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Funding Diversification and Bank Stability in Ethiopia: A Panel Data Analysis

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Abstract

This study investigates the determinants of bank stability in Ethiopia from 2017 to 2024, using panel data from 13 banks and a Random-Effects model with the Z-score as the dependent variable. The analysis identifies funding diversification as a key driver of stability, while inflation emerges as a destabilising factor, highlighting the importance of broadening funding sources and maintaining macroeconomic stability. Other variables, including loan share, operating costs, bank size, and credit growth, exhibit expected directional effects but are statistically insignificant, suggesting that impact may be indirect or context-dependent. The findings underscore that bank stability is shaped by both internal characteristics and external economic and institutional conditions. Policy implications include promoting diversified funding through capital markets and long-term debt, sustaining macroeconomic stability to safeguard solvency, and maintaining supervisory frameworks that encourage efficiency without incentivising excessive risk-taking. Additionally, credit growth should be monitored through instruments such as countercyclical capital buffers, as unrestrained expansion may increase systemic vulnerabilities despite short-term profitability.

Keywords: Risk Management, Z-Score, Stability Risk, Funding Diversification, Funding Sources

Introduction

Commercial banks face growing competitive pressures to maintain cost-effective and reliable funding systems. Since the structure of bank funding is closely linked to income generation, many banks pursue income diversification strategies to offset declining returns from traditional intermediation activities (Gambacorta et al., 2014). However, sustaining diversified income sources requires stability in capital and funding structures, which highlights the importance of predictable and secure financing for long-term operational resilience.

Banks mobilise funds from multiple channels, including customer deposits—such as demand, savings, and time deposits (Diamond & Dybvig, 1983) — as well as borrowings and interbank funding, such as short-term loans from other banks, central bank facilities, and repurchase agreements (Allen & Gale, 2000). They also raise funds through debt instruments and wholesale markets, including commercial paper and medium- to long-term bonds (Huang & Ratnovski, 2011), as well as equity contributions from shareholders (Berger & Bouwman, 2013). Such a diversified funding base reduces dependence on a narrow set of sources, lowering liquidity risk and strengthening resilience, particularly during episodes of bank runs (Elton & Gruber, 1977).

Funding diversification can further enhance performance by generating economies of scope (Rajan, 1992). Yet evidence remains mixed. Some studies suggest that diversification reduces bank-specific risk and improves profitability through broader revenue streams (Baele et al., 2007; Stiroh & Rumble, 2006; Mercieca et al., 2007; Abbas et al., 2024). Conversely, others argue that it may create agency problems, weaken managerial discipline, and heighten exposure to systemic shocks, making large and diversified banks more vulnerable to market-wide disturbances (Klein & Saidenberg, 1998; Laeven & Levine, 2007; Wagner, 2010).

The extent of diversification opportunities depends on the maturity and depth of a country's financial markets. In Ethiopia, financial markets remain at a formative stage:

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the stock market is newly introduced, and the treasury bill market—established in the 1990s—initially operated non-competitively, favouring state-owned banks (NBE, 2019; IMF, 2020). A shift occurred in 2019 when the National Bank of Ethiopia (NBE) introduced competitive auctions, allowing private banks and institutional investors to participate (NBE, 2019). However, the interbank market remains underdeveloped, and short-term funding dominates banks' liabilities, exposing the system to liquidity and stability risks (Reuters, 2025; Liu et al., 2025).

Despite its strategic importance, research on funding diversification and stability risk in Ethiopia remains limited. Prior studies focus primarily on asset or income diversification (Filatie & Sharma, 2024, 2025; Engida & Assegid, 2024; Yimer, 2024; Getinet et al., 2025), leaving a gap in understanding how funding diversification affects the stability of commercial banks. This study addresses this gap by systematically examining the relationship between funding diversification and stability risk in Ethiopia's banking sector.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature on credit risk; Section 3 outlines the research context; Section 4 describes the data and methodology; Section 5 presents empirical findings; and Section 6 concludes with key insights and policy implications.

