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#### Article

# Determinants of bank stability in Ethiopia: A two-step system GMM estimation

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### FINANCIAL ECONOMICS | RESEARCH ARTICLE

# Determinants of bank stability in Ethiopia: A two-step system GMM estimation

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**Abstract:** Studies on the determinants of bank stability conclude that bank-specific and external factors affect bank financial stability. However, most of these studies are conducted in developed countries, where Banks, on average, are richer and have more liquidity. This study evaluates the effect of bank-specific and external factors on Bank Stability in a least developed country—Ethiopia using commercial banks data from 2014 to 2020. By using Two-Step System Generalized Method of Moments (GMM) estimation, we find that bank lending rate, tangibility, GDP growth rate, control of corruption, and rule of law effectiveness stabilize bank financial stability. The effect is more pronounced for Banks with high market share of mobilized capital. On the other hand, bank concentration and bank efficiency reduce bank financial stability by about 2.51 and 0.97 units, respectively. Furthermore, the effect of historical level of bank stability has a positive and significant effect on current level of bank financial stability. The implication of this result is vital for policymakers, as it explicitly suggests that keeping bank stability today has a vital role in achieving higher bank stability in the future.

Subjects: Finance; Corporate Finance; Banking; Credit & Credit Institutions; Business, Management and Accounting; FinancialManagement; Financial Statement Analysis; StrategicManagement; Corporate Governance

Keywords: Bank Stability; Determinants; Ethiopia; System GMM; Z-score

#### 1. Introduction

Banks are economic catalysts that support keeping a country's economy sustaining (Pambuko, et al., 2018). In emerging economies, the banking industry plays a crucial role in economic and financial market development (Pham et al., 2021; Selvarajan and Vadivalagan, 2013). Through their intermediation functions, banks allow the movement of cash from surplus to deficit households in a more efficient manner by mobilizing, accumulating, and investing capital in support of enterprises and the development of the project, thereby promoting economic growth and development (Pham et al., 2021; GRM & Yogendrarajah, 2013; Khrawish, 2011).

Financially stable banks can resist shocks and are more efficient than unstable ones (Yensu et al., 2021; Swamy, 2014). A resilient banking system is critical for promoting economic development and reducing financial institutions' vulnerability to crises (Koskei, 2020). A malfunctioning financial system, on the other hand, puts pressure on businesses and households, impacting the actual economy by preventing money from flowing to worthwhile investments and possibly leading to credit crunches (Jahn & Kick, 2012; Ngaira & Miroga, 2018).





Banking stability is described as the absence of banking crises, which is achieved when all banks in a banking system are stable (Brunnermeier and Yogo, 2009), or it is a situation in which financial intermediation tasks are carried out smoothly, resulting in customer confidence (Jabra, 2020). Many studies have documented that the banking system is a foundation for long-term economic growth and stability (Ozili, 2019; Pambuko et al., 2018; Jahn & Kick, 2012; Aghion et al., 2010). Banking stability has therefore always been a top regulatory political objective for regulators (Ozili, 2019; Čihák, 2016; Jahn & Kick, 2012; Pambuko et al., 2018). Furthermore, early identification of riskier banks is critical since it allows for lower-cost problem solutions and the development of a stronger ability to resist negative shocks (Baselga-Pascual et al., 2015).

Bank stability can be affected by both internal and external factors such as macroeconomic, socio-cultural, regulatory, and political factors that are beyond the control of bank management (Almazari, 2014). However, due to differences in socio-cultural, political, geographical, and economic situations, there are still differences between the findings of many researchers in determining which factors have a major influence and the direction of their impact, if any. Thus, the aim of this study is to investigate the impact of internal and external factors determining bank stability and contribute to the existing empirical evidence in the Ethiopia context in the following dimensions. First, despite extensive literature on the factors that determine the bank stability, to the best of our knowledge there is no empirical study that assesses the impact of capital mobilization and effective government institutions (measured by corruption control) on bank stability explicitly. Second, studies on the determinants of bank stability are conducted in developed countries, where banks, on average, are richer and have more liquidity. This study evaluates the effect of bank-specific and external factors on Bank Stability in a least developed country—Ethiopia. Third, our study is related to the recent literature exploring the demand for high liquidity and in particular, the reasons why the liquidity is so low in developing countries specifically in Ethiopia. Therefore, this study will fill the gap in bank stability literature with the above contributions by applying Two-Step System Generalized Method of Moments (GMM) estimation technique to solve the problem of to address Ordinary Least Square (OLS), fixed effects, and random effects estimation problems specifically: endogeneity, biasedness, bank-specific heterogeneity, and serial correlation problems that was seen in the previous empirical works.

