appropriate model is the fixed effects model(**Annex 1**).

5.0 Empirical Findings

5.1 Descriptive Statistics

We also estimated other diagnostic tests including the normality test, cross-sectional independence test, and LM test for serial autocorrelation to determine if errors are normally distributed, and thus the assumption of independent and identically distributed errors. The diagnostic tests confirm that the fixed effect model errors are normally distributed, and the coefficients are valid and reliable.

We also computed the study descriptive statistics to analyze the basic characteristics of the variables. Descriptive statistics show the overall majority of the study variables were fit for statistical analysis, after some adjustment for the variables to meet Ordinary Least Square (OLS) assumptions. The low standard deviation across each of all the variables indicates less variations across each individual indicator data set. The mean BSI was -0.1 indicating the average banking sector stability condition was just below zero, indicating in the instability region (**Table 5**).

Table 5: Descriptive Statistics of Study Variables

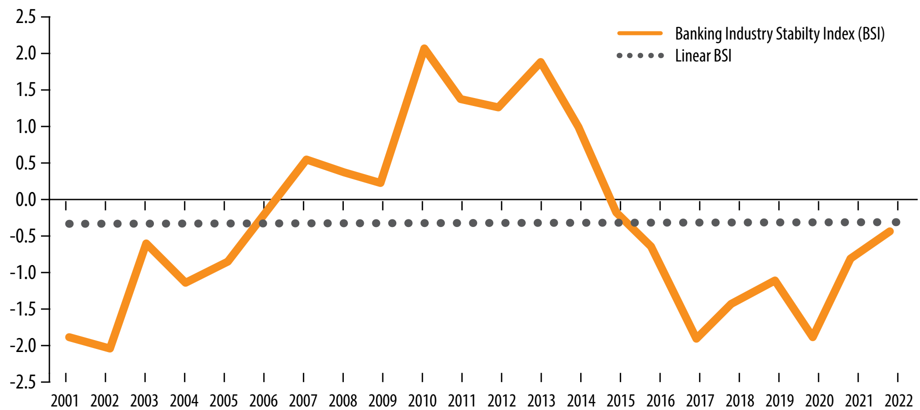
	BSI	CAR	ROE	NPLR	LIQR	INTRISK	CI	GDPR
Mean	-0.1	0.2	0.1	0.2	0.4	0.4	0.2	4.7
Median	-0.1	0.2	0.2	0.1	0.4	0.4	0.2	5.4
Maximum	4.9	0.9	1.0	1.0	1.2	1.3	1.5	8.4
Minimum	4.9	-0.5	-1.5	-1.5	-0.7	0.0	0.0	-1.2
Std. Deviation	2.2	0.1	0.2	0.2	0.2	0.2	0.1	2.2
Skewness	0.0	1.3	-2.5	-2.5	-0.1	0.2	3.0	-0.9
Kurtosis	2.5	8.3	16.1	6.1	5.8	3.3	30.9	3.5
Observations	**715**	**715**	**715**	**715**	**715**	**715**	**715**	**715**

Source: Author's calculations; CBK

5.2 Evolution of Banking Sector Stability Index

To assess the evolution of banking sector stability conditions we constructed the BSI using equation (2). The long-term trend of BSI indicated by its linear BSI equation, is upward sloping and above the zero (**Figure 6**). This show on overall banking sector stability conditions for Kenya financial sector is strong amidst the fluctuations over and below the zero experience in different time periods.

Figure 6: Evolution of Banking sector stability Condition -Banking sector stability Index



Zone discrimination: FSI>0, indicate stability region; FSI<0, indicate instability region

5.3 Sensitivity Analysis - Govt Bond repricing effect on Banking Sector Stability

The sensitive analysis tracks the responses of banking sector assets and liabilities to changes in the policy rate. We adopted Central Bank Rate (CBR) as the policy rate as the main benchmark interest rate that reflects the monetary policy signal. Sensitivity analysis revealed three key findings. First, over the past 13 years , repricing effects were driven by various factors among them, price and quantity factors, driven by policies, bank specific strategies and macroeconomic conditions. Second, the largest repricing effects in 2022 was driven by interest sensitive loans and deposits . Although government securities increased sevenfold between 2007 to 2020, government securities risk remained marginal with government securities repricing effects comprising a small proportion of total repricing effects in the banking sector. Conservative holding of government securities to maturity rather than for trading limited interest rate risks through repricing. The third findings reveals, interest rate policies repricing effects was more muted most notably in 2014 and 2016 – 2019 during the period Kenya implemented Kenya Banker's Reference Rate as based rate for pricing loans and period of interest rate capping, respectively (**Figure 7**).

