Reflecting on the recent banking crisis, what are the new financial stability determinants?

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Peterson K. Ozili

Abstract

Little attention has been paid to the role of inflation and financial inclusion in influencing financial stability. These factors have become all the more important in light of the recent banking crisis in the United States. The lessons learnt from the recent banking crisis have heightened the need for financial regulators and bank supervisors to undertake continuous search for the non-traditional determinants of financial stability to identify risks early and mitigate risks to financial system stability. In this article, we examine some non-traditional determinants of financial stability using data from sixty-one countries from 2009 to 2021. The first-difference panel GMM regression method was used to estimate the model, and we find that greater financial stability in the previous period is followed by greater financial stability in the subsequent period in all regions, signalling the persistence of financial stability. The loan-to-deposit ratio improves financial stability in European and Americas countries while countries that have a high level of financial inclusion, and whose banking sector have a high loan-to-deposit ratio, are more financially stable. Financial inclusion improves financial stability in high inflation environments particularly in African and Americas countries. High levels of financial inclusion impair financial stability during a recession particularly in Asian countries. African banks with a high loan-to-deposit ratio are more financially stable during a recession. Also, Americas and African countries that have a combined high financial inclusion and inflation rates and whose banking sector have a high loan-to-deposit ratio are less financially stable, indicating that high inflation hinders financial inclusion and loan-to-deposit ratio from improving financial stability.

Keywords: financial stability, determinants, financial inclusion, inflation, bank efficiency, loan-to-deposit ratio, economic growth, unemployment rate.

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1. Introduction

Financial stability is defined as a condition where financial markets are functioning well, financial institutions are operating without major difficulty, and asset prices reflect their fundamental values (Nelson and Perli, 2007). Houben et al (2004) define financial stability as a situation in which the financial system efficiently allocates resources between activities and across time, assesses and manages financial risks, and absorbs shocks. These two definitions suggest that financial stability is a state of absence of financial crisis.

The recent 2023 United States banking crisis, which led to the collapse of multiple high-profile regional banks, has increased focus on financial stability. The U.S. Federal Reserve Bank raised interest rates in early 2023 to combat high and persistent inflation. The hike in interest rate led to huge losses for banks that held large government bonds and treasury securities (Choi, 2023; Ozili, 2024). As people received information that some banks had weak fundamentals and had incurred huge losses following the rise in interest rate by the US Fed, depositors quickly pulled out their money from Silicon Valley bank, and their actions led to the outflow of deposits from other banks that depositors perceived were about to fail (Ciuriak, 2024). This contributed to the failure or collapse of multiple high-profile regional US banks, notably, Silicon Valley bank, Signature Bank and First Republic Bank in 2023. The collapse of the regional banks in the U.S. as well as the collapse of Credit Suisse in Europe increased concern about risks to financial system stability.

The 2023 U.S. banking crisis also led to increased interest in some financial stability determinants that were not previously given much attention in mainstream financial stability discussions. These factors are “inflation”, “financial inclusion” and the “loan-to-deposit ratio”. High inflation triggered stress in some regional banks. For example, Silicon Valley bank adopted an investment strategy that is profitable if the inflation rate and interest rates remain low (Ozili, 2024). Soon, inflation began to rise globally. High persistent inflation caused hidden vulnerabilities in the regional banks to emerge or surface, and these vulnerabilities led to the collapse of Silicon Valley following the hike in interest rates by the US Fed. The second factor is financial inclusion. The U.S. had a high level of financial inclusion in 2023. The positive implication of a high level of financial inclusion is that a large segment of the US population will keep their money with banks as deposit balances. This will increase the deposit base of

banks, increase banks' access to cheap deposit funding and increase banks' ability to withstand temporary funding shocks (Han and Melecky, 2013). However, the downside risk of financial inclusion is that depositors are "financially included" people, and any panic among these "financially included" depositors can trigger massive deposit withdrawals that may lead to bank collapse and increase financial fragility (Chen and Hasan, 2008). The third factor is the loan-to-deposit ratio. The crisis led to a shortage of deposit funding in some regional banks and decreased their ability to lend from deposit liabilities (Aharon et al, 2023). This further increased bank stress and made it difficult for the affected regional banks to continue their normal lending and banking operations. As a result, they collapsed. The recent crisis has made scholars to begin to attach a great deal of importance to these three factors following the 2023 US banking crisis (Ciuriak, 2024; Dinh, 2023; Akhtaruzzaman et al, 2023).

Prior to the 2023 U.S. banking crisis, inflation and financial inclusion were not considered to be important determinants of financial stability. The mainstream literature often focus on capital adequacy ratio, nonperforming loans ratio, profitability, monetary policy, competition, concentration, net funding stable ratio and liquidity risk as crucial financial stability determinants (Pozo and Rojas, 2023; Carlson et al, 2022; Thakor, 2014; Ozili, 2025a). The mainstream determinants were given much attention after the 2007 to 2009 global financial crisis, but the regional banks that collapsed in 2023 had sufficient capital adequacy ratio, a low non-performing loans ratio and they met the minimum prudential regulatory requirements, yet they failed. The failure of the regional banks, despite being well regulated, suggest that the factors influencing financial stability are dynamic, and the bank regulatory and supervisory rule-book that emerged from the 2007-2009 global financial crisis may not be able to detect early the cause of the next future financial crisis. Therefore, it has become important for discussions about financial stability to consider the emerging non-traditional determinants of financial stability such as inflation, financial inclusion and the loan-to-deposit ratio, among others. Financial regulators and bank supervisors need to consider these three determinants while searching for the non-traditional determinants of financial stability.

In this article, we join the search for the non-traditional determinants of financial stability by investigating whether the rate of inflation, the level of financial inclusion and the loan-to-deposit ratio are significant factors influencing financial stability while controlling for banking sector efficiency, the rate of economic growth and the unemployment rate. We use dataset

obtained from 61 countries to gain useful insights. We use the first-difference GMM regression method to estimate the model to determine the non-traditional determinants of financial stability. We extend the literature by linking inflation and financial inclusion to financial stability. We also extend the literature by exploring these relationships in recessionary environments.

Our results show evidence of the persistence of financial stability implying that stronger financial stability in the previous period is followed by stronger financial stability in the subsequent period in all regions. The loan-to-deposit ratio improves financial stability in European and Americas countries. Financial inclusion improves financial stability in a high inflation environment particularly in African and Americas countries. High levels of financial inclusion impair financial stability during a recession particularly in Asian countries. African banks with a high loan-to-deposit ratio are more financially stable during a recession.