The remaining part of the paper is organized as follows: a literature review in section 2, methodology in section 3, results and discussions in section 4, and conclusions and recommendations in section 5.

#### 2. Review of literature

Many countries have had severe episodes of systemic banking crises in recent decades (Jabra, 2020). Indeed, the 2007–2008 global financial crisis provided an ideal experiment for scholars to investigate the factors that influence bank stability. Among others, Yensu et al. (2021) used data from 2008 to 2017 to examine the factors that affect commercial bank stability in Ghana and discovered that the interest coverage ratio has an adverse impact on banks' stability, while inflation and GDP growth have a significant favorable impact. Ozili (2019) looked into the factors that influence banking stability in Nigeria and revealed that bank efficiency, bank concentration, credit supply, and bank profitability have a significant positive impact on bank stability, whereas inflation and GDP growth have a significant negative impact. According to Pham et al. (2021), bank stability is positively affected by the previous year's bank stability, equity-to-asset ratio, loan-to-asset ratio, bank size, foreign investment, and revenue diversification, while negatively affected by market share of mobilized capital, loan loss provisions, and market structure.

A study by Koskei (2020) on the determinants of Kenyan banking stability from 2015 to 2019 revealed that liquidity ratio, lending rate, and inflation rate have a significant negative influence on banking stability, while the return on equity and loan growth have a significant positive impact. Ozili (2019) also documented that foreign bank existence, banking concentration, banking sector size, banking efficiency, investors' protection, government effectiveness, control of corruption,

political stability, regulatory quality, and unemployment levels are major factors affecting the stability of banks in Africa. Kasri and Azzahra (2020) investigated the determinants of bank stability in Indonesia using comprehensive data obtained from 94 banks during the year 2015 to 2019; the result indicated that exchange rate, financial inclusion, returns on assets, and credit/ financing growth influenced bank stability positively, while interest rates had a negative impact.

Pambuko et al. (2018) also used monthly data from 2008 to 2013 to compare the financial stability of Indonesian Islamic banks with conventional banks. The findings revealed that income diversity, efficiency, exchange rate, liquidity, and the industrial production index all have favorable effects on Islamic Bank's stability, while interest rate and market share had a negative impact. Likewise, the stability of conventional banks responded positively to the exchange rate, interest rate, market share, income diversity, and liquidity, whereas other factors responded adversely, indicating that Islamic banking is less fragile than conventional banking. Ngaira and Miroga (2018) employed primary data to establish evidence on the drivers of the financial stability of Kenyan commercial banks in June 2016. They found that interest rate, bank size, and liquidity had a significant positive influence on the financial stability of commercial banks. Durand (2019), Wagner (2007), and Phan et al. (2019) also revealed that banks with a low level of liquidity ratio have a positive effect on financial stability.

The empirical research on the concentration-instability nexus revealed two possible influences: bank concentration can be a source of instability (Shehzad et al., 2009; Uhde & Heimeshoff, 2009) or can improve stability (Beck et al., 2006; Evrensel, 2008). According to Antony et al. (2021), Phan et al. (2019), Tan and Floros (2013), Fu et al. (2014), and Soedarmono et al. (2013), higher levels of concentration in the banking industry destabilize the financial system and expose banks to systemic risks due to equity capital reduction, increased bank risk-taking behavior, and banks probability of default. However, Kasman and Carvallo (2014), Schaeck and Cihák (2014), and Beck et al. (2013) found out that more concentrated banking systems with larger and more diverse banks improve financial system stability.

Studies on the relationship between asset tangibility and bank stability have revealed varied results. According to Isayas and McMillan (2021), GRM and Yogendrarajah (2013), and Joni and Lina (2010), having a greater tangibility of assets enables banks to have a better position in securing loans as they can be used as collateral for creditors, to operate more efficiently and to enhance their current and future performance. However, Xuezhou et al. (2020), Gathecha (2016), and Thim et al. (2011) discovered that asset tangibility and financial distress had a negative relationship.