Figure 7a: Banking Sector Net Pricing Gains/Losses, 2007 - 2022

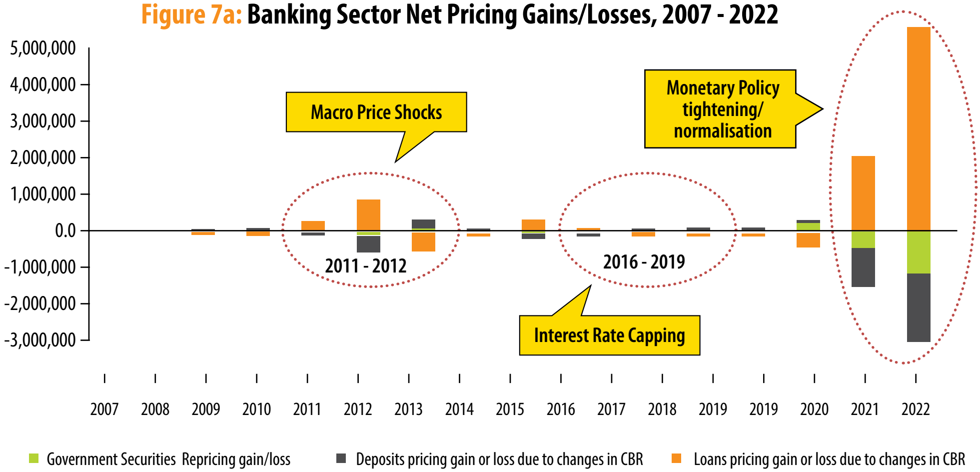
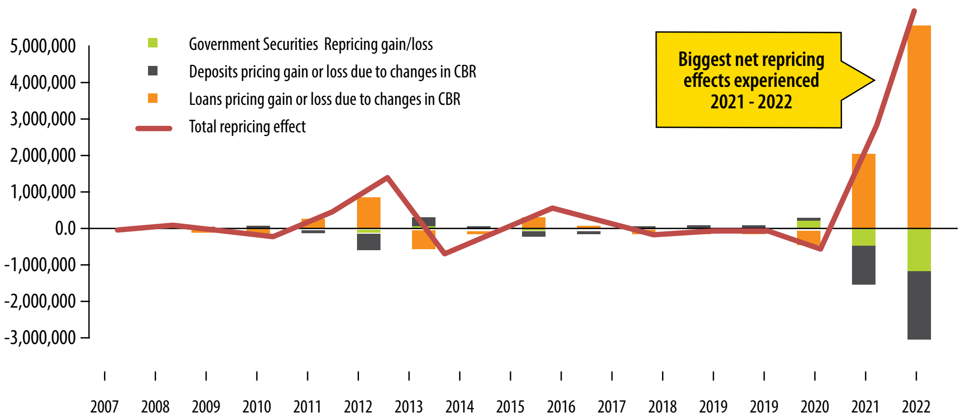
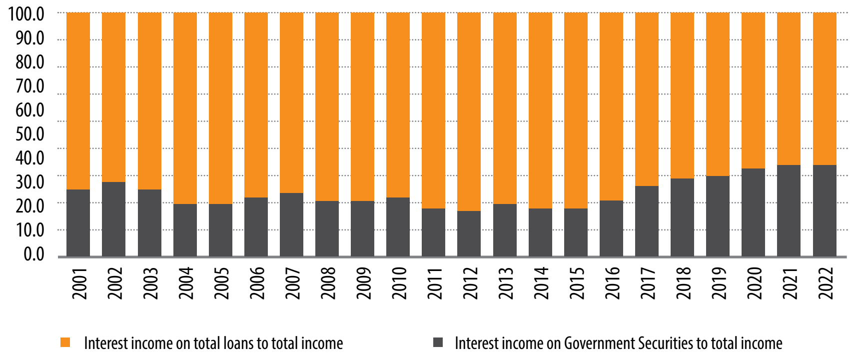