Literature Review

Research on Bank Stability Risk and Its Measurement

Bank stability risk refers to the probability that a financial institution will experience distress or insolvency due to its limited capacity to absorb shocks, maintain liquidity, or preserve solvency under adverse macroeconomic and institutional conditions (Laeven & Levine, 2009; Beck et al., 2013). It encompasses both structural and operational vulnerabilities arising from internal inefficiencies or external shocks, which may threaten not only individual banks but also the broader financial system (Demirgüç-Kunt & Huizinga, 2010). Key dimensions include solvency risk, liquidity risk, funding structure risk, and operational or efficiency risk, all of which interact to shape overall stability (Čihák & Hesse, 2010; Houston et al., 2010; Beck et al., 2013).

Evidence from developed economies highlights the stabilising role of capitalisation, profitability, and funding diversification. Well-capitalised U.S. banks engaged in mergers with nonbank financial firms faced lower failure probabilities (Boyd et al., 1993), and robust governance and regulatory oversight reduced fragility across OECD countries (Laeven & Levine, 2009). Similarly, European banks with higher Z-scores were more resilient during economic turbulence (Čihák & Hesse, 2010), with creditor rights and information-sharing mechanisms further constraining excessive risk-taking (Houston et al., 2010).

In emerging economies, stability is more sensitive to macroeconomic volatility, institutional quality, and financial market depth. Concentrated or unstable funding sources increase insolvency risk (Demirgüç-Kunt & Huizinga, 2010), while capital adequacy, liquidity, and governance are key determinants (Dress, 2022; Yitayaw et al., 2023). Financial inclusion shows a non-linear effect, enhancing resilience at moderate levels but increasing fragility when excessive (Arebo et al., 2025). Cross-country comparisons indicate that emerging markets are especially vulnerable to regulatory weaknesses and macroeconomic instability, despite the universal importance of capitalisation, profitability, and diversification (Beck et al., 2013).

Within Sub-Saharan Africa, banks with higher capitalisation and diversified funding demonstrate greater resilience, whereas those reliant on concentrated deposits and weak governance are more prone to distress (Arebo et al., 2025; Bassey & Nkoro, 2020). Operational inefficiencies exacerbate fragility, while strong regulatory frameworks and governance mitigate excessive risk-taking (Demirgüç-Kunt & Huizinga, 2010; Beck et al., 2013). Evidence from Ethiopia and Nigeria reinforces these patterns, showing that banks with stronger capitalisation and more diversified funding structure exhibit higher Z-scores and lower insolvency risk (Arebo et al., 2025; Bassey & Nkoro, 2020). Overall, policies promoting capitalisation, funding diversification, and governance quality are critical for reducing bank stability risk, particularly in emerging economies.

Empirically, stability risk is often measured using the Z-score, which integrates profitability, leverage, and return volatility to estimate the probability of insolvency (Čihák & Hesse, 2010; Mercadier & Strobel, 2024). Unlike Altman's (1968) Z-score, this measure quantifies the number of standard deviations by which a bank's return on assets would need to fall below its expected value before equity is depleted (Boyd et al., 1993). A higher Z-score signals robust capitalisation and stable earnings, while a lower score indicates vulnerability to shocks. Despite limitations, such as reliance on accounting data and assumptions of normality, the Z-score remains a widely used, cross-comparable indicator of bank stability (Strobel, 2010; Demirgüç-Kunt & Huizinga, 2010).

Bank Stability Research in Ethiopia

Studies in banking consistently demonstrate that diversified and stable funding structures are central to reducing stability risk. The IMF (2013) emphasises that minimising maturity mismatches and relying on a broad mix of funding sources lowers the probability of financial distress. Similarly, Doerr (2024) shows that geographic diversification of deposits reduces volatility and funding costs, enhances liquidity creation, and supports lending activities. Collectively, these findings indicate that diversification—whether across funding channels or deposit bases—serves as a key stabilising mechanism within the banking system.

Evidence from Ethiopia broadly aligns with these international insights while highlighting context-specific dynamics. Dress (2022) notes that internal financial strength, including bank size, capital adequacy, and liquidity, reinforces stability, whereas inefficiencies weaken it. Yitayaw et al. (2023) show that macroeconomic growth and strong institutional quality bolster resilience, while concentration within the banking sector undermines it. Additionally, Arebo et al. (2025) reveal a non-linear relationship between financial inclusion and stability: moderate inclusion enhances resilience, but excessive inclusion increases transaction costs and exposure to adverse selection. These findings confirm the stabilising effects of diversification and sound financial fundamentals while highlighting structural challenges unique to emerging financial systems.

