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Abstract

This study examines the dynamics of banks' holdings of government securities in Zambia using a panel dataset of 16 banks for the period 2010Q1-2022Q3. A fixed effects modelling approach regressing banks' holdings of government securities on balance sheet and macroeconomic conditions is employed. The empirical results indicate that bank-specific balance sheet conditions matter and banks purchase government securities to support their financial conditions, thereby reflecting the presence of the portfolio rebalancing channel. Government securities are suitable for meeting banks' needs during periods of high liquidity demand, falling profitability and loan quality deterioration due to their high liquidity, high returns and risk-free status. At variance with expectations, the results show no evidence that banks in Zambia purchase government securities to improve their capital adequacy ratio. The results also show that weak economic activity, stressed government fiscal position and widening loan-treasury spreads motivate banks to increase their investments in government securities, highlighting the importance of macroeconomic conditions. Thus, the results show that both demand-side and supply-side factors influence banks' holding of government securities in Zambia. Overall, the findings have important implications for financial stability and adds to the debate on sovereign exposure treatment in banking regulation and supervision, particularly the risk-free status of these exposures, which encourage banks to hold more sovereign debt, reinforcing the sovereign-bank nexus and distorting asset allocation in the economy.

Keywords: *Sovereign debt securities holdings, banks, panel data, fixed effects model.*

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1.0 Introduction

The 2009/2010 sovereign debt crisis that erupted in Europe has sparked debate and interest among academicians and policy makers with regard to increased commercial banks' holdings of sovereign debt securities. During the European sovereign debt crisis, the negative feedback loop between sovereign debt and banks was a major source of concern. Concerns about the solvency of the banking system or sovereigns were negatively reinforcing because European banks held a significant amount of sovereign debt. This development led to speculation as to what was driving increased banks' holdings of sovereign securities in stressed countries. A number of recent papers present evidence consistent with the idea that "moral suasion" or "financial repression" by governments in fiscally stressed times prompted increased exposure of domestic banks to their sovereigns (Ongena et al., 2016; Becker and Ivashina, 2018).[2] Other proponents (e.g. Buch et al., 2016; Affinito et al., 2019) attributed increased banks' purchase of domestic sovereign debt securities to the portfolio rebalancing motive (i.e. banks prefer to shift towards safer and more liquid assets when growth is weak, loan quality has deteriorated, and profitability and solvency are low).

Turning to Zambia, the recent past indicates that banks have held quite a significant share of government securities in their asset portfolio. On average, while the share declined to 19 percent from 23 percent of banks' total assets between 2010-2012 and 2013-2015, respectively, it increased to an average of 22 percent between 2016 and 2018, and to 25 percent between 2019 and 2021, respectively. As at end September 2022, the share of banking sector holdings in government securities stood at 31 percent of total assets. Trend analysis show that it has been rising, especially since 2016 due to the elevated fiscal deficits (Chart 1). Elevated yields on government securities since 2015, propelled by higher public financing needs, have made sovereign debt securities a lucrative investment venture for banks. With yields reaching over 23 percent and 31 percent in 2020 on Treasury bills and bonds, respectively, banks have steadily increased their holdings, thus escalating their exposure to the sovereign. This development raises serious concerns about the flows of credit to the private sector as larger commercial banks' holdings of government securities tend to be associated with lower credit extension to the private sector and increases concentration risk exposure to the sovereign (Bouis, 2019; Funyina, 2020; Dang and Huynh, 2020). This is more so that since banks have increased their investment in government securities and to some extent direct lending to government, private sector lending has broadly been on a downward trend in Zambia since 2009 (Chart 1).

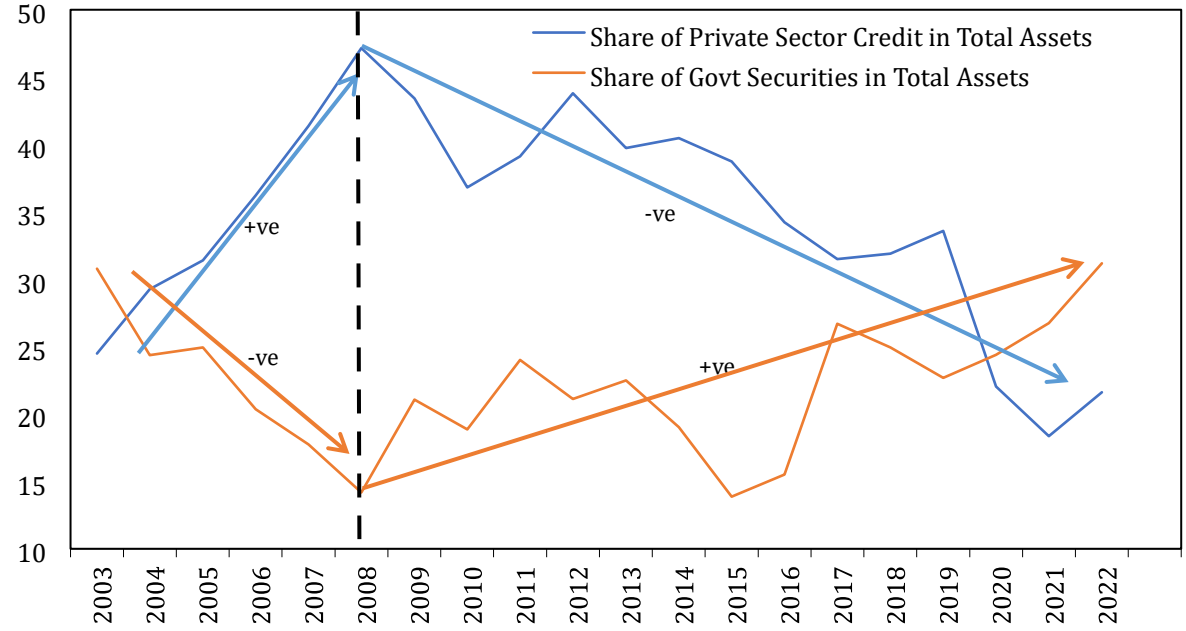
As a matter of fact, in the literature, it has been argued that increased banks' direct exposure to sovereign debt may be detrimental to financial stability as it is one of the channels through which an adverse feedback loop between sovereigns and banks can blossom (Dell'Ariccia et al., 2018). In case of sovereign default, large exposures to

[2] Governments pressure domestic banks to purchase additional amounts of domestic sovereign debt securities because market demand is weak.

government securities may make banks' balance sheets vulnerable to decreases in the value of assets, triggering collateral risk, capital losses, and counterparty risk, potentially

jeopardizing financial stability (Bank for International Settlements, 2011; Affinito et al., 2019). On the other hand, it is contended that large shares of banks' assets in sovereign securities may be positive for financial stability as it imparts liquidity and profitability in banks' business (Affinito et al., 2019; Singh et al., 2022).

