

Impact of financial inclusion on Banking stability in Algeria**Bessouyah Mouna ^{1♦}, Mimouni Yassine ²**¹ GMFAMI, Relizane University (Algeria), mouna.bessouyah@univ-relizane.dz² GMFAMI, Relizane University (Algeria), yassine.mimouni@univ-relizane.dz**Received: 26/08/2024****Accepted: 13/10/2024****Published: 19/11/2024****Abstract:**

This paper examines the impact of financial inclusion on financial stability in Algeria during the period 2004-2023, where the analytical descriptive approach was relied upon by describing variables and establishing the theoretical relationship between them. As for the applied aspect, ARDL model was used for standard modelling, by considering indicators as (ATM, BB, DB) as the interpreted variables of the subordinate variable of financial safety (z-score). After estimating the study model, a positive and moral impact of (ATM, BB) indicators was found in the short term on the (Z-score). In the long term, there was a positive and moral impact of all indicators on the financial safety index.).

Keywords: Financial inclusion, financial stability, banks, joint integration.**JEL Classification:** O47 · G20 · G15 · C33

1. Introduction:

As a result of the changes in the financial system, which led to the expansion of the circle of financial development, the term "financial inclusion" emerged following the 2008 financial crisis. This led decision makers to adopt it in order to achieve economic and financial development. At present, financial inclusion has become a tempting research topic among policymakers and researchers. It is of great importance in the development of more valuable and trouble-free finances in obtaining financial products Disadvantaged segments of society. (Bandyopadhyay S. P., 2022) The importance of financial inclusion is seen as an important indicator used to solve the problems, whether economic or social, that today's societies are experiencing, especially the poor strata and those with limited incomes. (Banna, 2021) Here, the need for governments and competent bodies to apply financial inclusion to facilitate the access of members of society to financial products and services on certain grounds has increased. (Jima, 2023)

International financial institutions are concerned with financial inclusion in relation to economic growth rates. This has made many central banks in developed and developing countries apply it and have been able to make significant progress in its indicators and provide digital financial services (Danisman, 2020). Thus, the relationship of financial inclusion and stability is demonstrated through a set of policies at good levels, which in turn contribute to the achievement of financial and economic stability, by expanding the size of financial activities and attracting the greatest amount of deposits and savings as well as reducing liquidity risks, and working to provide financial products commensurate with the material level of society (JungoJoão, 2021), A coordinated approach, if pursued coherently, can help policymakers build a resilient and inclusive financial sector and support economic growth. Financial inclusion and stability are important policy objectives these days (Botelho, 2022), and there is growing agreement that they can be mutually reinforcing. With the problem of monetary and financial stability in Algeria, it still faces significant challenges, which constitute an obstacle to the provision of financial services to the community, and through this study we will try to clarify the impact of financial inclusion on Algeria's financial stability. Through what has previously been put forward, the following forms can be asked:

How much does financial inclusion affect Algeria's financial stability?

2. Literature Review:

There are many previous studies on the subject of financial inclusion and stability. During our study, we will try to present the most important studies that relate to our subject according to the following:

Table 1: Literature Review

STUDY	Period	Method	Findings
Linda Rosalina; Diah Wahyuningsih* 2023 Impact of financial inclusion and banking characteristics on banking stability in Indonesia	data from 2009 to 2019	panel data analysis	This research refers to Financial inclusion variable has a negative impact on bank stability Owing to unequal access to financial inclusion and low financial literacy for banking
Shreya Pal · Indranil Bandyopadhyay 2022 Impact of financial inclusion on economic growth, financial development, financial efficiency, financial stability,	data from 1984 to 2018	Panel data	The results show that financial inclusion stimulates economic growth, financial development with financial institutions and markets, the Bank's financial efficiency, financial stability and, in most cases, the Bank's

and profitability: an international evidence			profitability for each income category.
Asghar Kamal 2021 Impact of financial inclusion and financial stability: Empirical and theoretical review	period from 1995-2020	Model Var	The study so far indicates that FI has a positive and significant impact on FS Stabilization of banks
Damane, Moeti and Ho, Sin-Yu 2024 Effects of Financial Inclusion on Financial Stability: Evidence from SSA Countries	data from 2005 to 2019	panel equation	Results indicate that financial inclusion has a positive impact on financial stability, especially in low-income countries with low levels of financial stability.
Mohammed Hammad Safi Hichem Khlif 2023 The Impact of Financial Inclusion on Banking Stability- An Analytical Study in the Iraqi	data analysis from 2010 to 2021	using the statistical software (STATA13)	Th research yielded a set of results, indicating a significant partial effect of financial inclusion indicators on banking stability in this study.