Our analysis in this study contribute to the existing literature in several ways. First, it contributes to the literature by investigating the determinants of financial stability in light of recent events. Second, it re-examines the determinants of financial stability along regional lines in order to gain new insights that can broaden existing scholarship on the non-traditional determinants of financial stability. Our study also contributes to the economic literature that examine the macroeconomic determinants of financial stability (e.g., Klingelhöfer and Sun, 2019; Martinez-Miera and Repullo, 2019; Phan et al, 2021; Chen and Phelan, 2023), but which have not captured inflation as a potential macroeconomic determinant of financial stability. We further add to the literature that examine the consequences of inflation and show that financial fragility is a consequence of high inflation. Finally, the analysis and results of our study offer useful insights for financial regulators and bank supervisors by showing that financial inclusion, the inflation rate, and the loan-to-deposit ratio can influence financial stability under different economic conditions.

The rest of the study is organized as follows. Section 2 presents the review of literature. Section 3 presents the research methodology. Section 4 reports the empirical results. Section 5 concludes the study.

2. Literature review

2.1. Theories of financial stability (or instability)

Several theories of financial stability (or instability) attempt to explain the cause of financial crisis. They include the global savings glut hypothesis, the global banking glut hypothesis, the income and wealth theory of financial crisis, and the financial instability hypothesis. The global savings glut hypothesis, championed by Bernanke (2005), argue that capital, in the form of excessive net savings in emerging markets, tend to flow into the bond markets of developed countries. Such capital inflows distort interest rates and inflate asset prices through the expansion of cheap credit. When the desired level of savings exceeds the desired level of investment, a global savings glut will occur. It leads to low interest rates and a slowdown in economic growth which could trigger a financial crisis (Bernanke, 2005). There is also the "global banking glut hypothesis" formulated by Borio and Disyatat (2010). This theory argues that the international banking system and large international financial institutions are responsible for asset price speculation in the developed world through their endogenous credit creation, excessive leverage and cross-border speculative lending activities, and these activities lead to financial instability (Borio and Disyatat, 2010). Another theory is the "income and wealth inequality theory of financial stability" postulated by Rajan (2010). The theory argues that political and socioeconomic factors, such as unequal access to education, weak labour unions and tax inequality, have led to stagnation of the wages of the working-class in the United States while the wages of those at the top of the income pyramid continues to increase. As a result, the working-class will fill the unequal gap in wages with cheap and easy credit which allows households to consume more than their means. This will lead to the build-up of debt and financial speculation that can trigger a financial crisis (Rajan, 2010).

Another theory is the financial instability hypothesis formulated by Minsky (1977). The financial instability hypothesis argues that, in periods of prolonged financial stability, economic agents will increase risk taking and their risk-taking behaviour and actions will lead to financial instability. The hypothesis emphasized the role of private finance and debt accumulation in business cycle fluctuations. He argued that economic (or financial) stability is inherently destabilizing in the long term due to the devaluing of liquidity, the easing of lending

standards, the accumulation of private debt to support inflated asset values, the build-up of costly capital stock, profit-seeking firms taking on more debt, conservative capital structures being relaxed to generate high return on equity capital, the desire of private firms to generate higher profit margins by undertaking debt financing, and the increasing possibility that any shock to the system can result in a liquidity crisis that would expose these underlying structural insolvency, and ultimately lead to financial instability.

2.2. Empirical literature

There is a vast literature on the determinants of financial (and banking) stability. Much of the debates in the literature are centered around the external (macro) and the internal (bank-specific) determinants of financial stability. The literature identify several external or macro determinants of financial stability. For instance, Martinez-Miera and Repullo (2019) use a general equilibrium model to show the role of monetary and macroprudential policies in improving financial stability and social welfare. They show that the monetary authorities can use tight monetary policy and tight macroprudential policy to maintain financial stability and the channel through which this happens is through the sale of government debt and increase in bank capital requirement. Phan et al (2021) focus on economic policy uncertainty and its impact on financial stability using data obtained for 23 countries from 1996 to 2016. Economic policy uncertainty was defined as uncertainty about what monetary policy, fiscal policy and regulatory policy would be in the near future. In their analysis, they find that economic policy uncertainty has an adverse impact on financial stability. They also observe that the adverse effect of economic policy uncertainty on financial stability is stronger in countries with higher competition, lower regulatory capital, and in countries that have smaller financial systems.

Giuzio et al (2019) present a discussion on the role of climate risk in influencing financial stability. They consider climate risk to be a macro determinant of financial stability in the Euro area and argue that climate risk may become systemic in the Euro area if financial sector agents do not price climate risk correctly into their product and services offerings. Leclaire (2023) focus on household debt and propose that household debt affects financial stability because it influences household's level of consumption, the rate of return on mortgage and other debt, the rate of return on the production of goods and services, and the overall well-being of households in the economy. Phan et al (2022) argue that geopolitical risk is a potential determinant of bank stability. They find that increase in geopolitical risk decreases

bank stability, and that holding sufficient capital ameliorates the destabilizing effect of geopolitical risk on bank stability. Kashyap and Siegert (2020) point out the limitations that some central banks face in addressing financial stability risks especially central banks whose core mandate is to oversee monetary policy, and not necessarily financial stability such as the US Federal Reserve Bank. They show that the FED's mandate gives it a very limited role in addressing financial stability risks. But they argue that the central bank can manage financial stability risks through the interaction between monetary policy and financial stability, implying that the central bank must take into account financial stability considerations when making monetary policy decisions.

Other studies identify several internal or bank specific determinants of financial stability. Many of the internal determinants arise from the activities of financial sector agents. For instance, Kanapiyanova et al (2023) examine the determinants of bank stability in Midde East countries and find that bank profitability and efficiency are the main drivers of bank stability. Abdelsalam et al (2022) focus on the role of asset securitization issuance in influencing bank stability. They investigate the effect of asset securitization on the performance and financial stability of banks. They find that banks involved in asset securitization have more risk and are less financially stable.

Boubaker et al (2020) examine whether firms' corporate social responsibility (CSR) activities affect financial stability through a reduction in financial distress risk among US-listed firms from 1991 to 2012. They find that firms that have higher CSR levels have lower financial distress risk, which suggests that high CSR performance makes firms appear more creditworthy, and they are rewarded with greater access to financing, and they have a lower probability of facing financial distress. Chiaramonte et al (2022) also examine the effect of environmental, social and governance (ESG) scores on bank stability. They analyze European banks in 21 countries during the 2005 to 2017 period and find that the ESG scores reduce bank fragility during periods of financial distress and the stabilizing effect is stronger among banks with higher ESG ratings.