Research Background

The Ethiopian Banking Sector: An Overview

As of 2024, the Ethiopian banking system comprised 32 banks, including two government-owned institutions—one of which functions as a policy bank—and 29 privately owned banks (NBE, 2024b). The state-owned Commercial Bank of Ethiopia dominates the sector, holding 47.9% of total assets and 47.1% of total deposits (NBE, 2024b). Despite a banking history dating back to 1905, the sector remains relatively young, with 40% of banks established within the last decade and 81% (25 out of 31) classified as small banks by the National Bank of Ethiopia (Akalu, 2024a, 2024b; NBE, 2024b).

To address sectoral heterogeneity, the NBE has introduced a bank classification framework based on asset size, providing regulatory clarity, benchmarking, and improved monitoring of stability and performance across large, medium, and small banks (Table 1).

Table 1: Bank Grouping: Industry Share of Resources as of June 30, 2024

Group	*No*	*Total Assets*	*Total Loans & Bonds*	*Tota; Deposits*	*Total Capital*
Large	1	47.9	45.2	47.1	24.2
Medium	5	28.9	31.1	30.3	33.0
Small	25	23.2	23.7	22.6	42.8
Total	31	100.0	100.0	100.0	100.0

Source: NBE-Financial Stability Report, November 2024.

The industry has experienced rapid expansion, with total assets reaching 3,409 billion birr (approximately USD 59.3 billion) by June 2024, equivalent to 29.5% of GDP. Year-on-year growth in deposits and loans stood at 15.4% and 16.1%, respectively, highlighting the sector's strong trajectory. Nevertheless, market concentration remains pronounced, with one large bank, five medium-sized banks, and twenty-five small banks, reinforcing the dominance of the Commercial Bank of Ethiopia (NBE, 2024b).

Digital banking is gradually advancing, driven by customer trust, ease of use, and service quality, thereby supporting the transition toward a cash-lite economy (Assefa, 2024; Tessema & Prasad, 2024). Structural constraints, however, persist, including limited financial and technological infrastructure, regulatory gaps, low digital literacy, fragmented policy frameworks, and incomplete integration of mobile money services, all of which hinder broader financial inclusion.

Research Objectives

Building on the identified research gap, this study investigates the impact of funding diversification on the risk-taking behaviour and stability of Ethiopian commercial banks. Specifically, it aims to contribute to the existing literature by examining how diversified funding sources influence banks' risk-taking patterns, thereby extending prior research (Vo, 2020; Nguyen, 2018). The study also explores the relationship between traditional funding sources and bank stability, assessing whether reliance on conventional deposits affects vulnerability to financial and macroeconomic shocks. Finally, the findings are intended to enhance understanding of the link between funding structures and risk exposure, providing policymakers and regulators with practical insights into how funding diversification can serve as a tool for mitigating systemic and bank-specific risks, particularly during periods of economic or financial stress.

Data and Methodology

Data, Sample, and Sample Size

Younger banks often face structural weaknesses due to underdeveloped operational and risk management systems. As Isik and Ersoy (2022) note, newly established banks frequently lack well-defined risk management frameworks, while Boyd et al. (1993) emphasise that banks under five years of operation are typically considered "very young" or start-up banks, as they are still in the process of building operational processes, internal controls, and customer bases. In the Ethiopian context, 42% of banks are less than five years old, and one of the 31 banks is a policy bank with no commercial activity. For the sake of data manageability, the analysis focused on banks selected according to asset size, covering those that constitute approximately 80% of the industry. Based on this criterion, 13 banks were included in the sample, representing 82% of total assets, 78% of equity capital, and 77% of branch networks across the sector as of June 2024. According to the National Bank of Ethiopia's classification, the sample comprises one large bank, five medium-sized banks, and seven small banks, thereby ensuring a representative coverage of the Ethiopian banking industry.

The financial data used in this study were drawn from the audited annual reports of the selected banks for the period 2017–2024. Audited financial statements are widely regarded as objective and verifiable indicators of a bank's financial condition, as they are reviewed by independent external auditors who assess whether the reports present a "true and fair" view, thereby minimising the risk of material misstatements caused by fraud or error (Joshi et al., 2010; Goh, 2005). To strengthen the analysis, additional information was drawn from the National Bank of Ethiopia's Financial Stability Reports of April 2024, November 2024, and the 2023/24 annual report, which provided system-wide insights into Bank stability and performance (NBE, 2024a, 2014b, 2024c).