Literature on measuring the impact of financial inclusion indicators on financial stability differs where, Shreya Pal (2022) explained that financial inclusion stimulates economic growth, financial stability and bank profitability at each income level and that its overuse contributes to the growth of the economy, On the other hand, Linda Rosalina (2023) showed that there is a negative issue between the financial inclusion index and banking stability and the reason is the lack of awareness of financial inclusion in banking, Either Study Asghar Kamal(2021) found a positive relationship between financial inclusion and financial stability and that the latter contributes to the strengthening of financial banking services, While some previous studies have revealed the negative impact of financial inclusion on financial stability due to lack or lack of efficiency in the credit process as its expansion and increase contribute to higher risk And so from this study we will try to study the impact between the two variables and bring it down on the State of Algeria in order to confirm the positive impact or reach the negative impact. The banking and financial system varies from one country to another, which makes the standard results different.

3.Theoretical framework of the study:

3.1 Financial inclusion:

The Arab Monetary Fund defines financial inclusion as "the availability and use of all financial services from different groups, institutions and individuals of society, through channels Ramasya, as long as bank savings accounts, payment and transfer services, insurance, finance and credit, and the creation of more convenient financial services at competitive prices ". (leila, 2022) According to the Rangarajan Commission's report, financial inclusion was defined as: the process of access to financial services and credit by vulnerable groups of society with low incomes in a timely, when needed and at a reasonable cost. (nadjim, 2022)

3.1.1 Financial inclusion indicators:

The most important indicators of financial inclusion are: (Bessouyah mouna, 2022)
 - Use mobile phone or Internet to access a bank account and include mobile phone usage ratio
 Or the Internet to access a bank account in the Arab world.

- Use of financial services (the extent to which clients use services provided by financial institutions), add to the quality of financial services.
 - Proportion of adult citizens with a bank account.
 - Number of bank accounts provided, current or deposit.
- Proportion of adult citizens with any kind of banking facility.
- The number of calculations of banking facilities for each 10 thousands of citizens reported.

3.2 Financial Stability:

Financial stability encompasses the integrity of an enterprise through management that is systematic and effective for achieving total stability. (mustafa, 2022) It also reflects the ability to cope with disruptions that can be experienced, to strengthen all components of the financial system, to ensure its stability and to continue to perform tasks authorized without the need for external assistance. (samira, 2023)

3.2.1 Indicators for measuring financial stability:

To monitor and analyse the integrity of financial stability, a set of indicators must be provided that detect and evaluate the financial system and estimate the likelihood of early financial problems before the risk occurs. For this purpose, financial safety indicators, which can be summarized as follows:

Table 2: Benchmarks and indicators constituting financial stability

Scale	Indicators
Financial Development Index	-Domestic credit to GDP (%) -Interest rates pread -Stock market capitalization to GDP (%)
Financial risk exposure index	-General budget deficit to GDP -Current account deficit of GDP(%)
Financial Safety Measure	-Non-PERFORMING loans/total loans (gnpar) -(ROA) -Liquidity - Bank regulatory capital to risk weighted assets

Source : Nasreen, S. S., Anwar, S., & Ozturk, I(2017)