Chart 1: Trend in Banks' Share in Government Securities and Private Sector Credit



Source: Author's construction using Bank of Zambia data

In light of the foregoing, understanding the dynamics of banks' exposure to sovereign debt securities in Zambia in terms of key determinants is paramount, especially for financial stability. A plethora of empirical evidence shows that various research work has been directed to this subject matter. Most previous studies have used either a balance sheet (bank-specific) or macroeconomic perspective or even a combination of both perspectives to explore the drivers of the increase in banks' holdings of sovereign debt securities (see Rodrigues, 1993; Egesa et al., 2015; Affinito et al., 2019; Chronopoulos et al., 2019; Dang and Huynh, 2020). Studies conducted so far on the subject matter have focused on advanced economies, especially those that were hit by the sovereign debt crisis in Europe (Affinito et al., 2019; Chronopoulos et al., 2019; Ongena et al., 2019) and Asia (Dang and Huynh, 2020; Singh et al., 2022). In sub-Saharan Africa, a study by Egesa et al. (2015) on the Ugandan banking sector is one of the few that attempted to address the determinants of sovereign debt securities holdings by banks though with a focus on balance sheet conditions. Despite this general understanding of the factors that influence banks' holdings of government securities, empirical evidence on Zambia is limited. To the best of my knowledge, there is no documented empirical evidence regarding the determinants of banks' sovereign exposures in Zambia. As a result, there is a knowledge gap that needs to be filled in the current study. This is more so that the subject matter borders on financial stability, a relatively new field to a developing country like Zambia

which is attempting to build and strengthen both micro and macro prudential regulation and supervision in the financial system as enshrined in the Bank of Zambia's 2020-2023 Strategic Plan.

Against this backdrop, this study examines the determinants of sovereign debt securities holdings by commercial banks in Zambia. In particular, the study employs a set of literature informed bank-specific balance sheet and macroeconomic conditions to characterise banks' exposure to the sovereign using bank-level data for the period 2010Q1 – 2022Q3. The period is chosen as it gives relatively more consistent data on the cross-section and time series observations and encompasses both the boom-and-bust cycles. This averts the challenge of estimation results being solely influenced by the boom or bust cycles thereby making the results useful in both normal and abnormal times. Further, this study considers both demand and supply side factors unlike other studies that are one sided. This is because the literature has shown that dynamics in banks' holdings of sovereign debt securities is a blend of both factors. Moreover, in line with contemporary literature using a dynamic panel data approach, banks are disaggregated into seven categories: all banks, locally owned banks, foreign owned banks, banks with government stake, small banks, medium banks and large banks. This classification helps document the degree of heterogeneity in sovereign debt securities holdings across banks.

This study is imperative given that the banking sector's purchase of sovereign debt securities in Zambia have been rising recently, especially in the context of the country's elevated fiscal deficits and public debt highlighting the build-up of vulnerabilities and risks to financial stability through the sovereign-bank nexus. Thus, the results from this study can be useful to financial stability authority in terms of the design of prudential policies to help minimise financial stability risks arising from increased banks' exposure to sovereign debt. Moreover, this study contributes to existing literature by providing the first assessment of the determinants of bank's holdings of sovereign securities in Zambia from a financial stability perspective. To the best of my knowledge, studies on this subject matter are non-existent with respect to Zambia.

The empirical results reveal that both balance sheet and macroeconomic conditions matter in influencing banks' holdings of government securities in Zambia. Banks rebalance their asset portfolio towards risk-free, highly liquid and high yielding government securities during periods of weak economic activity, stressed fiscal position, widening loan-treasury spread and deteriorating asset quality of borrowers, reflecting the portfolio rebalancing channel. However, there is no evidence that banks in Zambia purchase these securities to improve their capital adequacy ratio. The results also show notable differences across bank categories with banks having lower overall returns or higher stressed loan quality more likely to invest in Zambian government securities. While banks' increased investment in government securities amid higher public borrowings aligns with the moral suasion hypothesis, it also validates the portfolio rebalancing hypothesis as higher sovereign debt yields in stressed periods attract banks.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 covers model specification, estimation methodology and data. Section 4 discusses the empirical results. Section 5 concludes.

2.0 Literature Review

This section presents literature on the potential drivers of commercial banks' holdings of government securities. Irrespective of the typology used, extant literature points to common themes as to why banks hold government securities. The broad categories capturing the drivers of banks' holding of government securities relate to portfolio rebalancing and financial repression.

According to the portfolio rebalancing hypothesis, banks prefer to shift to safer and more liquid assets, such as government securities during times of stress, when growth is weak, banks have higher non-performing loans (NPLs), and are undercapitalised. Consequently, increased banks' holding of government securities is motivated by the need to meet and maintain capital and liquidity requirements (regulatory incentives), which frames financial stability (Bonner, 2016). With regard to the liquidity motive, Dell'Ariccia et al. (2018) argue that, to deal with an unexpected loss of funding, commercial banks maintain a pool of liquid assets to back short-term funding—assets that convert to cash without significant loss of value. Because of its relative safety, large and active market, and diversification benefits that reduce volatility and correlation with risky assets, sovereign paper is frequently the most liquid asset and serves as the natural benchmark for pricing other securities. Sovereign paper is thus an appealing asset for meeting bank liquidity requirements, and it may be the only one readily available in countries with underdeveloped capital markets.

Moreover, sovereign paper is important in the payment system because it is commonly used as collateral to secure credit and to support hedging, as well as banks' broader financial market operations and activity. Sovereign instruments are the most used asset in this type of arrangement due to their low volatility and relative safety. In addition, central banks' liquidity operations with banks are typically funded in large part by government paper. In a Gennaioli et al. (2018) theoretical model, it is contended that banks tend to keep an optimal share of sovereign securities as a strategy to store liquidity to finance future investments. This precautionary motive has been attested to by Affinito et al. (2019) in case of the Italian banking sector.