Nguyen (2022) examines the role of audit committee structure and effectiveness in influencing bank stability. They find that banks that have smaller audit committees and whose members are independent are more effective and have higher bank stability. The result indicates that audit committee effectiveness has a positive effect on bank stability. They also

find that the relationship between bank stability and audit committee effectiveness depends on the soundness of banks and the quality of institutions in each country. Karkowska and Acedański (2020) focus on the effect of bank's board structure and quality on its incentive to take risks which also impact bank stability. They examine board structure in terms of board size, board independence, and board members' affiliations, while they examine board quality in terms of board member experience, background, and skills. They analyze 239 commercial and publicly traded banks from 40 countries during the 1997 to 2016 period and find a negative relationship between board size and bank risk-taking. They conclude that an independent board constrained bank risk-taking which improved bank stability.

Ahamed and Mallick (2019) examine the effect of financial inclusion on bank stability using a sample of 2,913 banks from 87 countries during the 2004 to 2012 period. They were concerned about whether the global policy effort to accelerate greater financial inclusion is beneficial for bank stability. They find that higher level of financial inclusion leads to greater bank stability and the positive effect is pronounced in countries that are politically stable and in countries that have strong rule of law and a strong regulatory environment. Wang and Luo (2022) also examine the effect of financial inclusion on bank stability using data obtained from 36 emerging economies. They find that financial inclusion increases bank stability and the relationship between financial inclusion and bank stability is conditional on the state of the business cycle, and the quality of government policy environment. The literature has also considered the role of central bank digital currency in influencing financial stability. Kim and Kwon (2023) consider the case of a central bank digital currency (CBDC) and its effect on financial stability using a monetary general equilibrium model. They show that a renumerated CBDC leads to decrease in bank credit supply, and a decrease in available bank deposits. This increases the risk of a bank panic and may trigger a bank run when banks exhaust their available cash reserves; thereby leading to financial instability.

Although existing studies document the above determinants of financial stability, the studies that identify financial inclusion, inflation and loan-to-deposit ratio as determinants of financial stability are not abundant in the literature. Therefore, this study extends the literature by re-examining the determinants of financial stability with particular focus on financial inclusion, inflation and loan-to-deposit ratio as determinants of financial stability. Furthermore, considering the recent US banking crisis which increased the attention of bank

supervisors to the role of inflation and other factors in causing the crisis, there is a need to assess how these factors affect financial stability in different regional contexts and during a recession.

3. Methodology

3.1. Sample characteristics

The study used annual data obtained from the global financial development indicators (GFDI) and the world development indicators (WDI) of the world bank (see table 1). Data were obtained for sixty-one countries that have substantial available data, and the resulting final sample is an unbalanced panel data covering the period from 2009 to 2021. The countries in the sample are Afghanistan, Argentina, Bangladesh, Benin, Botswana, Brazil, Burkina Faso, Cabo Verde, Cameroon, Costa Rica, Cote d'Ivoire, Croatia, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Eswatini, Georgia, Ghana, Guinea, Israel, Italy, Kuwait, Kyrgyz Republic, Latvia, Lebanon, Lesotho, Libya, Madagascar, Malawi, Mali, Malta, Moldova, Namibia, Nicaragua, Niger, Nigeria, North Macedonia, Pakistan, Paraguay, Philippines, Poland, Qatar, Rwanda, Saudi Arabia, Senegal, Seychelles, Singapore, Tajikistan, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Uzbekistan, Zambia and Zimbabwe.

The descriptive statistics for the regions and the full sample is reported in table 2. The Asian region had the highest (mean) financial inclusion index (FID) while the African region had the lowest financial inclusion index. The region with the highest level of financial stability is the Asian region while the European region had a much lower level of financial stability measured by the zscore. In terms of the inflation rate, the African region has a high inflation rate while the European region has a low inflation rate. Regarding the loan-to-deposit ratio, the Americas region has a high loan-to-deposit ratio while the African region has a low loan-to-deposit rate.

The Pearson correlation matrix in table 3 shows that the FS variable is significant and positively correlated with the FID variable which indicates that high level of financial inclusion is correlated with greater financial stability. In contrast, the FS variable is significant and

negatively correlated with the LDR, INF and EFF variables which indicates that high inflation, low bank efficiency and a high loan-to-deposit ratio are correlated with greater financial fragility. Meanwhile, the FS variable is significant and positively correlated with the GDG and UNEMP variables which indicates that high economic growth and high unemployment rate are significantly correlated with high financial stability. Overall, the correlation coefficient between the dependent and independent variables are below 0.20 which indicates that multicollinearity is not a problem in the empirical analysis.

Table 1. Variable description

Variable	*Indicator Name*	*Short definition*	*Source*
FID	Financial inclusion index	The financial inclusion index is constructed using three financial inclusion variables: the number of bank accounts per 1,000 adults, number of automated teller machines per 100,000 adults, and number of commercial bank branches per 100,000 adults. The financial inclusion index is constructed using the principal component analysis method.	Author
LDR	Bank loan-to-deposit ratio (%)	The financial resources provided to the private sector by domestic money banks as a share of total deposits.	GFDI, World Bank database
FS	Bank Z-score	It measures financial stability. It captures the probability of default of a country's commercial banking system. A high Z-score means low probability of banking sector insolvency and higher financial stability.	GFDI, World Bank database
INF	Inflation rate	Inflation rate, measured by the annual growth rate of the gross domestic product implicit deflator, shows the rate of price change in the economy as a whole. The gross domestic product implicit deflator is the ratio of gross domestic product in current local currency to gross domestic product in constant local currency.	WDI, World Bank database
EFF	Bank cost to income ratio	Operating expenses of a bank as a share of sum of net-interest revenue and other operating income.	GFDI, World Bank database
GDG	Gross domestic product growth (annual %)	Annual percentage growth rate of gross domestic product at market prices based on constant local currency.	WDI, World Bank database
UNEP	Unemployment, total (% of total labor force) estimate)	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	WDI, World Bank database