3.3 Nexus between financial stability and financial inclusion:

Central banks focus on monetary and financial stability, through bank stability, so the importance of inclusion Financial stability factors relate to monetary and fiscal stability, and it is therefore difficult for monetary policy instruments to operate With regard to GDP and high inflation, these tools are more effective in the economy than benefiting individuals and how economic files are managed by the Central Bank. So the banking sector can benefit from inclusions role in education, leading to monetary and financial stability (karkar, 2020). There are many research that there is a close correlation between financial inclusion and financial stability. It turns out that there are some challenges in measuring financial inclusion and access to finance with its indicators. (omer, 2022) Financial inclusion is related to financial stability through the existence of channels as (Khan, 2011) explained. Channel 1 requires the diversification of financial assets in order to raise the credit granted, which reduces the risk in banks. Channel 2 includes the volume of deposits and savings that contribute to the expansion and stability of the market and increase the volume of customers. Financial inclusion allows for improved financial intermediation efficiency between savings and investment by changing the structure of the financial system and allowing reliance on more modern products. Some studies

also claim hostile relations between financial inclusion and financial stability point out that access and usage of financial services do not influence financial stability, which is again supported by the global financial development report produced by the World Bank, 2012 (Bandyopadhyay, 2022)

4. METHODOLOGY :

Our study aims to measure the impact of financial inclusion indicators on the financial stability index for 2004-2023, By considering financial inclusion indicators (ATM, BB, DB) as independent variables interpreted for the dependent variable of financial stability, The following table of study variables and sources of access to their data:

Table3: Variable notation, measurement and data sources.

Variable	Notation	Measurement	Source of Data
Financial stability index	FSI	Financial stability is measured by the financial safety index of z-score	Database (GFDD) of World Bank
Deposits in Commercial Banks	DB	Number of depositors in commercial banks Measured in Percentage	World Development Indicators, World Bank
Commercial Bank Branches	BB	Number of commercial bank branches Measured in Percentage	
ATM Machines	ATM	Number of ATM machines Measured in Percentage	

the z score will be relied upon to measure financial stability and financial integrity. The z score is based on the classification of banks based on the value found from the equation:
 $Z = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$

Classification is done by the following conditions:

- If the value of $Z > 2.66$ the bank is financially independent.
- If the z value falls between 1.1 - 2.6 here, it is difficult to predict the bank's financial position.
- If the value: $1.1 < Z$ here the bank is financially distressed, it is in financial danger.

The next table shows the basic elements of the calculation of the z-score:

Table4 : z-score indicator element

Ratios	Description	Coefficient
X1	Working Capital / Total	6.56
X2	Retained Earnings / Total	3.26
X3	EBIT / Total Assets	6.72
X4	Net Worth / Total Liabilitie	1.05

Source: (Altman, 2014)

4.1 Model :

Our current study has followed many methodologies adopted in previous studies. Such as: Asghar Kamal(2021), Mohammed Hammad Safi(2023) and other studies. The substantive difference is that the latter focused on the standard studies of a group of countries. However, our study includes one country's experience in Algeria to determine the relationship between study variables using the ARDL distributed temporal gap model.

For this, the general model formula of (bessouyah mouna, 2022)is adopted, which includes the dependent variable SI and the independent variables X, which can be expressed by a set of explanatory variables $X_1, X_2..X_t$, as follows:

$$\Delta \text{FSI}_t = c + \sum_{i=1}^p \beta_{1i} \Delta \text{ATM}_t + \sum_{i=1}^{q_2} \beta_{2i} \Delta \text{DB}_t + \beta_{3\text{BB}} \Delta \text{BB}_t + \varepsilon_t$$

Where

c: is any constant;

Δ : first-order difference;

k: the independent variable number;

p: slowdown period of the dependent variable y;

$q_1, q_2, \dots, q_k$: the intervals of the independent variables $x_1, x_2, \dots, x_k$; respectively;

$\beta_1, \beta_2, \dots, \beta_k$: coefficients of short-term relationship;

$\alpha_1, \alpha_2, \dots, \alpha_k$: long-term relationship coefficients;

ε_t : random error.

In order to analyze the relationship between variables related to our current study. Based on previous studies, the following hypotheses can be formulated:

-Hypothesis 1: There is a positive impact of financial inclusion indicators on short-term financial stability.

-Hypothesis 2: There is a positive impact of financial inclusion indicators on long-term financial stability.

