



The determinants of financial stability in Algerian commercial banks

محددات الاستقرار المالي للبنوك التجارية الجزائرية

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Received: 27/12/2025

Accepted: 31/12/2025

Published: 31/12/2025

ABSTRACT

This research aims to analyze the key determinants of financial stability in Algerian commercial banks. The objective is to assess the impact of several microeconomic variables (bank size, liquidity, profitability, credit risk) and macroeconomic variables (GDP, market structure) on banking stability. The empirical analysis is based on a sample of 19 commercial banks operating in Algeria over the period from 2011 to 2022. The methodology is grounded in panel data analysis, which allows for the consideration of both temporal and individual effects. The findings reveal that bank size and liquidity have a positive and significant impact on financial stability, while loan loss provisions and market structure exert a negative effect. On the other hand, profitability and GDP growth do not show a significant influence. These results highlight the importance of internal management factors, while also reflecting the structural characteristics of the Algerian banking system.

Key words: Financial Stability, Panel data, Determinants, Algerian commercial banks.

JEL Classification: G21, G28, C23

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تهدف هذه الدراسة إلى تحليل أهم محددات الاستقرار المالي للبنوك التجارية الجزائرية. ويتمثل الهدف في تقييم أثر المتغيرات الميكرو-اقتصادية، لاسيما حجم البنك السيولة، الربحية ومخاطر الائتمان إضافة إلى المتغيرات الماكرو-اقتصادية مثل الناتج المحلي الإجمالي وهيكل السوق على الاستقرار البنكي. وتعتمد الدراسة التطبيقية على عينة مكونة من 19 بنكاً تجارياً ينشط في الجزائر خلال الفترة الممتدة من 2011 إلى 2022. وتركز المنهجية المعتمدة على تحليل بيانات البانل، مما يسمح بأخذ البعدين الزمني والفردى للبنوك في الحسبان. وتبين النتائج أن حجم البنوك والسيولة لهما تأثير إيجابي ومعنوي على الاستقرار المالي في حين أن مخصصات خسائر القروض وهيكل السوق يؤثران سلباً عليه. في المقابل لم تُظهر الربحية ونمو الناتج المحلي الإجمالي تأثيراً معنوياً، وهو ما يعكس خصوصيات النظام البنكي الجزائري.

الكلمات المفتاحية: الاستقرار المالي، بيانات البانل (Panel Data)، المحددات، البنوك التجارية الجزائرية.

تصنيف JEL: G21، G28، C23.

1. Introduction

The banking system plays a central role in economic development through financial intermediation. However, this role cannot be fully ensured without sustainable financial stability. Past crises have shown that banks' stability depends on both internal factors, such as profitability, liquidity, credit risk, and bank size, and external factors, such as GDP, inflation, and market structure.

In the case of Algeria, the banking sector is characterized by the predominance of public banks, low financial inclusion, and governance that remains in need of improvement. The decline in oil prices in 2014 and the COVID-19 health crisis have further highlighted the need to assess banks' ability to remain stable in the face of economic and financial shocks.

Thus, it becomes essential to identify the factors that enable Algerian commercial banks to maintain their financial stability. Understanding these determinants is crucial not only for policymakers and regulators but also for investors and economic stakeholders, in order to strengthen the resilience of the banking system in the face of economic uncertainty.

The objective of this study is to analyze and assess the main determinants of the financial stability of Algerian commercial banks, taking into account both internal and external factors that may influence their soundness and resilience to economic shocks.

To address this objective, the study adopts a quantitative approach based on panel data analysis of a sample of Algerian commercial banks over the period 2011–2022, using appropriate econometric models.

This article is organized as follows: the first section presents a theoretical and empirical review of the literature on the determinants of bank stability. The second section is devoted to the methodological framework of the study. Finally, the third section focuses on model estimation and the interpretation of the results, followed by a conclusion.

2. Literature Review

The literature distinguishes two broad sets of factors influencing financial stability: internal microeconomic variables (such as size, profitability, liquidity, asset tangibility, diversification, credit risk, etc.) and macroeconomic variables (such as GDP, inflation, interest rates, financial inclusion, and market structure).