Higher bank capital improves banks' ability to raise funds, compete more effectively, and protect themselves from deposit risk when economic conditions deteriorate (Calomiris & Mason, 2003; Kishan & Opiela, 2000), expanding lending capacity, which is the major source of revenue (Thakor, 2014; Coval & Thakor, 2005), and contributes to financial stability by providing a cushion for absorbing losses during a crisis (World Bank, 2019; Thakor, 2014; Coval & Thakor, 2005). Furthermore, Berger and Bouwman (2013) suggest that capitalized banks have a greater probability of surviving a financial crisis and Calomiris and Mason (2003) obtain a competitive advantage in the financial markets. Thakor (2014) also demonstrated that increased capital leads to financial stability. Banks of all sizes perform better in times of crisis when they have more capital (Berger & Bouwman, 2013). Efficient banks outperform inefficient banks in terms of market power (Kasman & Carvallo, 2014) and are expected to have a lower risk (Fiordelisi et al., 2011), resulting in a more stable financial system. Phan et al. (2019) and Alber (2017) identified a positive link between efficiency and financial stability. Furthermore, Berger and DeYoung (1997) revealed that efficient banks are better at controlling credit risks since they may enhance their stability by reducing high nonperforming loans. However, Tan and Floros (2013) established a positive association between efficiency and financial vulnerability.

According to a study by Githinji (2016), commercial banks with reasonable interest rate policies affected commercial banks' financial stability. Okoye and Eze (2013), Espinoza and Prasad (2010), Mekonnon (2016), Baselga-Pascual et al. (2015), and Ghosh (2015) suggested that the lending rate influenced bank performance positively, which enable them to be stable. On the contrary, the result of Stiglitz and Weiss (1981) revealed that higher lending interest rates would probably attract the riskiest borrowers' moral hazard problem and Weill (2011b) and García-Herrero et al. (2009) indicated that higher interest rate induces excessive risk-taking by banks, thereby affecting their vulnerability. Boyd and De Nicolo (2005) identified that lower lending rates in a competitive market decreased the cost of borrowing and enhanced entrepreneurial performance, which helped bank stability by lowering exposure to credit risk.

Evidence suggested that the stability of the banking industry is also related to external factors. Karim et al. (2016), Boateng et al. (2015), Jokipii and Monnin (2013), and Athanasoglou et al. (2008) identified a positive relationship between GDP growth and bank stability. However, Ali and Puah (2018) found that GDP had a negative impact on bank stability. Many scholars have looked at the influence of corruption control and discovered that any increase in control of corruption prevents a banking crisis. According to M. S. B. Ali et al. (2020), Son et al. (2020), Mohammad et al. (2019), Toader et al. (2018), Fhima (2018 July), Chen et al. (2015), and Corke et al. (2014), the lower degree of corruption has a positive influence on bank stability and is related with fewer credit losses and more moderate credit growth. The extent to which the legal rights of local citizens, including corporate entities, are protected and enforced is determined by the rule of law (Ahn & York, 2009; Fogel et al., 2006). By securing the preservation of property rights (Haggard et al., 2008) and transactional trust (Fogel et al., 2006), the rule of law also helps the creation of a business environment suitable for development (Hausmann et al., 2005). Liu (2019) stated that rule of law is important for the bank's legitimacy, credibility, and effectiveness, as well as for promoting sustainable and equitable growth, and financial stability. Moreover, Bermpei et al. (2018) and La Porta et al. (1997) found that a better rule of law is associated with greater financial stability.

Previous studies provide empirical evidence on the various factors that affect bank stability, mainly using data from large and developed financial industries that do not take into account the Ethiopian context. In addition, no study has been conducted with the combination of the variables incorporated in this study. As a result, this study is conducted to address this gap and contribute to the existing empirical evidence.

#### 3. Data and Method

#### 3.1. Data

The bank-level data were taken from the financial statements of banks. Out of the total of 18 commercial banks in Ethiopia, 17 of them were taken based on the data availability with the criteria of having 6 to 7 years of audited financial statements during the year 2014 to 2020 (15 banks with 7 years and 2 banks with 6 years of data) because we applied system GMM estimation. To illustrate, System GMM was designed for a large group and small years, and it is recommended for unbalanced panel data. Thus, this study used secondary data obtained from annual audited financial reports, mainly balance sheets and income statements of commercial banks under study. Moreover, the country-level data were taken from the National Bank of Ethiopia and the World Governance Indicator Database (World Bank).