4.2 Results and discussions :

4.2.1 Descriptive statistics :

At the beginning of the assessment procedure, we perform preliminary tests to verify time chains by doing descriptive analysis of study variables:

Table 5: Descriptive statistics

	ATM	BB	DB	FSI
Mean	733744.8	725962.4	734341.7	735523.7
Median	733230.0	730118.5	734593.5	735436.5
Maximum	738219.0	739341.0	736782.0	737796.0
Minimum	630892.0	709420.0	731581.0	733438.0
Std. Dev.	2051.722	9190.427	1636.318	1050.255
Skewness	0.441680	-0.419662	-0.414641	0.247389
Kurtosis	2.214363	1.798642	2.107417	2.858279
Jarque-Bera	1.164626	1.789770	1.237010	0.220742
Probability	0.558605	0.408655	0.538749	0.895502
Sum	14674895	14519247	14686833	14710473
Sum Sq. Dev.	79981734	1.60E+09	50873189	20957665
Observations	20	20	20	20

Source: prepared by the researcher using EViews 12.

The table below shows the value of the Z-Score index in Algeria at 738219.0, while its lowest value was estimated at 630892.0, due to the global financial crisis and resulting from damages to financial

regulations. The changes in the latter highlight the initiatives and developments in the Algerian system.

4.2.2 Correlation Matrix between Variables :

The association matrix gives a preliminary view of the nature of the correlation between independent variables and dependent variables, as shown in the table below:

Table 6 : Correlation Matrix between Variables

	FSI	ATM	DB	BB
FSI	1.00	0.54	0.43	0.67
ATM	0.54	1.00	0.74	0.54
DB	0.45	0.50	1.00	0.87
BB	0.5	0.76	0.69	1.00

Source: prepared by the researcher using EViews 12.

From the above table, it is clear that there is a positive correlation between the independent variables and the dependent variable where the relationship of both the FSI and the ATM DB BB indicators is evident, so that these remain preliminary results regarding the impact of the financial inclusion indicators on financial stability while real results will be addressed by estimating the standard model.

4.2.3 Unit root tests :

Table 7: Unit Root test (Dickey & Fuller)

Variables	1st Differences								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
FSI	-7.346721	-3.523451	0.0001	-9.325615	-4.341820	0.0000	-5.154367	-1.234145	0.0000
ATM	-6.435123	-3.245123	0.0042	-7.432687	-3.253210	0.0052	-6.361476	-2.124356	0.0000
DB	-5.268754	-2.245376	0.0051	-6.345123	-3.241627	0.0001	-5.243671	-2.265234	0/0001
BB	-5.321657	-3.367234	0.0000	-6.457920	-3.267245	0.0000	-4.276582	-3.325687	0.0003

Source: prepared by the researcher using EViews 12.

Based on the results obtained from the Unit's root test of the time series shown in the table above, it is shown that: All chains associated with the FNI ATM DB BB variables are stable at the first difference i.e. T-Statistic values (in absolute terms) are greater than tabular values and this is explained by the probability of Prob they are less than 0.05 and therefore through this model it can be said that the time chains do not have a unit root 1 so they are stable, i.e. they are integrated than the grade.

4.2.4 Bound test for ARDL Time Series Gaps Model:

This test is used to determine the extent of a long-term balanced relationship between the dependent variable and the interpretative variables included in the post by means For test statistic (F), does not depend on the trend in estimation, The existence of cointegration between variables is tested using the F-test according to the following two hypotheses: (Al-Baldawi, 2017)

$$H_0 : \delta_0 = \delta_1 = \delta_2 = \delta_3 = 0$$

$$H_1 : \delta_0 \neq \delta_1 \neq \delta_2 \neq \delta_3 \neq 0$$

We compare the calculated value (F) to the calculated value of the test (F) (Abdullah, 2022)

- Minimum: all variables are assumed to be constant at their original level, i.e. integrated level (0).
- Upper limit: all variables are assumed to be constant in their first difference, i.e.

Level I (1). The decision is then made on the basis of comparing the calculated value of (F) with a minimum if the variables are combined with the first zero level (0), but if combined with one level I (1), the decision is made on the basis of comparing the value of the calculated amount (f) statistical with the scheduled value (F) of the upper limit.

Table 8 :Bound Test

F-statistic	Lower Bound	Upper Bound	Conclusion
5.118464	2.37	4.66	Cointegration

Source: prepared by the researcher using EViews 12.