2.1. Microeconomic determinants

The empirical literature on microeconomic determinants of bank stability reports heterogeneous and sometimes contradictory findings. In particular, the impact of bank size remains inconclusive. Several studies (Mahat et al., 2018; Oduno & Orwaru, 2018; Kim et al., 2015; Kakes & Nijskens, 2018; Ali & Puah, 2019; Tsegaye, 2024) document a negative relationship, suggesting that large banks may adopt excessive risk-taking behaviors due to implicit guarantees associated with the “Too Big to Fail” phenomenon, thereby undermining financial stability. In contrast, other authors (Kasman & Kirbas-Kasman, 2013; Adusei, 2015; Mohammed, 2022) report a positive effect, arguing that larger institutions benefit from stronger capitalization, diversified activities, and reduced earnings volatility, which enhance their resilience.

Similarly, the role of credit risk in bank stability is not univocal. A substantial body of research (Abu Salim et al., 2022; Ismail & Ahmad, 2023; Ditta, 2024; Djebali & Zaghdoudi, 2020) finds that rising levels of non-performing loans significantly deteriorate banks' financial soundness. Nevertheless, other studies (My & Quoc, 2021; Setiawan et al., 2019) suggest that when credit risk is effectively monitored and controlled, it may contribute positively to stability by improving risk-adjusted returns.

The effect of income diversification also varies across studies. Some scholars (Susanto et al., 2024; Al-Habashneh et al., 2022) argue that reliance on non-interest income increases earnings volatility and thus weakens stability. Conversely, other research (Adam, 2022; Peng et al., 2018; Mussa et al., 2015; Nguyen et al., 2012; Safitria, 2023) highlights the stabilizing role of diversification through enhanced profitability and risk dispersion, while certain studies (Paltrinieri et al., 2020) report no statistically significant association.

Regarding liquidity, most empirical evidence supports the view that prudent liquidity management strengthens bank stability by improving the ability to meet short-term obligations (Izadkhah et al., 2022; Tran, 2024; Kashiramka, 2020; Tsegaye et al., 2024). However, excessive liquidity holdings or inefficient allocation may generate opportunity costs and operational inefficiencies, ultimately increasing vulnerability (Nguyen et al., 2024; Sulistyowati & Dwinanda, 2021).

Profitability is generally considered a stabilizing factor, as higher returns provide banks with internal buffers to absorb potential losses (Xu et al., 2019; Tsegaye, 2020; Le, 2020). Nonetheless, exceptionally high profitability may incentivize riskier strategies, which can offset its stabilizing effect (My & Quoc, 2019; Pessarossi et al., 2020).

Finally, asset tangibility, reflecting the proportion of tangible assets and capital intensity, is often associated with improved operational performance and greater resilience (Yitayaw, 2022; Gamlath, 2013), thereby supporting bank stability over the long term.

2.2. Macroeconomic determinants

Existing studies indicate that macroeconomic factors affect bank financial stability in a non-uniform and context-specific manner. Among these factors, economic growth, measured by GDP growth, is generally associated with improved bank stability. Expansion in economic activity tends to boost credit demand and enhance banks' profitability, thereby reinforcing their financial strength (Apoga et al., 2018; Kumlachew et al., 2022; Ashraf et al., 2022). Nevertheless, periods of excessive or unsustainable growth may induce aggressive lending strategies and heightened risk-taking, which can ultimately undermine stability (Ali & Puah, 2015).

Financial inclusion is also viewed as a potential stabilizing factor when its expansion is accompanied by adequate regulatory oversight. By broadening the customer base and diversifying revenue streams, inclusion can enhance the resilience of the banking sector (Shah Khan et al., 2021; Coullibaly, 2023). However, rapid or weakly supervised inclusion policies may expose banks to higher credit risk and operational inefficiencies, thereby increasing systemic vulnerability (Merniz & Bendjelloul, 2024; Abbad & Touati, 2022).

The relationship between banking sector concentration and stability remains controversial. A number of empirical studies (Amendola et al., 2021; Arnould, 2011; Heimeshoff, 2009; Mirzaei et al., 2013) suggest that high concentration levels foster market power and encourage excessive risk-taking, which can weaken financial stability.

Conversely, in certain emerging economies, a moderate degree of concentration may contribute positively to profitability and stability by supporting economies of scale and reducing competitive pressures (Fazelina, 2017).

Regarding inflation, its impact on bank stability is generally adverse when price levels are poorly controlled. High inflation can distort financial intermediation and weaken balance sheets, although its overall effect depends largely on institutional quality and the ability of policymakers to absorb and manage macroeconomic shocks (Musa & Jun, 2020; Fouejieu, 2017; Fazio et al., 2018).