Source: World Bank database

Table 2. Descriptive statistics

S/N	Countries	Region	FS	FID	LDR	INF	EFF	GDG	UNEP
			Mean	Mean	Mean	Mean	Mean	Mean	Mean
1	Afghanistan	Asia	19.86	-0.29	27.36	4.00	71.73	3.51	9.50
2	Argentina	Americas	7.93	-0.23	70.61	32.72	56.57	0.65	8.34
3	Bangladesh	Asia	15.92	-0.26	90.68	7.61	46.09	6.27	4.44
4	Benin	Africa	12.06	-0.28	78.38	1.69	66.13	4.70	1.71
5	Botswana	Africa	8.43	-0.25	74.15	5.84	53.94	2.79	19.12
6	Brazil	Americas	15.96	-0.20	104.22	7.17	61.49	1.22	10.04
7	Burkina Faso	Africa	9.49	-0.29	83.31	2.01	55.36	5.55	4.37
8	Cabo Verde	Africa	21.01	-0.16	70.87	1.13	67.62	1.02	12.19
9	Cameroon	Africa	10.00	-0.29	82.59	1.73	60.71	3.77	3.74
10	Costa Rica	Americas	19.68	-0.20	194.45	4.09	66.55	3.12	9.69
11	Cote d'Ivoire	Africa	17.99	-0.28	80.58	1.93	64.86	5.69	4.10
12	Croatia	Europe	7.64	-0.14	93.78	1.18	54.79	0.63	11.97
13	Djibouti	Africa	13.08	-0.28	36.09	1.06	59.39	5.42	26.42
14	Dominican Republic	Americas	33.40	-0.24	108.94	4.53	69.47	4.84	6.49
15	Ecuador	Americas	10.45	-0.24	94.20	2.37	67.41	2.92	4.00
16	Egypt	Africa	20.32	-0.27	41.61	12.61	38.21	3.81	10.69
17	El Salvador	Americas	23.09	-0.24	98.17	1.93	55.99	2.05	4.50
18	Estonia	Europe	10.00	-0.19	123.00	2.94	48.31	2.03	8.52
19	Eswatini	Africa	24.36	-0.26	80.76	4.81	58.34	2.47	26.59
20	Georgia	Europe	8.33	-0.18	141.23	5.45	49.61	4.16	16.30
21	Ghana	Africa	13.23	-0.27	61.74	16.89	52.56	6.01	4.09
22	Guinea	Africa	24.00	-0.29	49.21	7.46	62.88	5.39	5.14
23	Israel	Asia	30.62	-0.19	90.80	1.63	65.52	3.82	5.73
24	Italy	Europe	13.56	-0.13	106.39	1.15	69.56	-0.23	10.31
25	Kuwait	Asia	17.08	-0.21	99.23	1.45	33.99	0.75	2.36
26	Kyrgyz Republic	Asia	16.51	-0.26	103.11	8.25	65.97	3.30	3.48
27	Latvia	Europe	6.81	-0.19	124.02	1.67	56.22	1.00	11.43
28	Lebanon	Asia	19.36	-0.21	37.47	21.24	49.76	-0.49	9.47
29	Lesotho	Africa	18.47	-0.28	54.87	5.96	57.85	1.02	16.56
30	Libya	Africa	36.85	-0.25	21.83	10.54	54.32	1.68	19.31
31	Madagascar	Africa	15.25	-0.29	72.30	7.03	56.24	1.86	2.39
32	Malawi	Africa	17.23	-0.29	61.58	14.05	54.48	4.45	5.05
33	Mali	Africa	14.64	-0.28	99.24	3.17	65.56	3.89	1.95
34	Malta	Europe	21.59	-0.16	78.58	2.24	52.99	5.52	5.17

35	Moldova	Europe	8.99	-0.14	75.94	7.85	57.13	3.24	1.81
36	Namibia	Africa	24.82	-0.23	89.51	5.52	53.43	2.09	20.45
37	Nicaragua	Americas	20.17	-0.27	90.89	5.74	52.78	3.07	5.58
38	Niger	Africa	15.11	-0.29	107.43	2.10	53.27	5.28	0.80
39	Nigeria	Africa	15.74	-0.26	68.10	8.35	80.76	3.57	4.43
40	North Macedonia	Europe	10.23	-0.20	97.75	2.48	54.06	1.99	25.38
41	Pakistan	Asia	10.77	-0.27	54.33	8.18	59.20	3.71	3.14
42	Paraguay	Americas	15.92	-0.26	150.89	3.77	58.54	3.54	5.52
43	Philippines	Asia	21.17	-0.26	63.84	2.26	56.94	4.75	3.11
44	Poland	Europe	9.10	-0.17	93.78	2.18	55.59	3.50	6.81
45	Qatar	Asia	22.70	-0.23	90.06	-0.33	26.95	5.14	0.25
46	Rwanda	Africa	20.41	-0.28	103.01	4.20	63.00	6.56	11.97
47	Saudi Arabia	Asia	21.37	12.36	140.49	1.89	35.44	3.06	5.91
48	Senegal	Africa	15.26	-0.28	90.81	1.06	65.26	4.54	3.97
49	Seychelles	Africa	14.63	-0.11	41.20	4.08	43.03	3.63	-
50	Singapore	Asia	31.65	-0.21	97.70	1.61	40.21	4.29	4.05
51	Tajikistan	Asia	14.81	-0.26	135.76	7.17	53.26	6.79	11.61
52	Thailand	Asia	7.53	-0.21	98.11	1.64	46.00	2.40	0.78
53	Togo	Africa	9.74	-0.28	78.57	1.42	67.87	5.10	2.45
54	Tunisia	Africa	32.21	-0.22	130.33	5.46	48.60	1.38	15.80
55	Turkey	Asia & Europe	10.73	-0.20	112.52	10.99	43.11	5.16	11.26
56	Uganda	Africa	14.75	-0.29	77.30	10.79	58.17	5.13	3.17
57	Ukraine	Europe	5.14	-0.21	123.36	15.81	56.87	-1.08	8.70
58	Uruguay	Americas	6.47	-0.22	59.15	8.84	68.51	2.44	7.75
59	Uzbekistan	Asia	9.21	-0.18	146.17	18.24	59.61	6.46	5.18
60	Zambia	Africa	9.68	-0.28	59.41	10.55	63.73	4.74	7.19
61	Zimbabwe	Africa	5.71	-0.27	64.83	97.20	65.70	5.76	6.23

Regional (mean)	FS	FID	LDR	INF	EFF	GDG	UNEP
African region	16.92	-0.26	72.83	9.03	58.97	3.94	9.24
European region	10.19	-0.18	106.27	4.90	54.39	2.36	10.69
Asian region	17.53	0.52	94.79	6.29	50.35	3.89	6.01
Americas region	16.61	-0.23	111.77	8.15	63.14	2.57	6.98

Overall statistics:	FS	FID	LDR	INF	EFF	GDG	UNEP
Mean	16.03	-0.016	88.08	7.55	56.62	3.44	8.14

