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The Use of the Z-Score Indicator to Measure Financial Soundness and Stability in Islamic Banks (The Case of Al Salam Bank Algeria during the Period 2015–2024)

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Abstract

Purpose: This study aimed to measure the level of financial stability and soundness in Islamic banks through the application of the Z-Score indicator, using Al Salam Bank Algeria as a case study over the period (2015–2024).

Design/Methodology/Approach: The research adopted a descriptive-analytical approach, drawing on financial data extracted from the bank's annual financial statements. The Z-Score model was adapted to align with the operational specificities of Islamic banks, particularly with regard to investment accounts and profit-sharing mechanisms.

Findings: The findings indicate that the Z-Score calculated on the basis of funds belonging to Profit Sharing Investment Account holders ($ISLB(Z)_{PSIA}$) reached 4.4861, while the financial stability index calculated for shareholders' equity accounts ($ISLB(Z)_{share,\ invest}$) recorded a value of 3.3955. These relatively high values reflect Al Salam Bank's strong level of financial stability and the low probability of distress throughout the study period. The results further confirm the effectiveness of the Z-Score as a quantitative instrument for assessing financial stability in Islamic banks, provided that due consideration is given to their operational specificities.

Practical Implications: The proposed framework offers regulators and risk managers a more nuanced and precise method to assess financial stability in Islamic banks. By taking into account the unique structure of their liabilities and governance practices, it provides a tool that supports more effective macroprudential oversight and strengthens internal risk management processes, thereby helping banks better withstand financial shocks.

Originality/Value: This study makes a significant contribution to the literature on Islamic banking by developing and empirically testing a modified Z-Score model that reflects Shariah compliant liability structures. By applying this model to emerging Islamic banking over a ten-year period, the research not only improves the methodology for assessing stability but also offers practical insights that can inform regulatory policies and supervisory practices.

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INTRODUCTION

The worldwide banking network experienced major changes throughout the last few decades because of financial globalization which expanded quickly and markets became more interconnected and financial crises started to occur repeatedly. The banking sector accepts Islamic banking as a modern financial system which follows Sharia law through its operational practices based on the Qur'an and the Sunnah of Prophet Muhammad and his Companions. The system operates through three core foundations which include the ban on interest (ribā) and the control of excessive uncertainty (gharar) and gambling (maysir) and the requirement that financing supports physical economic activities and banks need to share profits and losses with their business customers (Ansari et al. 2025). The institutional framework of Islamic banking has enabled Islamic banks to grow their presence through establishing new branches which operate as an alternative financial system which unites financial efficiency with social responsibility and environmental protection in Muslim-majority nations and non-Muslim countries that have shown an increasing interest in ethical financial practices (Pesendorfer and Lehner 2016).

The worldwide financial crisis of 2008 led to a sharp increase in academic studies about Islamic banking because researchers wanted to understand why traditional banking systems showed weak structures during that period. The Islamic banking system-maintained stability during the financial crisis while multiple traditional banks faced complete collapses because researchers believe these banks operated through asset-based activities and stayed away from dangerous financial products (Hasan and Drid 2011). The banking financial stability concept returned to economic discussions because economists started to view banking stability as their primary economic concern instead of focusing on bank earnings.

The International Monetary Fund defines banking financial stability as a state which enables banks to handle various challenges without losing their essential banking operations for providing credit to the real economy and managing risks effectively and continuing financial intermediation. The banking system must prove its stability against economic shocks because it needs to maintain its core operations without experiencing full system failure or major operational disruptions (IMF 2023). The economic literature under this conceptual framework has created multiple quantitative measures for bank soundness evaluation with the Z-score serving as the most popular tool which predicts bank insolvency by combining profitability data with return volatility and capitalization levels. The Z-score method offers a complete evaluation of banking stability which makes it the preferred tool for financial stability studies that include both Islamic and conventional banking systems (Beck et al. 2013).

Study Problem

In light of the foregoing, and against the backdrop of the gradual expansion of Islamic banking in Algeria in recent years, together with the emergence of specialized Islamic banks such as Al Salam Bank Algeria, which represents a pioneering experience in the implementation of Islamic banking instruments within a predominantly conventional banking environment, the present study is structured around the following central research question: **To what extent does the Z-score indicator measure the financial soundness and stability of Islamic banks, specifically Al Salam Bank Algeria, during the period (2015–2024)?**

Accordingly, the study proceeds from the principal hypothesis that: "**Al Salam Bank Algeria demonstrates a satisfactory level of financial stability within the framework of Islamic banking principles, as reflected by positive and relatively high Z-score values. This indicates the bank's strong capacity to absorb financial shocks and to reduce the probability of default during the period (2015–2024)".**

Study Objectives

This study seeks to achieve a set of scientific and practical objectives, which may be summarized as follows:

- To define the conceptual framework of Islamic banks through their operations and essential guidelines, and to identify potential financial risks that may affect their operational stability;
- To evaluate the financial stability of Al Salam Bank Algeria using the Z-score indicator and its components which include profitability, earnings volatility, and capitalization over the period (2015 - 2024);
- To develop practical and implementable recommendations to support regulatory authorities and bank management in enhancing the stability of Islamic banking institutions in Algeria.