Another motivating factor for banks' holding of sovereign paper is compliance with capital adequacy requirements. The Basle Accord requires banks to hold capital proportionate to their perceived credit risks. All assets and off-balance-sheet items are assigned risk weights ranging from 0 to 100 percent based on their perceived credit risk, and banks are required to hold certain percentages of capital against total risk-weighted assets and off-balance-sheet items (Bonner, 2016). However, when determining the riskweighted assets required to calculate the capital adequacy ratio, sovereign debt securities are assigned a risk-weight of zero. This mechanism incentivises banks, particularly undercapitalised banks, to purchase sovereign debt securities to comply with prudential regulation. Thus, risk-based capital requirements encourage the substitution of low-risk weighted assets such as government securities for high-risk weighted assets such as loans. Bonner (2016) and Buch et al. (2016) showed that both well capitalised banks and adequately capitalised banks had lower investments in Government securities compared to undercapitalised banks. Rodrigues and Keeton (1993) identified risk-based capital standards as one of the long-term factors explaining the increase in banks' sovereign debt holdings.

According to the preceding, preferential treatment in microprudential liquidity and capital regulation increases banks' holding of government securities significantly. Liquidity and capital regulations appear to incentivise banks to substitute government securities for other assets, implying that this "regulatory effect" causes banks to reduce lending to the real economy.

Besides the regulatory incentives strengthening the sovereign-bank nexus, the portfolio rebalancing further posits that weak loan demand and increased non-performing loans in recessionary periods or when growth is weak motivate banks to expand their exposure to the sovereign by holding substantial government securities. According to Keeton (1994) and Rodrigues (1993), banks' investments in securities tend to increase relative to loans during a recession and in time of weak growth. They argue that banks find lending less attractive due to reduced business activity and private sector loan demand as well as declining interest rates that they can charge on loans. They further conjecture that during a recession, non-performing loans increases, and this tend to reduce the amount of loans banks are willing to extend even without any change in interest rates.

Keeton (1994) also highlights the role of accommodative monetary policy in a recession as one of the drivers of increases in banks' sovereign debt securities holdings. He provided that accommodative monetary policy increases the funds available for banks to invest and lowers short-term interest rates to stimulate the economy. However, the lower short-term interest rates induced by an accommodative monetary policy may not immediately stimulate lending primarily because loan demand may be unresponsive to the cost of borrowing in the short-run. Linked to this is the effect of persistent higher interest rates on sovereign debt securities induced by increased government borrowing which influence portfolio reallocation towards sovereign debt securities during recessions. Thus, if lending rates on loans decline in tandem with accommodative monetary policy rate while sovereign debt securities retain relatively higher yields concomitant with higher public financing needs, banks will have an incentive to expand their securities holdings and limit lending to the private sector (Rodrigues, 1993).

The financial repression hypothesis on the other hand postulates that sovereigns may use moral suasion to persuade banks to invest in new issuances of government securities (Dell' Ariccia et al., 2018; Becker and Ivashina, 2018). The authors contend that when the risk and yield on sovereign issuances rise, governments may resort to formal and informal pressure on the local financial sector to absorb new issues of government securities; in other words, they may use a form of "financial repression." The term "financial repression" refers to a set of policies that use the financial sector to redirect savings to the government, and it stems from the seminal work by Shaw (1973) and McKinnon (1973). Dell' Ariccia et al. (2018) argue in their seminal work that commercial banks may hold sovereign debt not because they want to (i.e. because it is exclusively optimal), but because governments encourage or coerce them to do so either implicitly or explicitly. However, if the financial sector cannot raise additional funds to purchase government debt, these purchases will have to come at the expense of other investments, particularly loans, crowding out the private sector from financing. Reinhart (2012) and Reinhart and Sbrancia (2015) demonstrate in their seminal work that financial repression was widely practiced in the aftermath of World War II, which left a legacy of high public debt in many advanced economies. Becker and Ivashina (2018) also point to some evidence of financial

repression of the banking sector in European countries during the sovereign debt crisis and indicate that it crowded-out corporate lending. While Ongena et al. (2016) argue that explicit financial repression may be more difficult to implement in today's free market economies, it may still be practiced implicitly via moral suasion.

Empirical studies that assess the determinants of commercial banks' holding of government securities have used varied approaches that differ significantly in scope, choice of control variables, and estimation techniques. The results also differ, as summarised below. A pioneer study by Rodrigues (1993) examines the reasons for the run-up in banks' holding of government securities in the US economy. Using both aggregated time series and disaggregated cross-section individual bank models, results from the time series model revealed that increases in GDP growth and a wide loantreasury spread are associated with a decline in banks' holding of securities, highlighting the portfolio rebalancing in the face of changing economic cycles and interest rates. On the other hand, results from the cross-section bank model revealed that large banks tended to lower their securities holdings and that both well-capitalised banks and adequately capitalised banks have lower government securities holdings relative to undercapitalised banks. This highlighted the role of bank size and risk-based capital requirements in driving banks to increase their securities holdings. Further, the author showed that loan asset quality deterioration influenced banks to increase their securities holdings.

Egesa et al. (2015), in one of the few studies in sub-Saharan Africa, examine the determinants of investments in government securities by Ugandan banks. Using the generalised method of moments (GMM) regression technique, they found that poor loan performance and increase in capital motivate banks to raise their holdings of government securities. However, they do not find evidence that liquidity reserves drive banks' holdings of government securities, but that bank size is negatively related to the holdings of government securities.

Affinito et al. (2019), adopting a microeconomic approach, examined a bank-by-bank determinants of the purchase of sovereign debt securities in the Italian banking sector for the period 2007-2013. Using the fixed effects (FE) and GMM models, they revealed that bank-specific balance sheet conditions matter in influencing banks' decision to purchase government securities. They show that the high liquidity nature of sovereign debt securities, their convenience in terms of capital charges and elevated yields make them attractive to banks' needs in periods of intense liquidity demand, declining profitability and loan quality. They argue that increased asset quality deterioration during crisis, propels banks to engage in portfolio shifting of assets towards safer and highly liquid sovereign debt securities. Overall, they deduce that banks buy government securities to support their financial conditions.