Based on the results of the bound test boundary test by which the statistical value F is compared with the lowest and highest values., the statistical value F was estimated at 5.118464, which is greater than the upper limit of critical values at all levels of morale, and from which we accept the alternative hypothesis that there is a long-term relationship between the study variables.

4.2.5 Short-Term and Long-Term Relationship Test for the ARDL Model:

The ARDL model is assessed by estimating short-term transactions by estimating the error correction coefficient and the results analyzed in the table below show that it is negative and moral (0.55) is estimated that financial inclusion indicators correct the deviation of the z-score index by a 55% percentage of imbalance in the period in order to maintain long-term balance. The determination coefficient is estimated at 76%, which expresses the explanatory capability among the study variables, while Durbin -watson's scan value is 2.53, which justifies the absence of error associations in our study model.

Table 9: Short-Term Relationships

ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ATM)	2.018462	0.471150	-4.284119	0.0020
D(ATM(-1))	-1.866238	0.662072	2.818786	0.0201
D(BB)	0.043712	0.018408	-2.374555	0.0416
D(BB(-1))	0.062881	0.022756	2.763306	0.0220
CointEq(-1)*	-0.559858	0.268068	-6.080024	0.0002
R-squared	0.763098	Mean dependent var		59.22222
Adjusted R-squared	0.690205	S.D. dependent var		1309.047
S.E. of regression	728.6061	Akaike info criterion		16.25028
Sum squared resid	6901269.	Schwarz criterion		16.49760
Log likelihood	-141.2525	Hannan-Quinn criter.		16.28438
Durbin-Watson stat	2.536753			

Source: prepared by the researcher using EViews 12.

After estimating the error correction model in the above table, the results indicated the following:

- There is a positive and moral impact of ATMs on the financial safety index in the short term, as the increase in one unit of ATMs leads to the rise of the Z grade in units 2.
- There is also a positive and moral impact of the Commercial Bank Branches Index on the short-term financial safety index, as an increase of one unit of the BB Index increases the Z-score by 0.04 units.

The table below shows the results of the estimate in the long term, where it can be said that: there is a positive and moral effect of both the indicators Deposits in Commercial Banks and Commercial Bank Branches and ATM Machines.

Table10 :Long-Term Relationships

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ATM	0.060421	0.246751	0.244867	0.0121
DB	0.122683	0.281591	-0.435678	0.0033
BB	0.072065	0.030945	-2.328831	0.0448
C	833960.5	116229.3	7.175130	0.0001
EC = FSI - (0.0604*ATM + 0.1227*DB + 0.0721*BB + 833960.5277)				

Source: prepared by the researcher using EViews 12.

5. Discussion And Conclusion :

In this paper, researchers tried to test the relationship between financial inclusion and financial stability in the State of Algeria during the period 2004-2023 using the ARDL model. The standard results showed that all time series are stable and integration¹ After estimating the line correction model, a negative and moral factor was found showing the degree of relationship between the study variables, According to the results of the short-term relationship, a positive and moral impact of ATMs has been found on the financial safety index. This is normal. Although these devices are few, their presence facilitates financial transactions through the positive and moral empowerment of branches of commercial banks on the financial safety index. The increase of these branches contributes to the increase of liquidity. In the long run, we found a positive and moral impact for both commercial bank branches and between the size of depositors on the financial safety index. This shows that the higher the bank branches, the greater the volume of deposits, the higher the volume of liquidity, the bank can operate the latter in investments to convert cash flows to offset the present value of the funds, it can pay its obligations and achieve real value added to the banking system.

The Algerian banking system has witnessed significant fluctuations such as the repercussions of the mortgage crisis and others. But banks have always sought to provide acceptable rates of sufficient capital, Increased lending, enabling the financial system to cope with unexpected shocks and thus ensuring financial integrity ensures a consistent financial system that is responsive to crises, With Algeria applying the experience of financial inclusion at the level of its financial institutions and allowing it to provide sophisticated financial services and products according to the social levels of individuals and in line with their financial capacity and thus the good use of financial inclusion ensures the stability of the financial system and the strengthening of the financial environment.

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