#### 3.2. Methods of data analysis

Because of the dynamic nature of the data included in the study and as their current behavior depends on their past behavior, a dynamic panel model is required. Thus, the dynamic nature of the model incapacitates using standard Ordinary Least Squares (OLS) estimators, which might be biased and inconsistent due to the correlation between the unobserved panel-level effects and the lagged dependent variable (Hasanovic and Latic, 2017). Thus, the fixed/random effect models used

for panel data do not solve the econometric problems inherent in dynamic models. Arellano and Bond (1991) introduced a new generalized method of moments (GMM) estimator for the dynamic panel model to address the problem of endogeneity, which generates biased findings, and unobserved heterogeneity between banks, which cannot be correctly measured. They proposed to include additional instruments in the dynamic panel model and to use different transformations. Later, Arellano and Bover (1995) and Blundell and Bond (1998) proposed an improvement of the Arellano and Bond estimator by imposing additional restrictions on the initial conditions, which allow the introduction of more instruments to improve efficiency. It combines the first difference in equations with equations at the level where the variables' first differences are instrumented. It generates a system of two equations (System GMM), one original and one transformed.

GMM controls for endogeneity, unobserved panel, heterogeneity, autocorrelation, omitted variable bias, and measurement errors (Ullah et al., 2018). Bond (2002) claims that the unit root property biases the difference GMM estimator, whereas System GMM produces more exact findings. The differenced GMM method corrects endogeneity by first differencing all regressors and removing fixed effects. However, the first difference transformation has a flaw in that it subtracts the prior observation from the current one, amplifying data loss gaps (Ullah et al., 2018). As a result, it has an effect on the projected result to some extent. To correct endogeneity, the System GMM technique introduces more instruments for the lagged dependent variable and any other endogenous variable to drastically enhance efficiency, and it transforms the instruments to make them uncorrelated (exogenous) with fixed effects. Furthermore, instead of removing the prior observation from the current one like Differenced GMM does, System GMM subtracts the average of all future available variable observations (Roodman, 2009). As a result, System GMM was used in this study to investigate the relationship between the explanatory and dependent variables under study. GMM can be used without having diagnostic tests because by its very nature it is designed to solve the problems of endogeneity, autocorrelation, and heteroscedasticity. However, we tested that our data have endogeneity. Therefore, it is better to apply system GMM to capture and address the problem of endogeneity.

#### 3.3. Definition and measurements of variables

#### 3.3.1. Dependent variable

In this study, bank stability is a dependent variable. It is defined as the ability to run a business while maintaining its business continuity in a different economic environment without depending on external funding sources (Saksonova & Solovjova, 2012). Beck (2008) also defined the stability of banks as a condition in which banks can carry out their intermediary functions, such as collecting and channeling public funds, and providing financial services normally and effectively. According to the literature, bank stability is measured by Z-score (Pham et al., 2021; Albaity et al., 2019 Ozili, 2019; Klingelhöfer and Sun, 2019; Ali & Puah, 2018; Ahamed and Mallick, 2017, Kabir and Worthington, 2017). Boyd et al. (2005) stated that banks that have a negative Z-score are bankrupt, and have a Z-score near zero that tends to be unstable, whereas if a Z-score is much higher than zero, they have good stability. Therefore, the Z-score value much higher than zero, the more stable the bank is and interpreted inversely.

$$z - score_{it} = \frac{ETA_{it} + ROA_{it}}{\sigma ETA_{it}}$$
(1)

where  $ETA_{it}$ , indicating for equity-to-asset ratio at the bank i and the time t;  $ROA_{it}$ , indicating for return on assets at the bank i and the time t;  $\sigma ROA_{it}$ , denoting for the standard deviation of the sample; Z-score<sub>it</sub>, denoting for bank's stability.