Bouis (2019) reported significant findings on the determinants of banks' investment in government securities using panel data on 80 EMDEs spanning 2001 – 2016, based on FE and system GMM methods. He reported that, when the economy deteriorates and NPLs rise, banks increase their holdings of government debt, implying a rebalancing of their portfolio toward safer and more liquid public assets. Besides, he demonstrated that public debt to GDP and fiscal stress positively explained banks' holding of government debt, indicating higher public financing needs, and supporting the financial repression

hypothesis. He also demonstrated that banks' holding of government securities was associated with higher banking sector return on assets.

Chronopoulos et al. (2019) examine the determinants of bank holdings of domestic sovereign debt with a panel dataset of 295 banks in 35 countries between 2002 and 2013. Using pooled OLS, FE and GMM, they find that the structure of bank ownership (domestic, foreign or government), quality of governance, and the level of financial development of the countries in which banks operate all determine the holding of more domestic sovereign debt (home bias). They found that domestic banks tend to hold more domestic sovereign debt than their foreign counterparts. They also show that when a domestic bank is controlled by the government, the home bias is even stronger. Further, when government bonds are riskier, home governments are less effective, and banking systems are less financially developed, home bias increases. Overall, they show that banks in highdebt countries tend to hold more domestic sovereign bonds.

In a study by Lamas and Mencia (2019) that investigates the determinants of sovereign debt holdings by banks in Spain, they challenge the view that banks engaged in moral hazard strategies to exploit the regulatory treatment of sovereign exposures. Using the FE panel data method, they show that weakly capitalised banks are not associated with higher sovereign debt holdings. However, they show that macroeconomic conditions play a key role in banks' sovereign debt holdings. In this vein, they show that banks tend to increase (domestic) sovereign debt holdings during downturns (when GDP drops) and decrease the holdings in upturns.

Dang and Huynh (2020), using bank-specific determinants of sovereign bond holdings, assess how such holdings affect bank lending in Vietnam. Using panel data models of fixed effects, random effects and GMM, the results show that banks' sovereign bond holdings can be attributed to liquidity reserves, need to improve profitability and risk shifting. However, they do not find evidence to support the notion that Vietnamese banks purchase government bonds to improve their capital position. In addition, they show that purchases of government bonds in normal times may not be detrimental to bank lending and liquidity creation.

Singh et al. (2022) examine the asset portfolio dynamics of Indian banks with respect to loan growth and investment in government securities. Employing panel data and GMM approach, their results indicate that weak economic activity and stressed asset quality encourage banks to increase investment in government securities highlighting the presence of a portfolio rebalancing channel in India. The authors also show that, while an increase in the share of government securities in banks' asset portfolio is found to have a favourable impact on their profitability, it crowds out private sector credit, particularly when it coincides with higher government borrowing. They further reveal that crowding out is lower for banks with better asset quality and higher capital positions.

In summary, it is evident from the literature that both bank-specific balance sheet and macroeconomic variables significantly explain dynamics in banks' sovereign debt securities holdings. Empirical studies on Zambia that look at the drivers of commercial banks' holdings of government securities are non-existent. However, at global level empirical literature on this subject is well documented. Thus, this study contributes to the literature by investigating the subject matter. Further, this study explores balance sheet

and macroeconomic drivers of sovereign debt securities holdings by banks for a pooled sample of 16 banks and sub-samples of locally owned banks, foreign owned banks, banks with a government stake, small banks, medium banks and large banks. This provides relevant information to regulators in the design of appropriate prudential policies intended to limit the impact of systemic risk on the financial system.

3.0 Model Specification, Methodology and Data Description

3.1 Model Specification

Based on the literature, and specifically in line with balance sheet and macroeconomic determinants of banks' holding of government securities by Rodrigues (1993), Affinito et al. (2019), Bouis (2019), and Dang and Huynh (2020), the functional model to characterise this study is as follows:

$$BHGS = f\ (CAR, ROA, LDR, LLPR, FD, Spread, RGDP) \quad (1)$$

where BHGS is banks' holding of government securities as a share of banks' total assets; CAR is the capital adequacy ratio; ROA is the return on assets; LDR is the loan-to-deposit ratio; LLPR is the loan loss provision ratio; FD represents fiscal deficit; RGDP denotes growth in real GDP; and Spread is the difference between loan interest rate and government securities yield rate (i.e. proxied by the spread between average lending rate and 5-year bond rate). The 5-year bond yield rate is used as it is the most actively traded bond (see Akram et al., 2017).

Following the reviewed literature, the model for this study is precisely specified as follows:

$$BHGS_{it} = \alpha_0 + \beta_1 BHGS_{it-1} + \beta_2 CAR_{it} + \beta_3 ROA_{it} + \beta_4 LDR_{it} + \beta_5 LLPR_{it} + \beta_6 FD_t + \beta_7 Spread_t + \beta_8 RGDP_t + \varepsilon_{it} \quad (2)$$

where the variables are as previously stated except α_0 which is an intercept, while β_1 to β_8 are coefficient estimate of the independent variables, ε_{it} is the error term, t represents the sample period and i denotes individual banks. Previous studies have employed independent variables with one or more-period lags to deal with potential endogeneity problem in such models. However, lagging all independent variables may give rise to serial correlation in the model. Proactively, potential endogeneity is addressed by adding a lagged dependent variable to the right-hand side of equation 2 as well as incorporating lags of loan loss provisions, fiscal deficit and the spread consistent with previous studies (see Affinito et al., 2019; Bouis, 2019; Dang and Huynh, 2020).[3] This motivates the dynamic nature of our panel model and allows for the possibility of partial adjustment of actual banks' holding of government securities to its steady-state value while remedying

[3] Lags in some independent variables are used to account for delayed response, address reverse causality, diminish the potential endogeneity and reflect the nature of economic decisions.

serial correlation. In addition, the regression model is estimated with panel corrected standard errors (PCSE) robust to disturbances being heteroscedastic, contemporaneously cross-sectionally correlated, and autocorrelated of type AR (1) (Torres-Reyna, 2007).

3.2 Estimation Procedure

Given that the data set in this study is panel, the first possible regression method in this case is the ordinary least squares method (OLS) method. However, because the crosssections (i.e. banks) included in our sample are widely dispersed in terms of efficiency, size, technological infrastructure, the OLS method is not suitable as it is not able to tackle these differences. Equation (2) is based on OLS method, which considers all the observations for all the time periods as a single sample. The OLS model ignores the panel nature of data and assumes that ε_{it} has no serial correlation. Panel data may have group effects, time effects or both effects. These can either be fixed or random effects. Fixed effects and random effects approaches solve this OLS method shortcoming and consider the bank-specific effects in the regression estimates.