Median	15.35	-0.24	87.21	3.91	56.82	3.92	5.86
Maximum	66.63	14.47	261.88	604.94	202.04	86.82	34.15
Minimum	2.69	-0.29	14.72	-25.95	23.21	-50.33	0.10
Std. Dev.	7.74	1.66	35.62	26.50	13.84	6.22	6.54
Observations	765	745	764	788	767	788	780

Source: Author's computation

Table 3. Correlation analysis

Variable	FS	FID	LDR	INF	EFF	GDG	UNEP
FS	1.000						

FID	0.068*	1.000					
	(0.07)	-----					
LDR	-0.063*	0.173***	1.000				
	(0.09)	(0.00)	-----				
INF	-0.113***	-0.032	-0.121***	1.000			
	(0.00)	(0.41)	(0.002)	-----			
EFF	-0.161***	-0.207***	-0.102**	0.003	1.000		
	(0.00)	(0.00)	(0.01)	(0.92)	-----		
GDG	0.028	-0.004	-0.048	-0.068*	-0.0002	1.000	
	(0.45)	(0.91)	(0.21)	(0.07)	(0.99)	-----	
UNEP	0.096**	-0.036	0.041	0.0002	0.021	-0.105**	1.000
	(0.01)	(0.34)	(0.29)	(0.99)	(0.56)	(0.01)	-----

***, **, * represent 1%, 5% and 10% significance levels. P-values are reported in parenthesis. FS = financial stability indicator. FID = financial inclusion index. INF = inflation rate. EFF = bank cost to income ratio. LDR = loan-to-deposit ratio. GDG = gross domestic product growth. UNEP = total unemployment rate.

3.2. Empirical model and estimation procedure

To estimate the determinants of financial stability, we use a model similar to the models used in Ahamed and Mallick (2019), Kim et al (2020) and Elnahass et al (2022). In our model, financial stability is a function of the level of financial inclusion, the inflation rate and the loan-to-deposit ratio alongside other control variables, as shown below.

$$FSi,t = \beta 0 + \beta 1FIDi,t + \beta 2INFi,t + \beta 3LDRi,t + \beta 4EFFi,t + \beta 5GDGi,t + \beta 6UNEP + ei,t \ldots\ldots\ldots Eq\ (1)$$

Where i,t represents country and year. FS variable is the financial stability indicator. FID variable is the financial inclusion index. INF variable is the inflation rate. EFF variable is the bank cost to income ratio. LDR variable is the loan-to-deposit ratio. GDG variable is the economic growth rate. UNEP variable is the total unemployment rate. εit is the error term.

Regarding the estimation procedure, the estimation method used to estimate the financial stability model is the Arellano and Bond (1991) Generalized-Method-of-Moments (GMM) first difference estimator for dynamic panel estimation. The first difference GMM addresses three major econometric issues in the dataset. The first issue is the presence of unobserved country-specific effects, which is eliminated by taking the first-difference of the variables. The second issue is the autoregressive process in the data regarding the changing nature of financial stability, i.e., the need to use a lagged dependent variable as an explanatory variable to capture the dynamic nature of financial stability. The third issue is the likely endogeneity of the explanatory variables with the error term. In the GMM estimation, we use instrumental variables corresponding to the lagged endogenous variable up to two-year lag and the one-year lag of the explanatory variables. We also report the Sargan test for the validity of the GMM instruments as well as the AR(1) and AR(2) test for the presence of first-order and second-order serial correlation in the first-difference residuals.

3.3. Justification of the variables

The financial stability variable is the dependent variable. It is measured using the Z-score. The Z-score is widely used as a measure of financial stability in the banking and finance literature (Hou, 2023; Ozili and Iorember, 2024; Ullah et al, 2023).

Regarding the explanatory variables, the FID variable is the financial inclusion index which is constructed from the principal component analysis of three financial inclusion indicators namely the number of bank accounts per 1,000 adults, the number of automated teller machines per 100,000 adults and the number of commercial bank branches per 100,000 adults. The financial inclusion index is widely used in the literature to measure the level of financial inclusion (see Li and Wang, 2023; Ozili et al, 2023). In the literature, it is argued that a high level of financial inclusion will increase the deposit base of banks, increase their deposit funding, and make banks become more resilient to shocks, thereby maintaining bank stability and financial stability (Hannig and Jansen, 2010; Khan, 2011; Han and Melecky, 2013). Therefore, a positive relationship between financial inclusion and financial stability is expected. The INF variable is the inflation rate which captures the rate of price change in the economy as a whole. It is measured by the gross domestic product implicit deflator which is the ratio of gross domestic product in current local currency to gross domestic product in constant local currency. Generally, high inflation increases the risk of bank stress. It can cause hidden vulnerabilities in the banking sector to surface if inflation is high and persistent, and when the central bank raise interest rate to combat high inflation, the hike in rates can plunge financial institutions into a crisis and lead to financial instability (Abbate et al, 2023). Therefore, a negative relationship between inflation and financial stability is expected. The LDR variable is the loan-to-deposit ratio. A high LDR ratio indicates that banks are giving out more loans from the deposits they receive, and these loans are channeled to households and firms for consumption and investment (Hodula and Poloucek, 2017). A high LDR ratio signals greater loan intensity. It enhances credit provision and decreases the risk of a credit crunch that could trigger a financial crisis (Hodula and Poloucek, 2017). Therefore, a positive relationship between the loan-to-deposit ratio and financial stability is expected.

We also introduced three control variables into the model, namely the efficiency ratio, economic growth rate and the total unemployment rate. The EFF variable is the cost-to-income ratio which measures banking sector efficiency. Intuitively, efficient banks are safer

and more stable because they have lower costs and high income, which makes them resilient to shocks and more stable (Kasman and Carvallo, 2014). A negative relationship between the cost-to-income ratio and financial stability is expected. The GDG variable, which is the economic growth rate, is expected to have a positive complementary effect on financial stability. This is because, in good economic times, banks receive more patronage from households, firms and debtors. This leads to higher business activity and greater income for banks which translates to higher profitability and greater financial stability (Ozili and Iorember, 2024). The UNEP variable, which is the total unemployment rate, is expected to have a negative effect on financial stability. This is because high unemployment is associated with low incomes which reduces households' ability to borrow from banks. This, in turn, can adversely affect bank lending and lead to a decline in bank interest income from loans and a decrease in profitability which can threaten the stability of banks (Ozili, 2025b).