#### 3.3.2. Independent variables

Depending on the literature reviewed, we identify variables that determine the commercial banks' stability in Ethiopia. These are bank stability in the previous year, bank lending interest rate, liquidity ratio, tangibility, efficiency, the share of mobilized capital, and bank concentration which

Table 1. Summary of variables and their expected sign						
Variables	Notation	Calculation	Expected Sign			
Bank Stability	Z-score	$\frac{ETA_{it} + ROA_{it}}{\sigma ROA_{it}}$	NA			
Bank-specific Factors		1				
Previous year bank stability	Z-score <sub>it-1</sub>	Z-score at the previous year	+			
Liquidity ratio	LIQ	Liquid Assets/Total Customer Deposit	+			
Average lending rate	BIR	Interest Income/Loan and Advance	+			
Tangibility	TAN	Fixed Asset/Total Asset	+			
Efficiency	EFF	Non-interest Expense/ Non-interest Income	-			
Share of Mobilized Capital	SMC	Total Mobilized Capital/ Total Asset	+			
Bank Concentration	BC	Total Asset of i <sup>th</sup> Bank/ Total Asset of Banking Industry	-			
Macroeconomic Factors						
GDP growth rate	GDP	The annual real Growth rate of gross domestic product	<u>+</u>			
External Government Qualities Variables						
Control of Corruption	CoCrr	COC ranges from -2.5 to 2.5, and higher values indicate higher corruption control	+			
The Rule of Law	RuLaw	The rule of law index. Higher values indicate higher efficiency in law enforcement.	+			

Source: Developed based on the literature

are categorized as internal factors, GDP growth rate as macroeconomics factors, and control of corruption and rule of law as external governance quality variables. Those variables are used with different combinations and reported as significant factors that determine a bank's stability by various studies (Pham, et al., 2021; Yensu et al., 2021; Antony et al., 2021; Isayas & McMillan, 2021; Koskei, 2020; Kasri & Azzahra, 2020; Ozili, 2019; M. Ali et al., 2019; Mohammad et al., 2019; Ozili, 2019; Pambuko et al., 2018; Boyd & De Nicolo, 2005).

Table 1 presents a summary of variables and their expected sign on commercial bank stability.

To identify the effect of determinant variables on bank stability, this study formulated the following econometric model:

$$Z - \text{score}_{it} = \alpha + \phi_1 Z - \text{score}_{it-1} + \phi_2 (LIQ)_{it} + \phi_3 (BIR)_{it} + \phi_4 (TAN)_{it} + \phi_5 (EFF)_{it} + \phi_6 (SMC)_{it} + \phi_{78SorBC} (BC)_{it} + \phi_8 (GDP)_{it} + \phi_9 (CoCrr)_{it} + \phi_{10} (RuLaw)_{it} + a_i + v_t + \varepsilon_{it}$$
(2)

Where Z-score is the bank stability, LIQ is the liquidity ratio, BIR is the bank lending rate, TAN is the tangibility, EFF is the bank efficiency, SMC is the share of mobilized capital, BC is the bank concentration, GDP is the GDP growth rate, CoCrr is the control of corruption, and RuLaw is the rule of law, i is the i<sup>th</sup> Banks, t is the time,  $\Phi_1$ - $\Phi_{10}$  are the coefficients for each explanatory variables in the model,  $a_i$  is a bank-specific unobservable effect,  $v_t$  is a time-specific factor, and  $\varepsilon_{it}$  is the error term.

#### 4. Result and discussion

#### 4.1. Descriptive analysis

Table 2 depicts that bank stability as measured by Z-score has an average value of 10.74, which indicated that on average banks in Ethiopia were stable during the study period as the value is much higher than zero (Boyd et al., 2005). The minimum value and the maximum value of the Z-score are 0.26 and 18.97, respectively, with a standard deviation of 3.32, which is large and implies that there is a significant variation in bank stability scores among banks during the study period.

Regarding the explanatory variables, the liquidity ratio has an average value of 0.57 with a minimum and maximum value of 0.28 and 0.89, respectively, and a standard deviation (SD) of 0.16. This SD value is low and shows that the liquidity variation tends to be close to the mean value of 0.57. Regarding the bank lending rate, it has an average value of 0.13 with a minimum and maximum value of 0.08 and 0.21, respectively, and SD of 0.01. This means that the SD value was minimal and shows that the variation in bank lending rate tends to be close to the mean value of 0.13. The average value of tangibility is 0.28 with a minimum and maximum value of 0.006 and 0.07, respectively, and a standard deviation of 0.01. The average value of bank efficiency is 1.41 with a minimum and maximum value of 0.48 and 3.54, respectively, and SD of 0.61. The share of mobilized capital has an average value of 0.09 with a minimum and maximum value of 0.02 and 0.21, respectively, and SD of 0.04. The average value of bank concentration is 0.16 with a minimum and maximum value of 0.003 and 2.92, respectively, and a SD of 0.42. This SD value indicates that the variation of bank concentration is high given the mean value of 0.16. Likewise, the gverage value of the annual GDP growth rate is 8.74, which showed that on average the GDP growth rate during the study period was 8.74%, which varies from 6.05% to 10.39%. Control of corruption has an average value of -0.44 with minimum and maximum values of -0.56 and -0.36, which indicates the presence of weak control of corruption in the country. Finally, the rule of law also has an average value of -0.46 with minimum and a maximum value of -0.51 and -0.4, which also indicates that there is a weak rule of law in Ethiopia.