A fixed effects model assumes differences in intercepts across groups or time periods. In the fixed effects model (where the subscript *i* denotes the individual bank and *t* refers to the time period), the intercept α is different for each bank and is subscripted by *i* as follows:

$$Y_{it} = \alpha_i + X'_{it}\beta + \varepsilon_{it} \quad (3)$$

where Y_{it} represents holdings of government securities by bank *i* at a given period, *t*, X'_{it} is a 1 × k vector of independent variables, β is a k×1 vector of parameters to be estimated on the independent variables and ε_{it} is an error term. The term α_i (i=1,…,n) is the unknown intercept for each entity (n entity-specific intercepts). So, $\alpha_i = \alpha + \mu_i$ such that α is the intercept and μ_i is the unobserved bank-specific effect. Thus, in the fixed effects model, the unobserved bank-specific effects are absorbed by the intercept.

A random effects model explores differences in error variances. The rationale behind the random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. Green (2008) notes that the fundamental distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, and not whether these effects are

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stochastic. Thus, if there is a reason to believe that differences across entities have some influence on the dependent variable, then the random effects model is used. Therefore, the model is expressed as:

$$Y_{it} = \alpha + X'_{it}\beta + (\mu_i + \varepsilon_{it}) \quad (4)$$

where Y_{it}, X'_{it}, μ_i, ε_{it} *and* β are as defined under fixed effects in equation (3). In this case, the term "μ_i" is assumed to be random. Hence, $\mu_i \sim$ IID (0, σ_μ^2), $\varepsilon_{it} \sim$ IID (0, σ_ε^2) and that

the values of μ_i are independent of the values of ε_{it}. In addition, the values of X'_{it} are independent of μ_i and ε_{it}.

To decide between fixed and random effects model, the Hausman test is used where the null hypothesis is that the preferred model is random effects versus the alternative fixed effects model (Green, 2008). The Hausman test tests whether the unique errors (μ_i) are correlated with the regressors; the null hypothesis is that they are not. A rejection using the Hausman test means that the key assumption underlying random effects is false, and therefore estimates from the fixed effects are used. If the test statistic of the Hausman test is significant at 5% level, the fixed effects estimator is preferred, and the random effects model is assumed to be inconsistent.

3.3 Data Sources and Description

This study uses quarterly data spanning 2010Q1–2022Q3 relating to bank-level and macroeconomic variables. The study considered 16 commercial banks in Zambia based on consistent data availability for the specified period.[4] The selected banks consist of three (3) locally owned, 10 foreign owned and three (3) banks with a government stake.[5] Analysis of market share by ownership revealed that 10 banks, which are subsidiaries of foreign banks dominated the banking sector market share, accounting for 68.6 percent and 68.1 percent of total assets and deposits, respectively. This was followed by four (4) banks with a government stake, holding 28.0 percent of total sector assets and 28.4 percent of total deposits. The remaining three (3) locally owned private banks accounted for 3.4 percent of total assets and 3.4 percent of total deposits. To gain more insights, the study further disaggregates banks into small, medium and large.[6] At end-September 2022, the banking sector was dominated by four (4) large banks which held over half of the market share of total assets and deposits. These banks represented the top tier of the banking sector in Zambia and collectively accounted for 56.0 percent and 57.1 percent of the total sector assets and deposits, respectively. In the mid-tier were six (6) banks which accounted for 31.8 percent of total assets and 30.8 percent of total deposits. The remaining seven (7) banks were classified as small banks jointly accounting for 12.2 percent of total assets and 12.1 percent of total deposits.

[4] While the industry consisted of 17 banks, our analysis is based on 16 banks. This is because one small bank with a government stake was dropped from the sample. The bank started operating on 1st August 2018 and therefore it did not have sufficient data points.

[5] A locally owned bank refers to a bank licensed by the Bank of Zambia where at least 51 percent of its equity is owned by Zambian citizens or entities incorporated in Zambia. A foreign bank is one with over 49 percent of its equity owned by foreign entities. A bank with a government stake is one with joint ownership between Zambian citizens or entities incorporated in Zambia and foreign entities (Bank of Zambia, 2012).

[6] Categorisation of banks into different tiers is largely based on the banks' share of assets, deposits and loans.

The data used in this study was collected from three sources. Data on the average lending rate and 5-year bond yield rate was obtained from the Bank of Zambia, quarterly GDP was sourced from Zambia Statistics Agency (ZSA) while data on the fiscal deficit was collected from the Ministry of Finance and National Planning. Data on bank balance sheet variables relating to banks' investment in government securities, capital adequacy ratio, return on assets, loan-to-deposit ratio and loan loss provisions ratio was sourced from the prudential returns submitted by all licensed deposit-taking commercial banks to the Bank of Zambia. The prudential returns are submitted monthly by all commercial banks and largely consist of comprehensive income statements and bank balance sheets. Table 1 provides the full description of each variable and their respective data sources.