Finally, the effect of the real interest rate on bank stability is ambiguous. On the one hand, rising real interest rates may deteriorate asset quality by increasing the burden on borrowers and leading to higher non-performing loans (Tsegaye, 2022). On the other hand, higher interest rates can improve interest margins, enhance profitability, and strengthen banks' financial positions (Yitayaw, 2022).

Overall, the evidence suggests that the influence of macroeconomic determinants on bank stability is highly dependent on country-specific economic conditions, institutional arrangements, and structural characteristics.

3. Methodological Approach

3.1. Sample Description

The study is based on a sample of 19 Algerian commercial banks, covering a 12-year period from 2011 to 2022. This sample includes 7 public banks and 12 private banks, ensuring a balanced representation of the national banking sector.

3.2. Data collection

The data used in this empirical study were collected from the balance sheets and income statements of the banks included in our sample, covering the period from 2011 to 2022. This information was primarily obtained from the financial reports published on the official websites of the respective banks. These data formed the basis for the calculations and analyses conducted, including the construction of the dependent and explanatory variables.

3.3. Variable Description

Below, we define all the variables used in our analysis along with their measurements. We will start with the dependent variable, followed by the explanatory variables.

3.4. The dependent variable

To assess bank stability, we use the Z-score as the dependent variable. Widely used and recognized by the World Bank, this indicator measures a bank's distance to insolvency: the higher the Z-score, the lower the probability of failure (Laeven & Levine, 2009). Introduced by Roy (1952) and easily computed from accounting data (Zheng et al., 2019), it is defined as follows:

$$Z - score = \frac{ROA_{it} + CAR}{\sigma(ROA_{it})}$$

Where:

ROA: Return on Assets; i = bank; t = year;

CAR: Capital Adequacy Ratio (Equity / Risk-Weighted Assets);

$\sigma(ROA)$: Standard deviation of the Return on Assets.

Independent Variables

For the empirical implementation, we selected banking and macroeconomic variables commonly used in the literature on financial stability. The selection is based on data availability, calculation methods, and the correlation between variables, in order to avoid multicollinearity. The following table presents these variables, their calculation methods, and the assumptions regarding their expected impact on the Z-score.

Table: Overview of Independent Variables

Variable	Notation	Mesure	Sources	Hypotheses
Bank size	SIZE	Ln (total asset)	Pham(2021), tsegaye(2024), Mohamed (2022).	+
Credit risk	LLP	LLP = Provision s for loan losses / Gross loans	Pham (2021), Ozili and Outa (2017) Aristei and Gallo (2019)	-
Liquidity	LDR	Loans granted / Deposits collected	Setiawan et al. (2019), Yitayaw(2023) Sulistyowati et Dwinanda (2021),	+
Profitability	ROE	ROE = Net income / Equity.	Le (2020)	+
Real GDP	GDP	Data	Rupeika Apoga et al. (2018), Ashraf et al. (2022), et Kumlachew et al. (2023)	+ -
Market structure	MS	Bank assets share in total banking assets	Pham (2021), Mirzaei et al. (2011), Wen et al.(2015)Fazel ina (2017)	- +

Source : Author's own elaboration

3.5. Model specification

The purpose of our model is to examine the impact of financial stability determinants on bank size, credit risk, liquidity, and profitability as well as macroeconomic variables, including real GDP and market structure, on the financial stability of banks in Algeria, represented by the Z-score.

The model is specified as follows:

$$\text{Z-score} = \alpha_0 + \beta_1 \text{SIZE}_{it} + \beta_2 \text{ROE}_{it} + \beta_3 \text{LLP}_{it} + \beta_4 \text{LDR}_{it} + \beta_5 \text{MS}_{it} + \beta_6 \text{GDP}_{it} + \mu_{it}$$

4. Descriptive analysis

Before estimating the parameters of the panel data regression model, it is necessary first to perform a descriptive analysis of both the explanatory variables and the dependent variable.

4.1. Descriptive statistics

This section presents the descriptive statistics of the selected variables: the Z-score as an indicator of financial stability, the main explanatory variables (size, profitability, liquidity, credit risk), as well as the macroeconomic variables (market structure and real GDP).