Table 3 displays the correlation between variables under study and indicates that as one variable changes in value, the other variable tends to change in a specific direction. As shown in Table 3, market share of mobilized capital and previous year bank stability have a high positive correlation. Furthermore, bank concentration and previous year bank stability also have a high negative

Table 2. Descriptive statistics for the variables						
Variables	Obs	Mean	SD	Min	Max	
Dependent Varia	ıble					
Z-Score	117	10.7426	3.3272	0.2676	18.976	
Independent Variables						
Z-score <sub>it-1</sub>	100	10.8238	3.3791	0.2676	18.976	
LIQ	117	0.5705	0.1258	0.2821	0.8979	
BIR	117	0.1352	0.0181	0.0826	0.2124	
TAN	117	0.2875	0.0158	0.0068	0.0723	
EFF	117	1.4172	0.6134	0.4816	3.5472	
SMC	117	0.0996	0.0419	0.0211	0.2138	
BC	117	0.1674	0.4255	0.0036	2.9201	
GDP	117	8.7429	1.5498	6.0566	10.3925	
CoCrr	117	-0.4472	0.0577	-0.56	-0.36	
RuLaw	117	-0.4625	0.0334	-0.51	0.4	

Source: Author's Computation

correlation. It is also true that bank concentration and bank interest rate are highly and positively correlated. GDP growth is highly and positively correlated with the rule of law. For these variables, we introduce instruments to avoid the problem of multicollinearity. There are also variables that have weak correlation (below 0.5) both positively and negatively (see Table 3).

#### 4.2. The two-step system GMM estimation result

Table 4 presents the model results to identify the determinants of commercial banks' stability in Ethiopia. We report Hansen and Sargan test. Hansen J test is used to test the validity of Instruments: tests the null hypothesis of overall validity of instruments; failure to reject these null hypotheses gives support to the choice of the instruments. Sargan test assumes that the residuals or the error terms are not correlated with the instrument's variables. Validity of the test is established when the null hypothesis that the over-identifying instruments are valid is accepted (Roodman, 2009). Moreover, the test for autocorrelation/serial correlation of the error term is displayed to test the null hypothesis of the differenced error term first and second orders serially correlated this mean failure to reject the null hypothesis of no second-order serial correlation implies that the original error term is serially uncorrelated and the moment conditions are correctly specified (that is the value of AR (2) >0.05). Based on the result reported on Table 4, the F-test statistics (Prob > F = 0.000) indicated the goodness of fit of the model, the Hansen statistics result (Prob > chi2 = 0.657) showed that the instrumental variables are valid, the Sargan test (Prob > chi2 = 0.782) for the validity of the overidentifying restrictions in the GMM estimation is accepted for all specifications, and the second-order autocorrelation is rejected by the test for AR (2) (Pr > z = 0.629) as it indicated the absence of second-order autocorrelation.

The significant coefficient of lagged dependent variable proves that the historical bank stability level affects the current condition of bank stability. The lagged value of bank stability has a positive impact on the current level of bank stability and would appear to be a suitable instrument for bank stability. This is in line with our expectations as it is assumed that banks tend to maintain higher levels of stability from the past into the forthcoming period.