Table 1: Variable Description

Variable symbol	Definition/Description	Source	Expected Sign
BHGS	BHGS denotes banks' holdings of domestic government securities (treasury bills and bonds) as a share of banks' total assets. BHGS ratio is our dependent variable and is a proxy variable for banks' exposure to government.	BoZ	
CAR	CAR represent the capital adequacy ratio measured as the ratio of total regulatory capital to risk weighted assets of bank *i* at time *t*. In the literature, banks' capital is used to test the compliance with regulatory capital adequacy requirements. Thus, CAR allows for the verification of whether individual banks' capital levels influence their purchases of sovereign securities. If banks use government securities to improve their capital ratios by de-risking from loans to lower risk-weighted assets, the expected sign is negative (Affinito et al., 2019; Dang and Huynh, 2020).	BoZ	Negative
ROA	Return on assets (ROA) is a proxy measure for the overall profitability of banking activity. It captures the profit a bank can generate given total assets. A higher ROA indicates better profit prospects for growth and resilience to shocks. Literature argues that least profitable banks have a greater incentive to increase earnings by purchasing high-yielding government securities (Buch et al., 2016; Affinito et al., 2019). Thus, the expected sign on ROA is negative.	BoZ	Negative
LDR	The loan-to-deposit ratio (LDR) denotes the percentage of deposits used by banks to make loans and is a proxy measure for liquidity. This ratio is an important indicator of liquidity risk since it measures loan coverage with stable funding sources. If banks use fewer deposits to make loans, the remaining funds should be invested in more government securities (Dang and Huynh, 2020). Thus, a negative coefficient is expected on this liquidity proxy measure.	BoZ	Negative
LLPR	The loan loss provision ratio (LLPR) is computed as the ratio of bank loan loss provisions to bank loans. It is a proxy measure for bank loan performance (bank loan quality). Commercial banks are more likely to increase their holdings of government securities when loan performance deteriorates, as suggested by the portfolio rebalancing hypothesis (Rodrigues, 1993; Dang and Huynh, 2020). Given that the deterioration in the loan quality weakens the profitability of banks and makes it less valuable to engage in lending, a positive sign on LLPR is expected.	BoZ	Positive
FD	Fiscal deficit (FD) denotes the ratio of total government expenditure to total tax revenue and grants, a proxy measure for fiscal stress (to represent financial repression). The fiscal deficit is expected to explain banks' holdings of government securities positively, reflecting higher public financing needs (Bouis, 2019).	MoFNP	Positive
Spread	Spread denotes the loan-treasury spread. It is a measure of the spread between bank loan interest rates and treasury rates. In this study, it is computed as the difference between average lending rate on loans and yield rate on the 5-year bond securities. In other words, it specifically measures banks' comparative advantage between granting loans or investing in securities (Rodrigues, 1993; Affinito et al., 2019). Given that the spread captures the relative advantage of investing in government securities compared to the yield on lending, the expected sign on spread is negative.	BoZ	Negative
RGDP	RGDP is the real gross domestic product growth rate (a proxy for economic activity), allowing for the business cycle of the economy. During periods of economic expansion, borrowers tend to have higher incomes, which improves loan quality and demand for more loans thus amplifying the business cycle. Consequently, it might be evident that government securities are no longer appealing. However, in a recession, income generation declines, giving rise to deterioration in loan quality, diminishing lending and so government securities might be preferred. Thus, real	ZSA	Negative

	GDP growth is expected to have a negative sign since high growth rates raises loan demand, making lending more attractive relative to sovereign securities (Rodrigues 1993; Bouis, 2019; Singh et al., 2022).		

4.0 Empirical Results

Prior to running the regressions, correlation test, a standard procedure in empirical analysis, was conducted. Table 2 presents the correlation test results between each pair of variables, with the correlation coefficients ranging from -0.60 to 0.61. From the perspective of Gujarati (2004) and Hair et al. (2006), who have expressed that multicollinearity problem exists if the correlations exceed 0.75, 0.80 and 0.90, it is evident that there is no presence of severe multicollinearity in the specification in this study. In addition, as a robustness test that "multicollinearity is not a serious problem" in this study, variance inflation factor (VIF) test for each variable entering the regression model is conducted. Table 3 presents the results of the VIF and the tolerance (1/VIF) for our model. The results show that the average VIF for all the variables included in the analysis was 1.37, which is less than 10, suggesting that multicollinearity is not a problem (Gujarati, 2004). On the other hand, the average tolerance value of 0.74, which is closer to 1, also confirms that multicollinearity among explanatory variables is not a problem.

Table 2: Correlation Coefficient Matrix

	BHGS	CAR	ROA	LDR	LLPR	FD	Spread	RGDP
BHGS	1							
CAR	0.223	1						
ROA	0.157	-0.202	1 -					
LDR	-0.286	0.289	0.609	1				
LLPR	0.232	-0.273	-0.099	-0.112	1			
FD	0.080	-0.077	0.129	-0.155	0.176	1		
Spread	0.028	0.129	-0.140	0.130	-0.129	-0.482	1	
RGDP	-0.059	0.107	-0.123	0.114	-0.147	-0.376	0.619	1

Source: Computations by the author

Table 3: Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
	1.223	0.818
BHGS	1.228	0.814
CAR	1.277	0.783
ROA	1.411	0.709
LDR	1.252	0.799
LLPR	1.322	
FD	1.696	
Spread RGDP	1.589	

		0.756
		0.590
		0.629
Average	**1.375**	**0.737**

Source: Computations by the author

Following the correlation test analysis, fixed effects (FE) and random effects (RE) regression models were estimated. Using the Hausman (1978) test, it is assessed whether bank-specific effects could be captured in the FE model or the RE model. The test result reported in Table 4 rejects the null hypothesis that RE is the appropriate model, confirming that the FE model is the preferred approach. Table 4 shows the FE regression results for various bank categories. Further, the robust serial correlation test indicates that the model is well specified in terms of within-group residual autocorrelation. The Durbin Watson statistics (Durbin-Watson Stat. = 2.056) indicate that there is no serial correlation in the residuals and that the overall F-statistics (F-Stat. = 214.471) is statistically significant.

From the fixed effects estimation in Table 4, the results show that the previous quarter banks' holding of government securities are positively related to banks' current holdings of securities. The effect is significant, as a one percent increase in the banks' holdings of government securities in one period leads to a 0.772 percent increase in the holdings of securities the following period. This finding could be explained in part by the distress of incurring transaction costs associated with alternative investments, primarily maturing securities. According to Egesa et al. (2015), the cost of identifying new alternative investments may be a deterrent to selecting securities that only require a roll-over.

Contrary to a priori expectation, bank capitalisation is positively related to banks' holding of government securities. The results indicate that a larger buffer of capital encourages banks to invest in government securities. This seems to suggest that well-capitalised banks tend to invest in more sovereign debt securities, lending support to the notion that banks may choose to improve their capital ratios by both increasing capital and low-riskweighted assets. This finding concurs with the work of Cornett et al. (2011), Egesa et al. (2015) and Affinito et al. (2019). However, this finding contradicts Bonner (2016) who established that undercapitalised banks purchase government securities to comply with prudential capital regulations. Overall, this shows that being a weakly capitalised bank is not related to higher holdings of sovereign debt. The 2012 bank capital increase in Zambia has been driven by prudential requirements to among other things ensure financial system stability, a well-capitalised banking sector and increased capacity for banks to

fund significant projects without external financing.[7] This implies that such funds are kept in highly liquid public assets.