Variable Definition

As outlined above, the study incorporates five bank-specific variables—bank Z-score, funding diversification, loans, operating cost, and bank size—as well as two macroeconomic control variables, namely inflation and credit growth. The discussion of each variable is presented below.

Z-Score (ZSR)

According to Pham and Nguyen (2023), following the 2008 global financial crisis, researchers and policymakers were compelled to reconsider both the nature of bank risks and the methods used to measure them. In this context, the Z-score emerged as a widely accepted indicator for gauging bank risk-taking, receiving substantial approval among academics and practitioners (Li & Malone, 2016). The Z-score essentially measures the distance of a bank from insolvency (Laeven & Levine, 2009) and, therefore, serves as a key proxy for financial stability. Consistent

with the literature, the present study employs the Z-score as the dependent variable to capture bank stability risk. It is computed using the equation originally developed by Boyd et al. (1993).

A central component of the Z-score is Return on Assets (ROA), which has been extensively employed in prior studies as a measure of bank profitability (Kapur & Gualu, 2011; Olweny & Mamba, 2011; Tan & Floros, 2012). ROA is calculated as the ratio of net income to total assets, capturing the efficiency with which banks generate earnings from their asset base. In addition to profitability, the Z-score incorporates the standard deviation of ROA as a measure of earnings volatility, and the ratio of equity to total assets as a measure of capitalisation. Together, these variables combine profitability, risk, and capitalisation into a single stability metric. Formally, the Z-score is expressed as:

$$Z_{i,t} = \frac{ROA_{i,t} + \frac{E_{i,t}}{A_{i,t}}}{\sigma(ROA_{i,t})}$$

Where $ROA_{i,t}$ denotes the return on assets of bank i at time t, $E_{i,t}/A_{i,t}$ represents the equity-to-assets ratio, and $\sigma(ROA_{i,t})$ is the standard deviation of bank i's return on assets over the study period.

Independent Variables – Bank Specific

Funding Diversification (FDV)

By reducing dependence on any one funding source, diversified banks are better able to withstand liquidity shocks and maintain stable operations, which is reflected in higher Z-scores and lower insolvency risk (Filatie & Sharma, 2024; Getinet et al., 2025). Diversification into stable funding sources, such as retail deposits, further enhances resilience, while overreliance on volatile or short-term market funding can offset these benefits and potentially increase risk (Engida & Assegid, 2024; Yimer, 2024). Empirical studies indicate that the risk-reducing effects of funding diversification are particularly significant in emerging markets, where financial infrastructure limitations make banks more sensitive to shocks (Filatie & Sharma, 2025; Getinet et al., 2025).

As discussed in the literature review, the capital sources of Ethiopian banks encompass both liabilities and shareholders' equity. The liabilities of commercial banks originate from various sources, including borrowing from the National Bank, savings and demand deposits, interbank lending, and fixed-term deposits from other financial institutions. The summary of the financing structure of the sample banks is presented below:

Table 2: Funding Structure of Sample Banks (2017–2024)

Source of Finance	*Average*	*Max*	*Min*
Equity	12.6%	18.0%	6.4%
Core Deposits	68.8%	77.4%	54.8%
Time Deposit - Customers	7.3%	16.7%	1.2%
Time Deposit from Other Institutions	1.7%	8.6%	0.0%
Borrowing	0.5%	2.3%	0.0%
Others	9.2%	15.9%	4.8%

Source: Computed from the bank's Financial reports.

As can be observed from Table 2, the financing structure of the sample banks exhibits both strengths and vulnerabilities. With an average equity ratio of 12.6%, banks demonstrate a reasonable capital position, although the range—from a minimum of 6.4% to a maximum of 18.0%—highlights a concerning degree of variability, particularly for those at the lower end, which could elevate their risk exposure. Core deposits, constituting an average of 68.8% of the financing structure, serve as a stable and low-cost source of funding, yet the minimum level of 54.8% suggests that some banks may face challenges in maintaining this stability. Time deposits, both categorised as from customers (7.3%) and other institutions (1.7%), represent a smaller yet significant portion of funding, carrying a greater risk of interest rate exposure. Furthermore, borrowing remains minimal at an average of 0.5%, indicating a preference for deposit-based funding over external debt, which is generally a positive indicator of financial stability. However, the 9.2% average in other financing sources introduces an element of variability, necessitating careful management to mitigate potential liquidity risks.