Bank lending rate has a positive and statistically significant effect on banks' stability in Ethiopia. The result indicated that on average a percentage increase in bank lending rate leads to a 23.49 unit increase in bank stability in the short run, *ceteris paribus*. The result is in line with our prior expectation and the findings of Koskei (2020), Mekonnon (2016), and Boyd and De Nicolo (2005) who documented the positive effect of lending rate on bank performance, resulting in bank stability. However, it is against the argument of Weill (2011b), García-Herrero et al. (2009), and Stiglitz and Weiss (1981), that the higher interest rates charged by banks would likely attract the riskiest borrowers, creating an adverse selection problem and causing banks to take excessive risks, thereby affecting their vulnerability, and Koskei (2020) and Boyd and De Nicolo (2005) found lower lending rate helped to bank stability by lowering exposure to credit risk.

Share of mobilized capital was found to be a positive and statistically significant variable affecting bank stability. The result indicated that on average a percentage increase in the share of mobilized capital leads to a 48.59 unit increase in bank stability in the short run, other thing remains constant. Evidence suggested that banks with higher capital have a higher probability of surviving a financial crisis (Berger & Bouwman, 2013). The result is consistent with the prior expectation and the finding of the World Bank (2019), Thakor (2014), and Berger and Bouwman (2013) who found that higher mobilized capital has a significant positive effect on the banks' stability. However, the result is against the findings of Pham et al. (2021) and Durand (2019) who revealed that the share of mobilized capital has a negative effect on bank stability.

*Tangibility* was found positive and statistically significant to affect bank stability. The result indicated that on average a percentage increase in tangibility leads to a 21.69 unit increase in bank stability in the short run, *ceteris paribus*. As explained by Joni and Lina (2010), having a greater tangibility of assets enables them to have a better position in securing loans and is

Table 3. Corr	elation Table										
	ZScore	L.ZScore	LQR2	BIR	SMC	TAN	BC	CoCorr	EFF2	GDP	RuLaw
ZScore	1										
L1. Zscore	0.9268	7									
LQR2	0.1365	0.1526	1								
BIR	-0.2423	-0.3319	0.1404	1							
SMC	0.8808	0.8191	0.3987	-0.0752	1						
TAN	-0.0812	-0.1235	-0.4564	0.0814	-0.2723	1					
BC	-0.6206	-0.6353	0.4241	0.6057	-0.3242	-0.1022	1				
CoCorr	0.0289	-0.0362	-0.3139	0.2807	-0.0714	0.1343	-0.0058	-			
EFF2	-0.4842	-0.4498	-0.4991	0.4319	-0.4543	0.3782	0.2349	0.2679	1		
GDP	0.0664	0.1356	0.4196	-0.4924	0.1276	-0.232	-0.0478	-0.4271	-0.4434	1	
RuLaw	-0.0724	-0.1246	-0.4141	0.3992	-0.1182	0.2188	0.0369	0.1968	0.4252	-0.9354	1
Source: Author's	Computation										

Table 4. Two-Step System GMM Estimation Result					
Explanatory Variables	Coefficient	Standard Error	P > [t]		
Z-score <sub>it-1</sub>	0.151***	0.0499	0.008		
LIQ	-0.106	2.045	0.959		
BIR	23.49***	5.537	0.001		
SMC	48.59***	6.370	0.000		
TAN	21.69**	8.177	0.017		
BC	-2.510***	0.417	0.000		
EFF	-0.976***	0.307	0.006		
CoCrr	6.486***	1.637	0.001		
GDP	0.459***	0.129	0.003		
RuLaw	15.40***	4.156	0.002		
Constant	8.499***	1.984	0.001		
Number of Observations	100	A-Bond AR (2) test	0.629		
F statistics	856.69 ***	Sargan test	0.782		
Groups/Instruments	17/15	Hansen test	0.657		
A-Bond AR (1) test	0.278				

Source: Author's computation

Note: \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1 show statistical significance at 1%, 5%, and 10% level, respectively. Robust Standard errors are in parentheses. P-value reported for A-Bond AR (2), Sargan, and Hansen test statistics.

helpful to running their business well and having future stability. The result is consistent with the prior expectation and the findings of Isayas and McMillan (2021), GRM and Yogendrarajah (2013), and Joni and Lina (2010) who found that tangibility has a significant positive effect on the banks' stability. However, the result was against the findings of Xuezhou et al. (2020), Gathecha (2016), and Thim et al. (2011) who established a negative relationship between tangibility and bank stability.