Study Significance

The research gains its importance because it solves a specific gap which exists in the applied literature about Islamic bank financial stability assessment methods for new banking sectors including Algeria because

researchers lack sufficient data to evaluate bank survival capabilities during economic downturns. The research advances academic understanding through its application of the Z-score indicator for extended bank evaluation from 2015 to 2024 which analyses financial stability at the bank level. The research produces a numerical evaluation tool which benefits both academic investigators and industry professionals. The research findings enable policymakers and regulatory authorities to build stronger stability and confidence in the bank which underwent empirical testing. The system enables banks to assess their financial results which leads to better strategic choices.

LITERATURE REVIEW AND RESEARCH GAP

Recent economic scholarship has shown growing interest in measuring financial stability in Islamic banks, Hasan and Drid (2011) conducted one of the earliest comparative studies during the 2008 global financial crisis, demonstrating that Islamic banks exhibited greater resilience, relatively stable profitability, and lower risk exposure compared to conventional banks during periods of crisis, This resilience was attributed to the close linkage of their activities to the real economy and their avoidance of complex, high-risk financial instruments that contributed to the deterioration of conventional banks' performance during the crisis, although their analysis relied primarily on descriptive financial indicators, which limits its predictive capacity.

Within the context of quantitative analysis, Beck et al. (2013) employed the Z-score indicator to compare levels of financial stability between Islamic and conventional banks across several financial metrics. They concluded that Islamic banks often achieve higher levels of financial stability, although these findings may vary depending on the business model and regulatory environment.

Bitar et al. (2021) incorporated regulatory quality, particularly compliance with the Basel Core Principles (BCPs), and found that while regulatory adherence enhances financial stability, the effect is more pronounced in conventional banks, suggesting that traditional regulatory frameworks may not fully capture the unique risk structures of Islamic banks. Subsequent studies, such as Joudar et al. (2023), highlighted the importance of internal bank factors: capital adequacy and liquidity positively influence Z-score, whereas bank size negatively affects stability, confirming that operational and governance factors play a critical role alongside Sharia compliant practices. Fakhrunnas et al. (2024) further linked operational efficiency to stability using Data Envelopment Analysis combined with Z-score, showing that more efficient banks tend to achieve higher stability, although establishing causality remains a challenge.

Methodological advances have enhanced our understanding of Islamic banks stability. Mawardi et al. (2024) employed a Markov Switching model to capture regime changes, finding that Islamic banks are more likely to remain in stable states but recover more slowly during crises, underscoring the importance of dynamic analyses. Shair et al. (2025) introduced a modified Z-score to better capture Islamic banking characteristics, revealing that conventional Z-score metrics may underestimate or misrepresent stability in these institutions.

The literature has also examined macro financial and technological determinants of stability. Savon (2025) found that monetary policy changes negatively affect Islamic bank Z-scores, indicating the sensitivity of stability to macroeconomic conditions. Salem (2025) demonstrated that political and financial risks reduce Z-score levels in Egyptian banks, highlighting the importance of country risk consideration. At the same time, technological innovations have emerged as key factors: Mustafa (2024) provided empirical evidence that digital financial innovations, particularly payment systems, positively affect bank's Z-score, highlighting the role of technological advancement in strengthening financial stability, while Meero (2025) demonstrated that artificial intelligence and digital tools further strengthen both performance and stability. Susilawati et al. (2025) confirmed that internal factors, macroeconomic conditions, and Sharia compliance jointly influence Z-score outcomes, emphasizing the importance of integrating governance and environmental variables.

Nevertheless, a recent study by Omar et al. (2025) suggests that the existing empirical literature remains limited in terms of both geographical and methodological diversity. Research has largely concentrated on specific regions, such as the Gulf and Southeast Asia, with a notable absence of in-depth analyses in emerging economies, particularly in North Africa, including Algeria.

The number of Islamic banks has increased both qualitatively and quantitatively but researchers still need to develop enough studies which assess financial stability in these institutions. The research field contains two major gaps because no one has conducted empirical studies about Islamic banks which operate within Algerian banking systems that serve the Maghreb region. The first research problem emerges because no studies exist which use Z-score to assess financial stability in these settings through modifications that would make the indicator suitable for Islamic banks based on their institutional structure and Sharia governance system which prevents domestic financial stability analysis of Islamic banks. The second

research problem emerges because no current studies exist which analyze financial stability through long time periods while including all new economic and regulatory changes which might influence financial stability. The research will apply the Z-score indicator to Al Salam Bank Algeria between 2015 and 2024 to create a realistic evaluation of Islamic bank financial stability in an emerging market environment.