As discussed above, the funding diversity is measured by an index. The index is commonly derived from the

Herfindahl–Hirschman Index (Octavianus & Fachrudin, 2022; Wiyarni et al., 2022), which measures concentration by summing the squared shares of funding sources. A value close to zero indicates high concentration in one source, while values closer to one reflect greater diversification. Thus, mathematically,

$$\text{FDV Index} = 1 - \sum_{i=1}^{n} S_i^2$$

Where si represents the share of funding source i in total funding, and n represents the number of funding sources. This paper follows a similar formula to that applied by Nguyen (2018) and Vo (2020).

Loan (LON)

The loan portfolio of a bank is a key determinant of its risk profile, as it directly affects credit risk and overall stability. Higher loan volumes, particularly when associated with poor credit quality or concentrated exposures, tend to increase the probability of insolvency, which is reflected in lower Z-scores (Louzis et al., 2012; Altunbas et al., 2010). Rapid loan growth can exacerbate this effect if credit standards are relaxed, leading to higher default rates and reduced Z-scores, as observed in pre-crisis lending expansions (Jiménez et al., 2014). Ratios such as loan-to-asset or loan-to-deposit quantify the proportion of a bank's assets exposed to credit risk, with higher ratios generally associated with lower Z-scores, indicating increased vulnerability (Berger & DeYoung, 1997; Demirgüç-Kunt & Huizinga, 2010). Strong capital buffers and prudent provisioning can mitigate the impact of high lending on Z-scores, highlighting the interplay between loan exposure, credit quality, and bank stability (Laeven & Levine, 2009). In this paper, the bank's loans variable is calculated by normalising it by the total assets (Abreu & Mendes, 2002; Gul et al., 2011).

$$\text{Bank Loan (LON)} = \frac{\text{Loan \& Advances}}{\text{Total assets}}$$

Operating Cost (OPC)

The relationship between operating costs and bank risk is well-established. Banks with lower operating costs tend to be more stable, as higher profitability enhances their ability to absorb shocks and reduces insolvency risk (Berger & DeYoung, 1997). Conversely, high operating costs often reflect managerial inefficiencies and weak internal controls, increasing vulnerability and potentially encouraging risk-shifting behaviour to offset declining performance (Hughes & Mester, 2013; Fiordelisi et al., 2011). Operating costs thus serve as both a performance indicator and a proxy for managerial quality. Empirical studies support this link, showing that higher overhead costs are associated with weaker profitability and greater operational risk (Fang, 2025), and international evaluations often use the ratio of operating expenses to total assets to assess bank efficiency and stability (World Bank, 2024; Frame et al., 2020). Accordingly, this study measures operating cost as:

$$\text{Operating Cost (OPC)} = \frac{\text{Operating Cost}}{\text{Total assets}}$$

Bank Size (SIZ)

The relationship between bank size and risk remains inconclusive in the literature. Some studies report that larger banks face lower risk due to greater resources and stronger risk-management capacity (Konishi & Yasuda, 2004; Kasman & Kasman, 2016), while others challenge this view (Barrell et al., 2010). On one hand, size can enhance stability through diversification and broader funding bases (Beck et al., 2006; Čihák & Hesse, 2010). On the other, the "too-big-to-fail" effect suggests that large banks may assume excessive risks, driven by moral hazard and expectations of public support (Houston et al., 2010; Laeven et al., 2016). Empirical evidence also points to a nonlinear relationship, where moderate increases in size support stability, but excessive size heightens risk due to complexity and aggressive expansion (Altunbas et al., 2010). Consistent with prior studies, this research measures bank size as:

Bank Size (SIZ)=Log (Total Assets)

Independent Control Variables – Macroeconomic

Inflation (INF)

The relationship between inflation and bank stability risks can have both positive and negative implications for

banks. Moderate inflation is often associated with healthy economic growth, which can enhance bank stability by improving borrowers' ability to repay loans. When prices rise steadily, banks may benefit from higher interest margins, as they can charge borrowers more while maintaining lower rates on deposits (Borio, 2014).