Figure 7b: Banking Sector Net Pricing Effect (Baseline interest changes)



We also undertook sensitivity analysis aimed to mirror the twin shocks experienced globally. In the first shock, the analysis examines the effect of the COVID-19 policies in easing monetary conditions and specifically reducing the monetary policy CBR by 125 basis points in one year. As a result, this partial sensitivity analysis assumes the same 125 basis point change in the CBR between 2007 and 2020, to isolate the changes in quantity holdings of interest sensitive assets and liabilities, mainly government securities, loans and deposits (**Figure 8**).

Figure 8: Share of Interest Income by Asset, 2007 - 2022



Based on the baseline scenario, varied monetary policy stances and interest rate policies between 2007 and 2022, the sensitivity analysis found that the banking sector registers net repricing gains during contractionary monetary policy periods and net repricing losses during periods of accommodative monetary policy mainly driven in part by COVID-19 mitigation policies. Repricing effects are significant in assets while repricing effects on deposits are lower. A marginal rise in total deposits from the reduction in interest expenses partially offset the repricing losses from interest sensitive assets. The interest rate capping period between 2016 and 2019 led to the least repricing effects indicative of the market distortion on pricing and potential implications for other channels of monetary policy to impact banks, possibly through credit supply as credit growth was also at its lowest during this period.

Quantifying the effect of government securities as a share of total income illustrates that interest rate on government securities constitutes a greater share of total income particularly between 2016 and 2022 (**Figure 9a**). Monetary policy easing in 2020 contributed positively to government securities repricing due to the inverse relationship between government bond values and interest rates. Net pricing gains driven by asset repricing gains from government securities holding and asset repricing losses from gross loans asset net repricing losses during periods of accommodative monetary policy stance (**Figure 9b**). As monetary policy normalizes through cessation of COVID-19 mitigation policies and contractionary monetary policies in response to rising and elevated inflation between 2021 and 2022, the banking sector faces net repricing gains driven by interest income from gross loans that are marginally offset by declining repricing gains. Considering, government securities that are available for sale/ trading are determined by each bank's respective risk appetite and trading strategy, which illustrates that holding all exogenous factors constant, bank specific factors and strategies can hedge the extent to which monetary policy stance affects their balance sheet through determining assets and deposits subject to changes in interest rates or general market rates. Nonetheless, repricing effects observed in 2021 and 2022 have been the largest since 2007 which may reflect either period of bigger increases in the CBR. greater risk taking on the part of banking in exposing a larger proportion of their assets and liabilities to market risks or base effects of the removal of interest rate capping policy which may have muted the price sensitivity of financial instruments in response to interest/market rates particularly when marked to market or held for trading (**Figure 9c**).

Figure 9a: Accommodative Monetary Policy Scenario - Asset Repricing Gains/Losses – COVID-19 Monetary Policy