4. Empirical Result

4.1. Full sample analysis: first-difference GMM estimations

The full sample GMM result in table 4 shows that the FS_{lag} variable is positive and statistically significant. The positive sign on the coefficient of the lagged FS variable indicates that stronger financial stability in the previous period is accompanied by stronger financial stability in the subsequent period. This indicates the persistence of financial stability. The LDR variable is significant and positively related to the FS variable which indicates that a high loan-to-deposit ratio increases financial stability. This result supports the expectation of a positive relationship between LDR and financial stability (Hodula and Poloucek, 2017). An explanation for this is that banks give out more loans from the deposits they receive, and it enhances credit provision and decreases the risk of a credit crunch that could trigger a financial crisis (Hodula and Poloucek, 2017). In contrast, the FID, INF, EFF, GDG and UNEP variables are statistically insignificant in the full sample result.

4.2. Regional sub-sample analyses: first-difference GMM estimation

Next, we undertake regional analyses to account for regional characteristics that may influence the determinants of financial stability. The literature shows that each region has unique characteristics that may influence financial stability, such as differences in financial sector development, differences in banking regulation, and differences in supervisory frameworks, which are not directly observable from the data (Vagizova et al, 2013; Vo et al, 2021). Such characteristics can be accounted for by dividing the full sample into four regional sub-samples, namely, the African countries sub-sample, European countries sub-sample, Asian countries sub-sample, and the Americas countries sub-sample which comprises of countries in North America and South America.

The African countries subsample result in table 4 reveals that the FS_{lag} variable is positive and statistically significant. The positive sign on the coefficient of the lagged FS variable indicates that stronger financial stability in the previous period is accompanied by stronger financial stability in the subsequent period. This signals the persistence of financial stability in African countries. The GDG variable is significant and negatively related to the FS variable. This indicates that a high economic growth rate does not significantly improve financial stability in African countries.

In the European countries subsample analysis, the FS_{lag} variable is positive and statistically significant. The positive sign on the coefficient of the lagged FS variable indicates that stronger financial stability in the previous period is accompanied by stronger financial stability in the subsequent period. This signals the persistence of financial stability in European countries. The FID variable is significant and negatively related to the FS variable. This indicates that a high level of financial inclusion does not improve financial stability in European countries. The result is inconsistent with the expectation of a positive relationship between the FID and FS variables as shown in Hannig and Jansen (2010), Khan (2011), and Han and Melecky (2013). The UNEMP variable is significant and positively related to the FS variable, indicating that high unemployment does not impair financial stability in European countries. The EFF variable is significant and negatively related to the FS variable. This indicates that greater cost efficiency (i.e., a low cost-to-income ratio) leads to greater financial stability in European countries. An explanation for this might be that efficient European banks can lower their costs and increase

their income, which makes them resilient to shocks and therefore financially stable (Kasman and Carvallo, 2014). The LDR variable is positively significant. This indicates that a high loan-to-deposit ratio increases financial stability in European countries. This result implies that European banks give out more loans from the deposits they receive, and it enhances credit provision and decreases the risk of a credit crunch that could trigger a financial crisis (Hodula and Poloucek, 2017).

In the Asian countries subsample analysis, the FS_{lag} variable is positive and statistically significant. The positive sign on the coefficient of the lagged FS variable indicates that stronger financial stability in the previous period is accompanied by stronger financial stability in the subsequent period. This signals the persistence of financial stability in Asian countries. The EFF variable is significant and negatively related to the FS variable. This indicates that greater cost efficiency leads to greater financial stability in Asian countries. An explanation for this might be that efficient Asian banks decrease their costs and increase their income, which makes them more profitable, resilient to shocks and therefore financially stable (Kasman and Carvallo, 2014). The GDG variable is also significant and positively related to the FS variable indicating that a high economic growth rate improves financial stability in Asian countries. This result is supported by the findings of Ozili and Iorember (2024).

In the Americas subsample analysis, the FS_{lag} variable is positive and statistically significant. The positive sign on the coefficient of the lagged FS variable indicates that stronger financial stability in the previous period is accompanied by stronger financial stability in the subsequent period. This signals the persistence of financial stability in the Americas countries. The FID variable is significant and negatively related to the FS variable. This indicates that a high level of financial inclusion does not improve financial stability in the Americas countries. The GDG variable is also significant and positively related to the FS variable indicating that a high economic growth rate improves financial stability in countries in the Americas region. The UNEMP variable is significant and positively related to the FS variable, indicating that high unemployment does not impair financial stability in the Americas region. The EFF variable is significant and negatively related to the FS variable which indicates that greater cost efficiency leads to greater financial stability in the Americas region. An explanation for this might be that efficient banks can lower their costs and increase their income, which makes them resilient to shocks and therefore financially stable (Kasman and Carvallo, 2014). The LDR

variable is positively significant and indicates that a high loan-to-deposit ratio increases financial stability in the Americas region, implying that a high loan-to-deposit ratio enhances credit provision and decreases the risk of a credit crunch that could trigger a financial crisis (Hodula and Poloucek, 2017).

Table 4. Difference-GMM full sample and regional analyses of financial stability determinants

Variable	Full sample	Africa Region	Europe region	Asia region	Americas region
FS_{lag}	0.194***	0.137**	0.342***	0.413***	0.463***
	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)
FID	0.229	-44.154	-29.154**	0.607	-45.176***
	(0.74)	(0.25)	(0.01)	(0.27)	(0.00)
INF	-0.002	-0.009	-0.046	0.016	0.015
	(0.62)	(0.35)	(0.12)	(0.44)	(0.80)
LDR	0.024**	0.016	0.019**	0.002	0.034*
	(0.04)	(0.57)	(0.01)	(0.82)	(0.05)
EFF	-0.028	-0.052	-0.058***	-0.062**	-0.045
	(0.32)	(0.22)	(0.00)	(0.01)	(0.19)
GDG	-0.009	-0.054***	-0.006	0.107***	0.074**
	(0.49)	(0.00)	(0.82)	(0.00)	(0.04)
UNEP	0.118	0.181	0.126**	-0.004	0.427**
	(0.36)	(0.46)	(0.02)	(0.98)	(0.01)
J-Statistic	154.19	117.09	83.09	87.89	74.29
P(J-Statistic)	0.0001	0.0001	0.064	0.031	0.028
AR(1)	0.000	0.009	0.000	0.000	0.004
AR(2)	0.294	0.002	0.138	0.693	0.175
Country fixed effect	Difference	Difference	Difference	Difference	Difference

The p-values are in parenthesis. Regression coefficients are reported above the p-values. ***, **, * represent statistical significance at the 1%, 5% and 10% levels. The GMM instruments are the lagged dependent variable and the one-year lag of the explanatory variables. Difference-country fixed effect is applied in the estimation