However, high or volatile inflation can pose significant risks to bank stability. Elevated inflation erodes purchasing power, which can lead to decreased consumer spending and increased defaults on loans, particularly if wages do not keep pace with rising prices (Adrian & Shin, 2010). Additionally, banks may face challenges in managing interest rate risk, as central banks might raise rates to combat inflation, leading to increased borrowing costs and potential declines in loan demand (Mian & Sufi, 2018).

Moreover, inflation can impact the quality of bank assets. If inflation leads to increased costs for businesses, it can reduce profitability, resulting in higher rates of default on corporate loans. This deterioration in asset quality can weaken banks' balance sheets and reduce their capital adequacy (Ghosh, 2015). The consumer price index (CPI) data, used as a proxy for inflation, are obtained from the NBE 2023/24 annual report (NBE, 2024a).

Domestic Credit Growth (CRG)

While domestic credit expansion can fuel economic growth by enabling increased lending, rapid or poorly managed credit growth can elevate bank stability risks (Kaminsky & Reinhart, 1999). Studies indicate that excessive credit growth may lead to over-leveraging, increasing the potential for defaults if borrowers cannot repay their loans (Adrian & Shin, 2010). Furthermore, the quality of loan portfolios is directly linked to financial stability, which emphasises the importance of sound credit risk management (Berrospide & Edge, 2010). During economic downturns, high levels of outstanding credit can result in increased defaults, thereby heightening stability risks (Borio, 2014). Some research indicates a negative relationship between credit growth and bank stability (Mian & Sufi, 2018). Therefore, while domestic credit can support economic activity, it is crucial to maintain prudent lending practices and strong regulatory oversight to mitigate potential systemic risks. Factors like liquidity risk and credit risk are also intertwined and can significantly impact bank stability (Ghosh, 2015). The domestic credit annual growth rate is calculated from the NBE 2023/24 annual report (NBE, 2024a).

Regression Model

The following panel regression equation is used to measure the sensitivity of Z-score to both bank and macroeconomic specific variables over the sample period for each bank.

Let,

$Z - score_{i,t}$: Z-score for bank i in year t

$FDV_{i,t}$: Fund diversification index for bank i in year t

$LON_{i,t}$: Ratio of loans & advances for bank i in year t

$OPC_{i,t}$: Ratio of operating cost for bank i in year t

$SIZ_{i,t}$: Bank size for bank i in year t

INF_t: Consumer price index in year t

CRG_t: Domestic credit growth rate in year t

β_i(i =0, 1, 2, 3, 4, 5, 6) are the coefficients of the respective independent variables & the constant, α_i is the individual-specific effect, and ε is the error term

Thus,

$$\mathrm{Z-score}_{i,t} = \beta_0 + \beta_1 FDV_{i,t} + \beta_2 LON_{i,t} + \beta_3 OPC_{i,t} + \beta_4 SIZ_{i,t} + \beta_5 INF_t + \beta_6 CRG_t + \alpha_i + \varepsilon_{i,t}$$

Empirical Results and Analysis

Descriptive Statistics

The descriptive statistics indicate notable variation across the key variables in the sample of 13 banks over eight years. Credit growth (CRG) has a mean of 0.262 with relatively low dispersion (SD = 0.057), suggesting moderate and stable lending expansion, while funding diversification (FDV) averages 0.480, reflecting that banks rely on a mixture of funding sources with some heterogeneity (SD = 0.083). Inflation (INF) exhibits a mean of 0.210 and mild positive skewness (0.093), indicating a slight concentration of observations around the mean (Table 3).

Table 3: Descriptive Statistics

	CRG	FDV	INF	LON	OPC	SIZ	ZSR
Mean	0.262	0.480	0.210	0.582	0.044	16.410	33.580
Median	0.258	0.469	0.201	0.602	0.043	17.513	34.296
Maximum	0.352	0.701	0.338	0.759	0.097	21.085	57.157
Minimum	0.156	0.297	0.074	0.253	0.002	0.040	0.431
Std. Dev.	0.057	0.083	0.089	0.116	0.016	4.868	14.687
Skewness	-0.200	0.254	0.093	-1.128	-0.050	-2.888	-0.569
Kurtosis	2.449	3.065	1.763	4.130	4.050	10.065	2.789

Source: Author.