With regard to return on assets (ROA), the results indicate that less profitable banks tend to hold more sovereign debt securities contrary to the "search for yield" incentive that banks may invest less in low yielding securities but more into high yielding loans. This finding is in line with Affinito et al. (2019) and Dang and Huynh (2020) who established

[7] The Bank of Zambia (BoZ) adjusted upward regulatory capital as of April 2012 and this has contributed to the banking sector's strong capital position. The minimum capital requirement for local banks was increased to K104 million while that for foreign banks was increased to K520 million from K12 million for all banks (Bank of Zambia, 2012). The minimum capital requirement in Zambia was revised to ensure financial system stability, a well-capitalised banking sector, public confidence in the banking industry, and increased capacity for commercial banks to fund significant projects without external financing. The revision also aimed to empower Zambians by allowing them to acquire shares in banks that may raise capital through listing on the local securities exchange, potentially diluting some commercial banks' shareholding structures.

Table 4: Results from the Fixed Effects Linear Model

	Variables	(1) All Banks	(2) Local Banks	(3) Banks with GRZ Stake	(4) Foreign Banks	(5) Small Banks	(6) Medium Banks	(7) Large Banks
Bank-Specific Variables	Intercept		2.188	22.703***	6.508***	3.596***	8.501***	5.927***
	$BHGS_{t-1}$	(0.703)	(1.363)	(3.696)	(0.981)	(1.090)	(1.470)	(2.242)
			0.849***	0.602***	0.674***	0.791***	0.700***	0.645***
	CAR	(0.020)	(0.039)	(0.057)	(0.029)	(0.033)	(0.039)	(0.043)
		4.296***	0.018	0.032	0.062***	0.028**	0.050***	0.161***
		0.771***	(0.016)	(0.036)	(0.013)	(0.013)	(0.009)	(0.052)
		0.047***						
		(0.007)						
	ROA	-0.063*	-0.138***	0.087	0.142**	-0.133***	0.036	0.241**
	LDR	(0.035)	(0.053)	(0.228)	(0.051)	(0.044)	(0.078)	(0.117)
		-0.013***	-0.018**	-0.233***	-0.028***	-0.013**	-0.042***	-0.051**
	$LLPR_{t-1}$	(0.004)	(0.008)	(0.047)	(0.005)	(0.006)	(0.010)	(0.022)
		0.107***	0.389**	0.069	0.114	0.168***	-0.064	0.086
		(0.033)	(0.153)	(0.078)	(0.072)	(0.055)	(0.061)	(0.065)
Macroeconomic Variables	FD_{t-2}	2.148**	0.522	2.448***	1.642***	2.213	1.603	1.884
	$Spread_{t-1}$	(0.908)	(2.361)	(0.766)	(0.408)	(1.855)	(1.308)	(1.743)
		0.128***	0.235***	0.198***	0.145**	0.162**	0.046	0.246***
	RGDP	(0.032)	(0.071)	(0.051)	(0.053)	(0.072)	(0.051)	(0.052)
		-0.249***	-0.266**	-0.201***	-0.247***	-0.288**	-0.224**	-0.255***
		(0.061)	(0.120)	(0.043)	(0.068)	(0.141)	(0.094)	(0.092)
	Hausman's Test Result: Chi-square statistic =51.021; P-Value=0.000***							
	Observations	784	147	147	490	294	294	196

Number of Banks	16	3	3	10	6	6	4
R-squared	0.866	0.897	0.774	0.847	0.863	0.905	0.789
Adjusted R-squared	0.862	0.889	0.757	0.841	0.857	0.900	0.776
F-Statistic	214.471	119.041	46.635	154.070	136.148	205.362	62.581
Prob (F-Statistic)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Durbin-Watson Statistic	2.056	2.239	1.940	2.042	2.221	1.977	1.863

Notes: Figures in parentheses are robust standard errors. The standard errors are robust to heteroscedasticity and autocorrelation and the observations are clustered at bank or banking group level. The asterisk ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

that less profitable banks in Italy and Vietnam had greater incentive to purchase more high yielding sovereign debt securities to improve their earnings, especially when incomes drop. However, this negative result is only significant for all banks, local banks and small bank categories. On the contrary, ROA is positively related with sovereign debt securities in foreign and large bank categories. This result suggests that more profitable banks also have a greater incentive to increase earnings by purchasing high yielding government securities.

Estimation results on the proxy for liquidity reserves motive show that the loan-todeposit ratio (LDR) is negatively associated with banks' holding of government securities and this is significant across all bank categories. This result entails that when banks mobilise deposits, they utilise a smaller portion of it to make loans and invest a greater portion of funds in sovereign debt securities. This finding supports the notion that the more the availability of funding from deposits, the more banks invest in sovereign debt. This result confirms that commercial banks in Zambia hold sovereign debt to boost their liquidity reserves in line with Affinito et al. (2019) and Dang and Huynh (2020) in the case of the Italian and Vietnamese banking sectors, respectively. Thus, the high liquidity of sovereign debt securities makes them well-suited to satisfying banks' needs in a period of declining bank liquidity.

Deterioration in asset quality, measured by the increase in the loan loss provisions raises banks' holding of sovereign debt securities. This result implies that banks' investment in securities increases as bank's loan quality deteriorates. The deterioration in asset quality makes banks become more conservative and cautious with their investments, especially discouraging them from granting new loans and thus increasing their purchase of riskfree sovereign debt securities instead. As loan performance deteriorates, sovereign debt securities offer a less risky investment option, and coupled with their high yields, gives a reasonable return to commercial banks. Surprisingly, this result is only significant for all banks, local banks and small bank categories. Moreover, this finding corroborates with Egesa et al. (2015), Bouis (2019) and Dang and Huynh (2020) who established that asset quality deterioration explains positively the growth rate of banks' holding of government debt. This finding is also consistent with risk-based supervision requirements as continued expansion of credit amid deteriorating loan performance would require higher loan loss provisioning and subsequently capital expansion.