Bank concentration was found negative and statistically significant to affect bank stability. The result indicated that on average a percentage increase in bank concentration leads to a 2.51 unit decrease in bank stability in the short run, other thing remains constant. The empirical literature dealing with the bank concentration and stability documented mixed results; Beck et al. (2006) and Evrensel (2008) found out that bank concentration may promote stability, and Uhde and Heimeshoff (2009) and Shehzad et al. (2009) found out that it can be a source of instability. The result is in line with our prior expectation and the findings of Antony et al. (2021), Phan et al. (2019), Tan and Floros (2013), Fu et al. (2014), and Soedarmono et al. (2013) who found that bank concentration has a negative effect on bank stability. However, the result is against the findings of Ozili (2019), Kasman and Carvallo (2014), Schaeck and Cihák (2014), and Beck et al. (2013) who documented a positive effect of bank concentration on bank stability.

*Efficiency* was found negative and statistically significant to affect bank stability. The result indicated that on average a percentage increase in bank efficiency leads to a 0.976 decrease in bank stability in the short run, *ceteris paribus*. Efficiency is a performance measure used as an indicator of a firm's ability to control the operating expense that, in turn, leads to improved profitability and future stability (Atsango, 2018). The result is consistent with our prior expectation which is efficient firms (lower expense) tend to earn higher performance and finding of Tan and Floros (2013) who found a negative effect of efficiency on bank stability. However, the result is against the findings of Ozili (2019), Phan et al. (2019), and Pambuko et al. (2018) who revealed a positive effect of efficiency on bank stability.

*Control of corruption* was found positive and statistically significant to affect bank stability. The result indicated that on average a percentage increase in control of corruption leads to a 6.486 unit increase in bank stability in the short run, *other thing remains constant*. The result was consistent with our prior expectations and the findings of M. S. B. Ali et al. (2020), Son et al. (2020), Mohammad et al. (2019), Toader et al. (2018), and Fhima (2018, July) who found a positive effect of control of corruption on bank stability. Moreover, Chen et al. (2015) and Corke et al. (2014) found that any increase in the control of corruption avoids a banking crisis.

GDP growth rate was found positive and statistically significant to affect bank stability. The result indicated that on average a percentage increase in GDP growth rate leads to a 0.459 unit increase in bank stability in the short run, *ceteris paribus*. The result is in line with the finding of Yensu et al. (2021), Karim et al. (2016), and Boateng et al. (2015) who documented a positive association between GDP growth rate and bank stability, while it is against the finding of Ozili (2019) and Ali and Puah (2018) who found a negative relationship between GDP growth rate and bank stability.

*Rule of law* was found positive and statistically significant to affect bank stability. The result indicated that on average a percentage increase in the rule of law leads to a 15.40 unit increase in bank stability in the short run, *other thing remains constant*. The result is in line with our prior expectations and the findings of Liu (2019), Bermpei et al. (2018), and La Porta et al. (1997) who found that a better rule of law is associated with greater financial stability.

In the long run, bank interest rates, mobilized capital share, tangibility, corruption control, rule of law, and GDP growth rate all have a positive and statistically significant effect on bank stability in Ethiopia. On the other hand, efficiency and bank concentration have a negative and statistically significant effect on bank stability in the long run.

#### 5. Conclusions and recommendations

This study investigated the determinants of bank stability in Ethiopia using a two-step system GMM estimation. The descriptive analysis result shows that on average, banks considered in this study were stable during the study period. Moreover, the results of the model indicated that there is substantial evidence of a link between bank stability and both the internal and external factors considered in this study. From the variables employed, bank lending rate, tangibility, the share of mobilized capital, GDP growth rate, corruption control, and rule of law have a statistically significant and positive effect on bank stability in Ethiopia. Conversely, bank efficiency and concentration have a statistically significant and negative effect on bank stability. Likewise, the result confirmed our initial expectations that the effect of historical level of bank stability has a significant positive effect on the current level of bank stability.

The implication of this result is vital for bank managers and policymakers in the field, as it explicitly suggested that keeping banks stable today has a vital role in achieving higher bank stability in the future. Another important finding is that banks can increase their stability by raising the share of mobilized capital, bank lending rate, and asset tangibility. Our study underlines that, with the government intervention (i.e., control of corruption and rule of law), bank stability can be enhanced. Furthermore, even though our study provides insightful policy implications with the identification of variables that increase bank stability and fills a clear gap in the literature, quantifying the determinants of bank stability with a detailed specification of how particular policy interventions are structured and implemented across space and time is needed.

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