Loan share (LON) has a high average of 0.582 and moderate negative skewness (-1.128), suggesting that most banks have a relatively large share of lending, with a few banks having very low loan exposure. Operating costs (OPC) are low on average (0.044) but display positive kurtosis (4.05), implying occasional high-cost outliers. Bank size (SIZ) shows a wide range (0.040–21.085) with pronounced negative skewness (-2.888) and high kurtosis (10.065), indicating a heavily left-skewed distribution dominated by one large bank, namely the CBE. Bank stability (ZSR) has a mean of 33.580 with moderate negative skew (-0.569) and near-normal kurtosis (2.789), suggesting that most banks cluster around moderate stability, with some extremely low-Z-score outliers.

Correlation Analysis

The correlation matrix reveals generally weak relationships between the variables and bank stability, as measured by the Z-score (ZSR). Among the explanatory variables, loan share (LON) exhibits the strongest positive correlation with ZSR (r = 0.255), suggesting that higher credit exposure is modestly associated with greater stability in this sample, possibly reflecting profitable lending or effective risk management practices. Inflation (INF), funding diversification (FDV), operating costs (OPC), credit growth (CRG), and bank size (SIZ) all show negligible correlations with ZSR, indicating limited linear associations at the bivariate level. Notably, LON is moderately correlated with both inflation (r = 0.489) and operating costs (r = 0.490), which may suggest that banks expanding lending in an inflationary environment incur higher costs (Table 4).

Table 4: Pearson's Correlations

	CRG	FDV	INF	LON	OPC	SIZ	ZSR
CRG	1.000	-0.164	-0.042	-0.057	-0.262	-0.032	-0.010
FDV	-0.164	1.000	-0.044	0.169	0.114	0.058	-0.022
INF	-0.042	-0.044	1.000	0.489	0.415	0.090	-0.049
LON	-0.057	0.169	0.489	1.000	0.490	-0.256	0.255
OPC	-0.262	0.114	0.415	0.490	1.000	-0.074	-0.083
SIZ	-0.032	0.058	0.090	-0.256	-0.074	1.000	-0.145
ZSR	-0.010	-0.022	-0.049	0.255	-0.083	-0.145	1.000

Source: Author.

Funding diversification exhibits weak correlations with most variables, including a slight negative correlation with ZSR (r = -0.022), which highlights that its stabilising effect may become more apparent in a multivariate context. Overall, the matrix indicates limited direct bivariate associations, underscoring the importance of multivariate analyses to capture the combined and conditional effects of these factors on bank stability.

Variance Inflation Factor (VIF)

The VIF analysis indicates that multicollinearity is generally not a serious concern in the model, consistent with best practices in banking and finance research (Gujarati & Porter, 2009; Hair et al., 2019). Funding diversification (FDV) and credit growth (CRG) exhibit low-centred VIFs (1.08 and 1.44), reflecting minimal correlation with other predictors, while loan share (LON) and inflation (INF) show moderate VIFs (3.12 and 4.11), both of which remain conventional thresholds (Kennedy, 2008).

Table 5: Variance Inflation Factors

Variable	*Centered VIF*
FDV	1.08
LON	3.12
OPC	2.33
SIZ	2.18
INF	4.11
CRG	1.44

Source: Author.

Operating costs (OPC) display a slightly higher VIF (2.33), reflecting expected correlations with bank size and loan portfolio characteristics (Berger & DeYoung, 1997), and bank size itself has a centred VIF of 2.18, indicating that mean adjustment effectively reduces collinearity, consistent with panel data practices (Baltagi, 2021). Overall, these findings suggest that multicollinearity is unlikely to distort coefficient estimates, supporting the reliability of the random effects regression (Table 5). This aligns with prior studies in which moderate correlations among structural variables, such as size, loan exposure, and inflation, do not typically invalidate inference but should be considered when interpreting coefficient magnitudes and significance (Hughes & Mester, 2013; Laeven et al., 2014).