4.3. Interaction analysis: first-difference GMM estimation

Next, we examine the joint interaction effect of inflation, financial inclusion and the loan-to-deposit ratio on financial stability in table 5. The FID*INF coefficient is positively significant in the full sample, the African and Americas countries subsamples. This result indicates that a high level of financial inclusion improves financial stability in high inflation environments particularly in African and Americas countries. The FID*LDR coefficient is positively significant in the full sample, implying that countries that have a high level of financial inclusion, and whose banking sector have a high loan-to-deposit ratio, are financially stable. The INF*LDR coefficient is negatively significant in the African and Americas countries subsamples, implying that African and Americas countries that have a high inflation rate, and whose banking sector have a high loan-to-deposit ratio, are less financially stable. The FID*INF*LDR coefficient is negatively significant in the full sample and in the African and Americas countries subsamples, implying that African and Americas countries that have high financial inclusion and inflation rates and whose banking sector have a high loan-to-deposit ratio are less financially stable.

Table 5. Difference-GMM interaction analyses of financial stability determinants					
Variable	Full sample	Africa Region	Europe region	Asia region	Americas region
FS_{lag}	0.186**	0.003	0.364***	0.424***	0.414***
	(0.01)	(0.96)	(0.00)	(0.00)	(0.00)
FID*INF	**0.590****	**15.952*****	3.757	-0.052	**13.098***
	(0.01)	**(0.00)**	(0.29)	(0.78)	**(0.08)**
FID*LDR	**0.222***	0.710	0.297	-0.0001	0.785
	(0.06)	(0.52)	(0.37)	(0.98)	(0.12)
INF*LDR	-0.0003	-0.051**	-0.007	-0.001	-0.029**
	(0.63)	(0.01)	(0.39)	(0.52)	(0.04)
FID*INF*LDR	-0.004**	-0.185**	-0.034	0.0004	-0.123**
	(0.01)	(0.01)	(0.37)	(0.78)	(0.04)
FID	-3.801*	-70.788	-52.36*	0.869	-164.225***
	(0.09)	(0.43)	(0.10)	(0.63)	(0.00)
INF	0.125*	4.372***	0.713	-0.048	3.019*
	(0.06)	(0.00)	(0.35)	(0.59)	(0.08)
LDR	0.025**	0.207	0.074	-0.003	0.209*
	(0.04)	(0.48)	(0.23)	(0.77)	(0.06)
EFF	-0.029	-0.102**	-0.061***	-0.056**	-0.051
	(0.30)	(0.01)	(0.00)	(0.02)	(0.13)
GDG	-0.013	-0.031*	-0.002	0.109***	0.064*
	(0.34)	(0.09)	(0.93)	(0.00)	(0.08)
UNEP	0.039	0.195	0.096*	0.002	0.404**
	(0.78)	(0.39)	(0.08)	(0.99)	(0.04)
J-Statistic	136.77	111.75	83.45	83.38	70.039
P(J-Statistic)	0.0001	0.0003	0.061	0.062	0.058
AR(1)	0.000	0.027	0.000	0.000	0.003
AR(2)	0.109	0.015	0.127	0.671	0.372
Country fixed effect	Difference	Difference	Difference	Difference	Difference

The p-values are in parenthesis. Regression coefficients are reported above the p-values. ***, **, * represent statistical significance at the 1%, 5% and 10% levels. The GMM instruments are the lagged dependent variable and the one-year lag of the explanatory variables. Difference-country fixed effect is applied in the estimation

4.4. Moderation effect of economic recession

We perform additional sensitivity test to determine whether financial inclusion and lending intensity improve financial stability during an economic recession. The literature show that financial systems tend to be unstable during a recession (Nayyar, 2011; Vidal, 2021), however, the literature has not considered whether financial inclusion can improve financial system stability during a recession. We extend the literature by examining whether financial inclusion and lending intensity improve financial stability in recessionary times. We introduced the REC dummy variable that takes the value of one if the economic growth variable (GDG) is negative and zero otherwise, reflecting economic downturns or recessionary periods. We interact the REC variable with the FID and LDR variables to detect whether financial inclusion and lending intensity improve financial stability in recessionary times. The results are reported in table 6.

The FID*REC coefficient is negative and significant in the Asian countries subsample. This indicates that financial inclusion does not improve financial stability during a recession in Asian countries. This implies that recessions hinder financial inclusion from positively improving financial stability. The REC coefficient is also negative and significant in the Asian countries subsample. This indicates that a recession impairs financial stability in Asian countries. The LDR*REC coefficient is positive and significant in the African countries subsample. This indicates that greater lending intensity (or a high loan-to-deposit ratio) improves financial stability during a recession in Africa countries. This result suggests that policymakers in African countries should encourage banks to increase lending during a recession to improve financial stability. The REC coefficient is also negative and significant in the African countries subsample. This indicates that a recession also impairs financial stability in African countries.

Table 6. Moderating role of economic recession: Difference-GMM analyses of financial stability determinants