Table : Descriptive analysis of the variables

Stats	z_score	Taille	LLP	LDR	MS	ROE	GDP
Mean	46.43078	26.30281	0.0508285	0.9098606	0.2612893	0.1080581	0.0205507
SD	41.99658	1.442188	0.0409692	0.2605581	0.2673347	0.054539	0.023737
Max	321.1373	29.3612	0.1677831	1.999049	1	0.2500029	0.038
Min	11.04713	23.6314	0	0.2832729	0.0049134	- 0.0306348	-0.051

Source : Results obtained from statistical analyses performed using STATA.

The descriptive statistics table shows that the Z-score has a relatively high mean (46.43), indicating overall financial soundness of the banks, but with considerable heterogeneity among them. Bank size appears relatively homogeneous (mean 26.30), whereas credit risk (LLP mean 5.08%) reveals highly varied provisioning practices. The loan-to-deposit ratio (mean 90.98%) is generally acceptable but exhibits significant liquidity imbalances. Market structure (mean 0.26) confirms a high level of banking concentration in Algeria, limiting competition. In terms of performance, the average ROE (10.8%) reflects reasonable profitability despite some cases of negative results. Finally, economic growth (average GDP 2.05%) remains modest, with certain periods of recession potentially weakening the banking sector.

4.2. Correlation matrix

To identify the nature of the relationships between the dependent variable and the explanatory variables, and to facilitate their interpretation, we calculate the correlation coefficients for each pair of

variables. The table below presents these coefficients for all the variables included in the model.

Table : correlation matrix of the model variables

	z_score	SIZE	LLP	LIQ	MS	ROE	GDP
z_score	1.0000						
Taille	0.1887*	1.0000					
LLP	-0.0210	0.4645*	1.0000				
LDR	0.0436	-0.4093*	-0.0263	1.0000			
MS	-0.1061	0.1466*	0.5490*	0.0124	1.0000		
ROE	-0.0459	-0.0101	-0.3470*	-0.1780*	-0.1582*	1.0000	
GDP	0.0183	-0.0741	-0.0218	-0.0083	0.0062	0.1136	1.0000

Source : Results obtained from statistical analyses performed using STATA.

(*) Significant at the 5% level.

The correlation analysis shows that bank size is positively and significantly associated with the Z-score (0.1887), confirming that larger banks are generally more stable due to better risk management, broader access to capital, and greater diversification. In contrast, most other variables exhibit weak or negative correlations with stability.

LLP shows a very weak negative correlation with the Z-score (-0.0210), suggesting that high provisions do not necessarily ensure greater stability but rather reflect the anticipation of future losses. Furthermore, size is strongly and positively correlated with LLP (0.4645), indicating that larger banks tend to provision more.

The liquidity ratio (LDR) is weakly positive with the Z-score (0.0436), implying that a higher level of loans may slightly support

stability. However, it is negatively correlated with size (-0.4093), highlighting that smaller banks take on higher liquidity risks.

Market structure (MS) is weakly and negatively correlated with stability (-0.1061), confirming that high banking sector concentration may undermine banks' prudence. Finally, profitability (ROE) and economic growth (GDP) do not show significant relationships with bank stability.

4.3. Multicollinearity test (VIF)

Multicollinearity occurs when some explanatory variables capture redundant information, which increases the variance of the coefficients and weakens their interpretation. To detect it, the Variance Inflation Factor (VIF) is used, where a value greater than 10 indicates a high risk, or its reciprocal, tolerance, which should remain above 0.1. When present, multicollinearity can render certain coefficients insignificant, cause high instability in estimates, and alter the effect of variables if they are removed. It therefore undermines the robustness of the model.

Table : Verification of multicollinearity among explanatory variables using the VIF test

Variable	VIF	1/ VIF
LLP	2.15	0.464493
SIZE	1.68	0.596162
MS	1.47	0.679974
LDR	1.28	0.781298
ROE	1.22	0.819362
GDP	1.02	0.976999
Mean VIF	1.47	

Source: Results obtained from statistical analyses performed using STATA.

The multicollinearity test using the VIF index indicates that all variables have values below 10, with an average of 1.47, suggesting the absence of severe multicollinearity. The highest variable is LLP (2.15), which remains well within acceptable limits, while real GDP shows the lowest value (1.02), reflecting very low collinearity.

5. Results and discussion

This study is based on a panel data regression model applied to 19 Algerian banks over a 12-year period. After confirming the absence of serious multicollinearity among the explanatory variables, several econometric tests were conducted. The Fisher test (Prob > F = 0.0000) indicated the presence of specific effects, while the Hausman test (Prob = 0.1771) validated the random effects model, which was further confirmed by the Breusch-Pagan test (Prob = 0.0000).