Model Selection Tests

Panel regression models can be estimated using three primary approaches: (a) the Common Effect (Pooled) Model, which assumes homogeneity across banks and time; (b) the Fixed Effects Model, which accounts for individual-specific, time-invariant differences; and (c) the Random Effects Model, which treats unobserved effects as random and uncorrelated with explanatory variables, capturing variation across banks and over time. Specification tests guided model selection. The Chow test rejected the Pooled Model ($p = 0.000$), thereby favouring models with individual heterogeneity. However, the Hausman test favoured the Random Effects model over the Fixed Effects ($p = 1.000$). Finally, the Breusch-Pagan test also supported the Random Effect model over the Pooled ($p = 0.000$). Consequently, the Random Effects model was selected as the most appropriate specification. The following table depicts the results of the model.

Result Analysis

The regression output presents the results of a panel data estimation using the Random Effects model, where the Z-score (ZSR) serves as the dependent variable. The analysis covers 13 banks over the period 2017–2024, yielding 104 balanced panel observations.

The random effects regression results reveal that funding diversification (FDV) exerts a strong and positive influence on bank stability, as measured by the Z-score, with statistical significance at the 1% level. This outcome is consistent with Mercieca et al. (2007), who argue that a diversified funding structure reduces reliance on volatile or concentrated sources of finance, thereby lowering liquidity pressures and insolvency risk (Table 6). In contrast, the loan share (LON) variable, although theoretically expected to capture credit risk exposure, is statistically insignificant, suggesting that loan expansion does not directly undermine stability when considered alongside other bank-level controls.

Table 6: N Model Regression Result

Variable	*Coefficient*
C	13.45 (0.990)
FDV	*16.22(2.72)
LON	-0.99 (-0.12)
OPC	64.56(1.34)
SIZ	0.70(0.91)
INF	*-14.90(-1.99)
CRG	6.85(1.00)

Source: Author; *P <5%, t-statistics in brackets.

Operating costs (OPC) also display a positive but insignificant coefficient, which diverges from the efficiency–risk hypothesis advanced by Berger and

DeYoung (1997), who argue that high operating costs often reflect managerial inefficiency and heighten risk. Similarly, bank size (SIZ) does not significantly affect stability, implying that scale alone does not guarantee resilience—an observation consistent with Laeven et al. (2014), who caution against assuming that larger banks are inherently more stable. By contrast, inflation (INF) emerges as a significant determinant with a negative coefficient, indicating that rising price levels undermine financial stability by eroding real loan values, deteriorating credit quality, and amplifying systemic risks. This finding aligns with Boyd et al. (2001), who demonstrate that inflation weakens financial intermediation and increases the likelihood of distress. Credit growth (CRG), although positively signed, remains insignificant, reflecting the dual role of credit expansion, which can enhance profitability but may also plant the seeds of instability if unchecked. Taken together, the model suggests that bank risk is shaped not only by internal financial structures but also by broader institutional, regulatory, and macroeconomic conditions that are not fully captured in this specification.

When the largest Government-owned bank, CBE, is excluded from the sample, the re-estimation results show that funding diversification (FDV) remains the only significant determinant of bank stability, while all other variables lose statistical significance. This finding suggests that the state-owned bank's dominant position structurally influences the industry's overall results, likely because of its size, market share, and implicit government backing. State-owned banks often enjoy preferential access to funding, implicit guarantees, and policy-driven mandates (La Porta et al., 2002), which can distort the relationship between risk determinants and stability at the industry level. Their presence may mask the importance of structural factors—such as funding composition—for privately owned medium- and small-sized banks.

Conclusions and Policy Implications

The study's findings indicate that funding diversification is a critical determinant of bank stability, whereas inflation acts as a destabilising macroeconomic factor. Other variables—loan share, operating costs, size, and credit growth—exhibit expected directional effects but are statistically insignificant, suggesting that their influence may be conditional or indirect. These results highlight that banking stability emerges from the interaction between internal institutional characteristics and broader macroeconomic and regulatory environments.

Policy implications are significant: regulators should promote broader funding diversification, including the development of capital market instruments and long-term debt facilities, while maintaining macroeconomic stability through effective inflation management to safeguard solvency and mitigate systemic risk. Although bank size and operational efficiency are not statistically significant in this analysis, they remain important for governance and competitiveness, thereby emphasising the need for supervisory frameworks that encourage efficiency without incentivising excessive risk-taking (Berger & DeYoung, 1997; Laeven et al., 2014). Additionally, prudential oversight of credit expansion, through instruments such as countercyclical capital buffers, is recommended to balance short-term profitability with long-term systemic resilience.

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