Variable	Full sample	Africa Region	Europe region	Asia region	Americas Region	Full sample	Africa Region	Europe region	Asia region	Americas region
FS_{lag}	0.304***	0.131**	0.334***	0.395***	0.456***	0.286***	0.170***	0.341***	0.407***	0.455***
	(0.00)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
FID*REC	-15.207	-2.989	6.880	-26.513**	-7.069					
	(0.14)	(0.86)	(0.43)	(0.03)	(0.58)					
LDR*REC						-0.013	0.089***	0.004	-0.002	0.007
						(0.31)	(0.00)	(0.72)	(0.89)	(0.52)
REC	-4.653**	-0.082	0.971	-5.796**	-1.740	0.062	-6.569***	-0.625	0.536	-1.023
	(0.04)	(0.98)	(0.54)	(0.04)	(0.56)	(0.96)	(0.00)	(0.61)	(0.65)	(0.53)
FID	0.489	-53.489	-31.009**	0.704	-44.747***	0.348	-22.571	-29.396**	0.721	-45.725**
	(0.44)	(0.17)	(0.01)	(0.18)	(0.00)	(0.61)	(0.56)	(0.01)	(0.19)	(0.01)
INF	-0.002	-0.008	-0.047	0.014	-0.002	-0.003	-0.003	-0.045	0.014	0.022
	(0.62)	(0.42)	(0.11)	(0.51)	(0.97)	(0.58)	(0.72)	(0.13)	(0.47)	(0.77)
LDR	0.014	0.015	0.019**	0.0001	0.031*	0.017	0.014	0.018**	0.003	0.030*
	(0.23)	(0.59)	(0.01)	(0.99)	(0.08)	(0.55)	(0.59)	(0.02)	(0.74)	(0.09)
EFF	-0.027	-0.051	-0.055***	-0.062***	-0.052	-0.027	-0.018	-0.057***	-0.061**	-0.051
	(0.35)	(0.24)	(0.00)	(0.00)	(0.15)	(0.31)	(0.66)	(0.00)	(0.01)	(0.15)
GDG	-0.053***	-0.058***	-0.019	0.129***	0.059	-0.047**	-0.047**	-0.019	0.133**	0.049
	(0.00)	(0.00)	(0.62)	(0.00)	(0.39)	(0.02)	(0.01)	(0.64)	(0.01)	(0.50)
UNEP	0.143	0.192	0.128**	-0.091	0.399**	0.160	0.014	0.127**	-0.013	0.384**
	(0.28)	(0.44)	(0.02)	(0.57)	(0.02)	(0.22)	(0.95)	(0.02)	(0.94)	(0.02)
J-Statistic	139.77	114.08	81.69	81.16	76.11	149.84	111.97	82.11	86.78	74.61
P(J-Statistic)	0.0001	0.0002	0.079	0.085	0.0204	0.000	0.000	0.074	0.036	0.027
AR(1)	0.000	0.008	0.000	0.000	0.004	0.000	0.0001	0.0001	0.0003	0.004
AR(2)	0.105	0.001	0.138	0.712	0.139	0.162	0.083	0.159	0.731	0.139
Country fixed effect	Difference	Difference	Difference	Difference	Difference	Difference	Difference	Difference	Difference	Difference

The p-values are in parenthesis. Regression coefficients are reported above the p-values. ***, **, * represent statistical significance at the 1%, 5% and 10% levels. The GMM instruments are the lagged dependent variable and the one-year lag of the explanatory variables. Difference-country fixed effect is applied in the estimation

4.5. Explaining the heterogenous effects of LDR on financial stability

The results in tables 4 to 6 showed that the loan-to-deposit ratio has heterogenous effects on financial stability in the regions. This may be explained by the differences in banking regulations and the structural characteristics of the banking system across regions. Firstly, regulatory differences may be responsible for the heterogeneous effects of LDR on financial stability. This is because certain regional blocs, like the European Union and the United States, have strict regulations, e.g., Basel regulation, that require banks to keep a high loan-to-deposit ratio to encourage greater bank lending to the economy. Such strict regulations encourage extensive bank lending by compelling banks to give out more loans to households and firms and ensuring that banks issue loans to borrowers from different industries to ensure that banks' loan portfolios are well-diversified, thereby mitigating credit risk and improving financial stability. However, in other regions where banks operate in a high-risk business environment, the loan-to-deposit ratio of banks is not strictly regulated, and which gives banks the opportunity decrease their loan-to-deposit ratio to minimise nonperforming loans and improve bank stability. Secondly, structural characteristics of the banking system, such as bank competition and bank concentration, may also explain the heterogenous effects of the loan-to-deposit ratio on financial stability across the regions. Some regional banking environments are more competitive than other regional banking environments. Banks operating in competitive regional banking environments tend to have a higher loan-to-deposit ratio as they compete with rival banks for borrowers in loan markets to increase their profitability and maintain bank stability. In contrast, banks operating in a less competitive regional banking environment tend to have a lower loan-to-deposit ratio and they are still able to maintain bank stability.

5. Conclusion

Recent banking crisis, such as the 2023 United States banking crisis, have led financial regulators and bank supervisors around the world to be more vigilant and increase their search for non-traditional determinants of financial stability in order to identify and mitigate risks to financial system stability. We join the search for the non-traditional determinants of financial stability and investigate whether the level of financial inclusion, the loan-to-deposit ratio and the rate of inflation are significant factors influencing financial stability while controlling for banking sector efficiency ratio, the rate of economic growth and unemployment rate. We extend the literature by linking inflation and financial inclusion to financial stability. We analysed our data using the first-difference GMM regression method.

The findings revealed that stronger financial stability in the previous period is followed by stronger financial stability in the subsequent period in all regions, signalling the persistence of financial stability. The loan-to-deposit ratio improves financial stability in European and Americas countries. We also found that financial inclusion improves financial stability in high inflation environments particularly in African and Americas countries. High levels of financial inclusion impair financial stability during a recession particularly in Asian countries. Furthermore, African banks with a high loan-to-deposit ratio are more financially stable during a recession. Also, Americas and African countries that have a combined high financial inclusion and inflation rates and whose banking sector have a high loan-to-deposit ratio are less financially stable, indicating that high inflation hinders financial inclusion and the loan-to-deposit ratio from improving financial stability.

The policy implication of the findings is that financial regulators and bank supervisors should pay closer attention to how inflation, the level of financial inclusion and the loan-to-deposit ratio affect financial stability especially during a recession. We found evidence that financial inclusion did not improve financial stability during recession while the loan-to-deposit ratio improves financial stability during recession. This suggests that policymakers should strengthen loan-to-deposit regulations, rather than focus on strengthening financial inclusion initiatives during bad times, since the loan-to-deposit ratio has a more significant effect on financial stability in bad times. **It is also recommended that financial regulators and bank supervisors should use regional stress tests and big data-based early warning indicators to monitor the emerging and non-traditional determinants of financial stability.**

The findings of this study contribute to ongoing debate about the non-traditional determinants of financial stability, some of which are often ignored, but could lead to adverse consequences if the risks they pose materialize. Our findings add to this debate by showing that inflation and financial inclusion, alongside bank efficiency and loan-to-deposit ratio, can influence financial stability, and their impact could be more severe in some regions relative to other regions. The insights we provide on the financial stability determinants can guide financial regulators and bank supervisors in their choice of policy tools to incorporate into their prudential regulatory and supervisory frameworks to preserve the stability of the financial system.

The study has some limitations. The first limitation is the choice of financial stability indicator. We used a specific and common measure of financial stability, the Z-score. We did not consider other measures of financial stability that may offer new insights. Another limitation is the choice of financial stability determinants. In the study, we focused on a narrow set of non-traditional determinants which are important. However, there may be other macroeconomic and bank-specific determinants that are equally important but were not considered in this study.

Future research can extend this study by investigating other determinants of financial stability. Future studies can also extend our study by examining other countries and additional measures of financial stability that may provide additional valuable insights to this line of research.

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