However, the autocorrelation test (Prob > F = 0.000) revealed error dependence, and the heteroskedasticity test (Prob > χ^2 = 0.000) indicated non-constant residual variance. To address these issues (autocorrelation, heteroskedasticity, and intra-group correlations), the Panel-Corrected Standard Errors (PCSE) method was adopted, allowing for more robust and reliable estimates.

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The regression results using the PCSE method are as follows:

Table : Results of the Multivariate Analysis of the Model

Linear regression, correlated panels corrected standard errors (PCSEs)			
Variables	Signe attendus	Coefficient	P-value
SIZE	+/-	10.10239	0.000
LLP	-	-164.183	0.055
LDR	+	26.95649	0.018
MS	-	-13.39806	0.037
ROE	+	-67.47947	0.362
GDP	+/-	92.68981	0.425
_cons			
R-squared		0.0894	
Wald chi2		101.31	
Prob > chi2		0.000	
Number of obs		227	

Source: Results produced from statistical analyses using STATA.

The results of the model examining the effect of the selected explanatory variables on the financial stability of Algerian banks indicate the following:

The coefficient of determination (R-squared) has a value of 0.0894, indicating that the model explains approximately 8.94% of the variation in bank financial stability. In other words, the chosen explanatory variables contribute significantly to understanding the fluctuations of the dependent variable.

The Wald χ^2 test, used to assess the overall significance of the model, is highly significant at the 10% level ($\text{Prob} > \chi^2 = 0.0000$). This result indicates that the model as a whole is statistically valid, with a satisfactory explanatory power.

Interpretation of Results

The results obtained from statistical analyses performed using STATA allow several conclusions regarding the relationship between bank financial stability and the explanatory variables in our model.

The results show a positive and significant relationship at the 10% level between bank size (SIZE) and financial stability. In other words, the larger a bank, the more likely it is to be stable. This relationship can be explained by the fact that larger banks benefit from economies of scale, which improves efficiency, reduces bankruptcy costs, and enables them to sustain higher growth rates. Furthermore, larger banks can offer a wider range of financial services, mobilize more funds, and better serve their clients, which strengthens both profitability and stability.

Regarding market structure (MS), our study indicates a negative and significant effect on bank stability. A high market share appears to be associated with lower stability. In Algeria, 2022 data show that public banks hold approximately 87.88% of total banking assets, while private banks account for only 12.11%. This high concentration reflects low competitive intensity, limiting competition among institutions and negatively affecting the stability of the banking system.

The variable loan loss provisions (LLP) has a negative and significant impact on bank stability. An increase in LLP reduces the short-term stability of banks, reflecting the influence of future credit risks on banking performance.

Liquidity risk, represented by the loan-to-deposit ratio (LDR), has a positive effect on bank stability. A higher loan-to-deposit ratio increases interest income from loans, boosts profitability, and strengthens equity, thereby enhancing banks' capacity to absorb potential losses. Banks that maintain adequate liquidity can continue generating profits through lending activities, which contributes to their stability.

Profitability, measured by ROE (net income to equity), does not have a significant effect on the financial stability of Algerian banks in our study.

Finally, GDP appears to have a positive effect on bank stability, although this impact is not statistically significant. Sustained economic growth improves borrowers' ability to repay debts, reduces non-performing loans, and generally enhances operating conditions in the banking sector, contributing to the overall soundness of the system.

6. Conclusion

This research aimed to analyze the determinants of financial stability of Algerian commercial banks using a panel data model. The results show that bank size and liquidity enhance stability, whereas loan loss provisions and market concentration weaken it. In contrast, profitability and GDP do not have a significant effect.

From a theoretical perspective, the study contributes to the literature by highlighting the specific characteristics of the Algerian banking system. Methodologically, the panel data approach allowed us to capture both individual and temporal effects. Practically, the findings provide guidance for managers and policymakers, particularly regarding the importance of improving credit portfolio quality, strengthening liquidity, and promoting competition within the sector.

However, the research is limited by insufficient data availability, the absence of certain key variables (governance, regulation), and the lack of explicit consideration of recent crises. For future research, it would be relevant to extend the time horizon, incorporate qualitative variables, and compare results with those of other emerging economies.

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