Turning to estimations on fiscal deficit, results indicate that increases in the sovereign's fiscal stress is associated with the rise in banks' holding of securities and this is significant for all banks, foreign banks and banks with a government stake category. This result suggests that banks in fiscally stressed and highly indebted countries tend to hold more domestic sovereign debts consistent with the observed increased bank-sovereign nexus phenomenon in the Euro area by Dell' Ariccia et al. (2018), Becker and Ivashina (2018) and Chronopoulos et al. (2019) during the sovereign debt crisis. In a way, this result could point to some form of moral suasion (financial repression) at play, especially that banks with a government stake increase their holdings of securities when the sovereign is faced with widening fiscal deficit.[8] However, the fiscal deficit variable could be endogenous to

[8] The increased sale of securities through a private offering arrangement (private placements) in the period under review, especially between 2017 and 2021, mostly to a few selected financial institutions could point to formal and informal pressures on the local financial sector (some form of financial repression).

the business cycle and thus does not distinguish between financial repression and the portfolio rebalancing hypotheses as pointed out in Bouis (2019).[9] While the effect of fiscal deficit is found to be significant for banks with a government stake (which are more likely than foreign banks to be influenced to absorb new issues of government securities), the significance of results on foreign banks and all bank categories could be indicative of the extensive impact of fiscal challenges on the wider banking sector.

The results for the spread indicate that the loan-treasury spread is positively related to banks' holding of government securities and is significant across five bank categories. This contradicts the negative a priori expectation that a large spread entails that bank loans become attractive relative to sovereign debt securities. While a widening loantreasury spread is theoretically associated with a declining share of sovereign debt securities holdings by banks, the results in this study prove otherwise. This could suggest that increases in the loan-treasury spread raises borrowing costs on loans making it costly for the borrowers to service loans and thus bolster an increase in asset quality deterioration. Thus, higher spreads on loans accelerate defaults on loans pushing banks to rebalance their portfolios towards risk-free and more liquid sovereign assets. This finding contradicts Rodrigues (1993) and Affinito et al. (2019) who found that increases in loan-treasury spread is negatively related to banks' sovereign securities holdings.

The coefficient on the real GDP growth (economic activity) is negative and significant across all bank categories in line with a priori expectations. The result entails that an increase in real GDP growth is associated with declining share of government securities holdings in commercial banks portfolio in line with Rodrigues (1993) and Sing et al. (2022). On the flipside, this finding implies that in economic downturns when private sector loan demand declines and their loan quality deteriorates amid higher public financing needs, banks rebalance their portfolio towards risk-free, high yielding and liquid public assets.

5.0 Conclusion

This study examined the balance sheet and macroeconomic determinants of banks' holding of government securities in Zambia. Using panel data comprising 16 banks disaggregated into sub-categories for the period spanning 2010Q1 – 2022Q3, the empirical results from the fixed effects regression model reveal that both balance sheet and macroeconomic conditions significantly explain the dynamics of banks' holdings of

sovereign debt securities. Nevertheless, there are some few variations in the influences of these variables across different bank categories.

[9] In economic downturns, banks' portfolios may be rebalanced towards safer, more liquid public assets while sovereigns may be more likely to use moral suasion to persuade banks to purchase public securities to meet increased financing needs. Consistent with the moral suasion hypothesis (financial repression), banks may be swayed to participate in new issues of sovereign debt securities when conditions deteriorate, and governments find it difficult to attract funding from foreign investors.

From the bank-specific balance sheet conditions, the results show that banks invest in sovereign securities to improve their profitability and liquidity positions as well as ameliorate the stressed loan quality, suggesting the presence of a portfolio rebalancing hypothesis. In addition, the results point to important differences across bank categories. More specifically, the regression results show that banks with lower overall returns or higher stressed loan quality are more inclined to invest in government securities in Zambia. On the other hand, at odds with expectations, the results show that weakly capitalised banks are not associated with higher holdings of sovereign securities.

Turning to macroeconomic conditions, the results indicate that they matter for banks' decision to hold sovereign debt securities. Weak economic activity, stressed government fiscal positions and widening loan-treasury spread encourage banks to hold more government securities, reinforcing the presence of a portfolio rebalancing hypothesis. While increased investment by banks in government securities in the face of higher government borrowings is consistent with the moral suasion hypothesis (some form of financial repression), it also validates the portfolio rebalancing hypothesis as higher sovereign debt yields in stress periods become attractive to banks. Moreover, the significance of the fiscal deficit in explaining banks' holdings of sovereign debt for all banks, banks with a government stake and foreign banks emphasizes the critical role fiscal policy plays in the allocation of assets by the banking sector into the economy.

These results have important policy implications for financial stability and contributes to the debate on the treatment of sovereign exposure to banking regulation and supervision. On the one hand, banks' holdings of government securities could be a rational choice as it enhances their resilience (bank stability) through improved liquidity, profitability, and quality of assets. The high yields on sovereign debt securities induced by increased public financing needs in economic downturns when loan quality deteriorates make them appealing to banks. Besides, the risk-free status (zero risk-weights) of sovereign securities makes them favorable for bank solvency accumulation. Thus, the purchases of sovereign securities by banks may frame bank stability as it improves their soundness.

On the other hand, excessive holdings of sovereign debt securities by banks raises risks to financial stability. First, excessive banks' investment in sovereign securities may be detrimental to private sector lending. It amplifies the crowding-out effect by raising risks to private sector loans and the wider economy in an event of a sovereign default. According to empirical evidence by Gennaioli et al. (2018), banks that heavily invest in domestic sovereign debt experience drastic reduction in loans to the private sector when the sovereign defaults. Second, excessive bank exposure to sovereign debt securities may be detrimental to financial stability as it is one of the conduits through which an adverse feedback loop of the sovereign-bank nexus can thrive (Bank for International Settlements, 2011; Dell' Ariccia et al., 2018; Affinito et al., 2019). Thus, deterioration in the sovereigns' creditworthiness might weaken banks' balance sheets by exposing them to a decrease in the value of securities, triggering collateral risk, capital losses, and counterparty risk, potentially jeopardizing financial stability.[10]

[10] Deterioration in creditworthiness of the sovereigns impairs bank's balance sheet and capital adequacy by contracting the value of assets (securities), reducing the value of the collateral that banks can use to raise

In conclusion, prudential policies such as positive risk weights or exposure limits that restrict banks from holding excessive amounts of sovereign securities on their balance sheets can help to strengthen financial stability and market efficiency in the banking sector. However, it is important to bear in mind that optimal purchase of sovereign securities by banks primarily reflects a portfolio rebalancing towards risk-free (safer), more liquid and high yield assets during times of stress, which bodes well for financial stability (Dell'Ariccia et al., 2018).

funding from the interbank market or the central bank and negatively impacting on the funding costs of banks that benefit from either implicit or explicit government guarantees (see Chronopoulos et al., 2019).

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