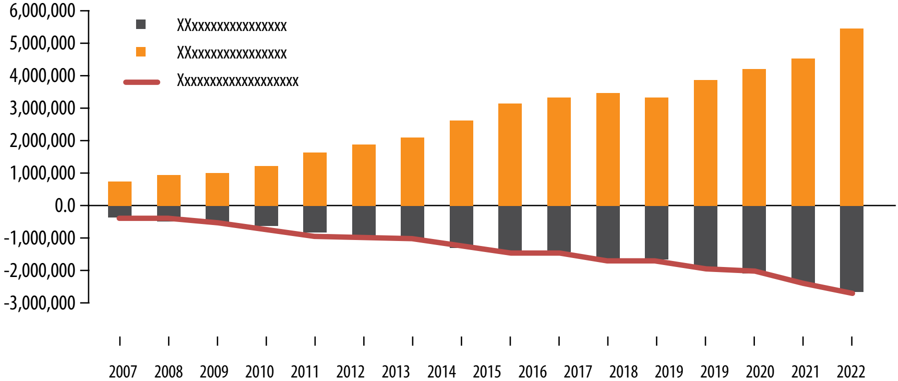


Figure 9b: Banking Sector Repricing Gains/Losses – Normalization Monetary Policy

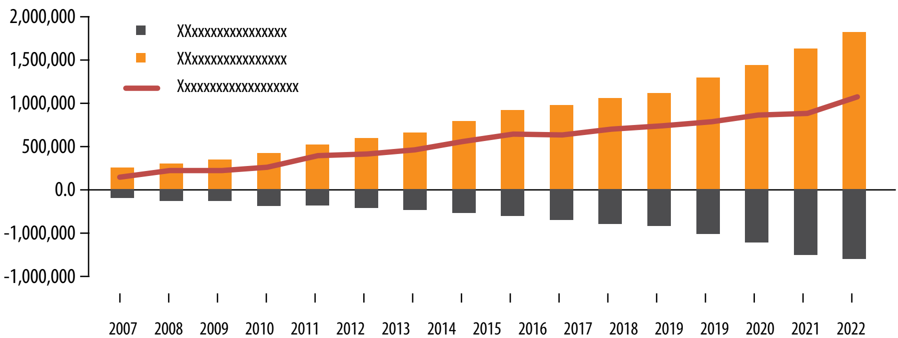
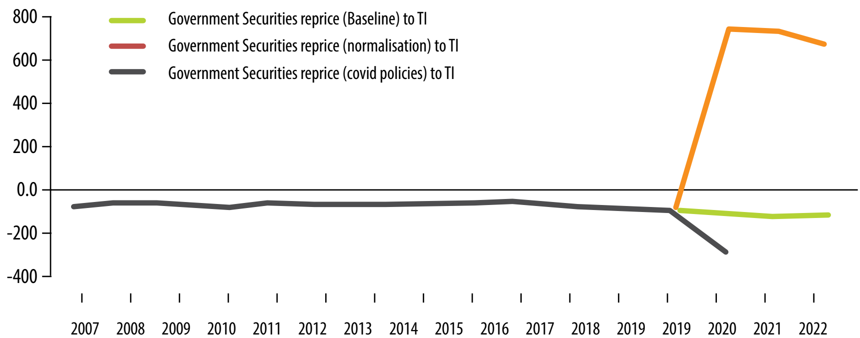


Figure 9c: Banking Sector Repricing Gains/Losses as a share of Total Income



5.4 Fixed Effects Model Findings

The fixed effects model results suggest that both idiosyncratic bank specific factors, credit risk, liquidity risks, interest rate risks, bank capital buffers, bank size and public debt explain banking sector stability between 2007 and 2022. The selected model finds that over the period in review, banking sector stability declined marginally to the instability zone that is below the zero threshold.

The fixed effects model finding shows rising credit risk lower banking sector stability disproportionately. Additionally, credit risk lowers banking sector stability by the largest magnitude relative to other factors identified. This result is reflected across all comparable models. The results also showed, rise in liquidity risks strengthen stability, while interest rate risk offsets the effect of liquidity risks and lowers stability by a similar magnitude., and both effects are statistically significant and confirmed by comparable models. These findings suggest a link between liquidity and interest rate risks. This may reflect the fact that liquidity instruments held by the banking sector such as government bonds are also the source of interest rate risks for the banking sector. Bank capital accumulation was found to strengthen banking sector stability , the effect is statistically significant in the selected model and the relationship while not statistically significant is confirmed by other comparable models. Bank size was found to be positively related to stronger banking sector stability and the effect was statistically significant (**Table 6**).

In terms of macroeconomic factors, the selected model suggests rise in public debt to GDP lower banking sector stability , though marginally and the effect is statistically significant, and the direction of the relationship confirmed by comparable models. A rise in real GDP growth strengthens banking sector stability in the selected model, though the effect is not statistically significant. The proportion of government securities as a share of total assets is found to lower banking sector stability though the effect is not statistically significant in the selected model.

Table 6: Panel Model Results

Dependent Variables	Pooled	Fixed Effects	Random Effects
	FS Coefficients		
CREDITNPLR	-6.00***	-6.00***	-2.53***
LIQRSK	5.37***	5.37***	1.82***
INTRSK	-5.52***	-5.52***	-1.28***
BCCAR	7.82***	7.82***	4.33***
DEBT	-0.06***	-0.06***	-0.03***
LOGTA	1.55***	1.55***	0.40***
LOGGS/LOGTA	-0.38**	-0.38	-2.23**
RGC	0.04***	0.04	0.10***
Statistics			
Adjusted R-squared	0.51	0.65	0.65
Durbin-Watson stat	1.84	1.58	1.58
S.E. of regression	1.88	1.58	1.58
Log likelihood	-1318.45	-1187.44	-1187.44

6.0 Conclusion and Policy Recommendation

The paper sought to examine the effect of interest rate on fiscal risks and banking sector stability in Kenya. The paper constructed BSI, undertook sensitivity analysis and estimated panel model using annual macroeconomic and bank-level datasets. The BSI was constructed as a measure of banking sector stability using bank-level annual data from 2001 to 2022 for 37 banks. Overall findings show banking sector stability conditions for Kenya's financial sector is resilience amidst the fluctuations during periods of instability.

The paper findings show interest rate risks in the banking sector are driven by bank specific strategies, monetary and interest rate policies. The analysis on fiscal and banking sector stability conditions finds monetary policy affects both fiscal and banking sector stability that is reinforced by a tight sovereign-bank nexus. Contractionary monetary policy aims to stabilize prices, raises both fiscal and banking sector stability risks through higher domestic debt service and higher interest rate risks for the banking sector. This is especially during periods when public debt is high. Accommodative monetary policy has ambiguous effects on interest rate risks dependent on bank specific strategies to diversify assets and liabilities. Banks are able to mitigate interest rate and market risks. Banks limit exposure to market risks through their unique risk strategies and portfolio diversification. However, interest rate policies distort transmission of monetary policy to banks and ambiguously impacts repricing risks in the banking sector, which may make it difficult for the banking sector to effectively mitigate its market and interest rate risks.

The paper also found banking sector stability is explained by credit, liquidity, interest rate risks and capital buffers. Increase in bank size was found to strengthens banking sector stability meaning bigger banks are more likely to be more stable. Macroeconomic factors such as public debt and Real GDP growth affect banking sector stability. Rising public debt was found to lowers banking sector stability indicating a positive link between fiscal and banking sector stability. This may suggest that due to the sovereign-bank nexus, policies measures to improve fiscal sustainability are likely to strengthen banking sector stability. The fiscal-banking sector stability link is a potential emerging area for further analysis and research to enhance understanding of the implications of sovereign-bank nexus amidst high public debt concerns.

The paper concludes that the sovereign-bank nexus, interest rate risks and liquidity risk are key channels through which the fiscal-banking sector stability risks are reinforced. Monetary policy stance appears to have asymmetric effects on both fiscal and banking sector stability through the interest rate channel. The paper proposes tracking of sovereign-bank nexus overtime to cover multiple business cycles to enhance understanding of sovereign-bank nexus dynamics. The paper also proposed further research on the fiscal-banking sector stability linkage towards coordinating monetary, fiscal, and macroprudential policies that are complementary.

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Annex

1. Hausman Test Results

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. hausman fixed random, sigmamore
```

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
L.BSI	.2999262	.478336	-.1784098	.0151794
CCARR	4.662106	1.809479	2.852627	.7046245
CREDITNPLR	-7.516679	-3.261798	-4.254881	.4393843
INTRSK	-.689476	-.6128688	-.0766073	.0157876
LIQRSK	.9331795	1.012634	-.0794544	.035716
BANK_NEX	2.259956	-.3024135	2.56237	.856995
INF	-.0312804	-.0321092	.0008288	.0015732
GDP	.0965327	.1314948	-.034962	.0053004
DEBT	-.0329685	-.029414	-.0035546	.0028419

```
                 b = consistent under Ho and Ha; obtained from xtreg
  B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic
```

Source: Authors' estimations

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