Theoretical Framework of the Study

Islamic Banks

Definition of Islamic Banks and Their Fundamental Principles

The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) through its conceptual framework and standards defines Islamic banks as financial entities which operate banking services and financial operations and investment activities following Shariah principles. The practice of ribā which means interest and maysir which refers to gambling and gharar which involves high levels of uncertainty must not occur in any form. All operations and financial instruments must be structured on Shariah-compliant contracts such as muḍārabah (profit-sharing), mushārakah (partnership), murābaḥah (cost-plus sale), and ijārah (leasing) (Nuzulia and Roisatun 2024, 117). Islamic banks operate differently from traditional banks because they use Profit and Loss Sharing (PLS) systems to share financial outcomes with their customers. The mechanisms work to create financial systems which spread risks between all parties involved instead of placing the entire burden on the banking institution (Khayat et al. 2025, 271). Islamic banks follow Shariah governance standards which differ from conventional banking systems because they have Shariah supervisory boards which verify all products and transactions meet Islamic legal requirements (Hamed n.d.). Islamic banks function based on religious beliefs which aim to achieve approval from God. The institutions maintain specific principles which Islamic financial institutions use to operate their systems according to (Sri Dewi et al. 2023, 366):

– The prohibition of ribā in all transactions and the assurance of transparency regarding the sources of deposited funds;

– The conduct of commercial and exchange activities on the basis of justice, and the generation of lawful (ḥalāl) profits without contravening Shariah principles;

– The payment of zakāt on the outcomes of financial activities undertaken by the institution, thereby contributing to the realization of sustainable development;

– The prohibition of monopoly practices or market control that undermine fair competition;

– The fulfilment of social responsibility through commercial activities and transactions that conform to the provisions of Islamic law.

Risks in Islamic Banks

The field of Islamic bank risk management has become a subject of rising academic study because these banks face special obstacles which arise from their need to follow Islamic Sharia financial rules (Alamgir et al. 2025, 1195). The Islamic Financial Services Board (IFSB 2005, 01) defines risk management in Islamic financial institutions as a complete system which includes various procedures to identify and measure and monitor and control different types of risks while the board of directors and senior management maintain Sharia compliance. The Islamic banking and finance sector recognizes risk through two main components which consist of gharar prohibition and contractual freedom principles. Gharar is defined as any probabilistic element involving uncertainty, information asymmetry, risk, or speculation that may result in illegitimate gain. The Islamic system allows parties to create their own contracts as long as their agreements follow Sharia rules which prevent both ribā and gharar. Islam recognizes that financial operations contain risk elements because banking activities naturally include these risks which would damage Islamic financial institutions' performance and survival if not properly handled. Islamic banks encounter multiple complex risks which exceed the typical bank risks because they operate under specific conditions that traditional banks do not face (Nuzulia and Roisatun 2024, 117). The risks which banks encounter fall into two distinct groups because they face both typical banking risks and Sharia compliance risks which make Sharia governance essential for bank management (Rahahleh et al. 2019, 11). The main risks which Islamic banks face include the following according to (Alamgir et al. 2025, 1195):

- **Risks Similar to Those Faced by Conventional Banks**

– Credit Risk represents the financial danger which clients face when they fail to make their required payments. Islamic banks face a growing threat because their (PLS) agreements and asset-based funding systems create direct impacts on their financial performance (Rehman et al. 2025). The credit risk management system of Islamic finance uses multiple tools which include strong credit evaluation methods and collateral backing and shared risk agreements. The bank needs to perform comprehensive feasibility

studies and risk evaluations before it can provide financial support to clients who enter into mudarabah contracts which require them to share their business results (Sardar and Farooq Iqbal 2023, 16).

– Organizations face liquidity risk when they cannot produce cash flow which matches their current financial commitments at their scheduled payment dates (Mikou et al. 2024, 59). The Sharia law which prohibits interest-based borrowing creates difficulties for Islamic banks to find suitable methods for managing their liquidity needs because they face barriers when they need to obtain funds at affordable rates. The various elements have raised Islamic banks' vulnerability to liquidity risk which has made their financial management operations more difficult to maintain (Rahma and Musa 2020, 59).

– Operational Risk refers to the possibility of financial losses which occur because internal workflows and staff members and technological systems fail to function properly or because of outside occurrences. Islamic banks face a growing threat from this risk category because they pursue market expansion through digital platform development. The financial statement also reveals losses which stem from Sharia non-compliance and breaches of fiduciary duties (Alamgir et al. 2025, 1195).

– Market Risk stands as a major threat which Islamic banks must face during their operations. The net asset value experiences changes because equity prices and commodity prices and exchange rates and interest rates experience market fluctuations. Banks face the risk that their net asset value will drop because financial markets can generate unforeseen price changes. The risk needs to be understood completely so that financial institutions can develop risk management policies which will protect Islamic banks against economic changes in the world (Zolkifli et al. 2015, 01).

- **Shariah Non-Compliance Risk**

Shariah non-compliance risk refers to the financial dangers which Islamic financial institutions face when their operations and products fail to follow Shariah rules which Shariah Supervisory Board or authorized bodies have established. Organizations face multiple risk types because they invest in activities which violate Shariah rules and they enter into contracts that break Shariah requirements which leads to financial losses and damage to their public image and they must spend unexpected expenses to conduct Shariah compliance assessments and fix problems that emerge from these assessments (Hassan 2016, 21-25). Islamic banks protect themselves from Shariah non-compliance risk through three main approaches which include Shariah supervisory boards and regular Shariah audits and reviews and the guidance of Islamic financial jurisprudence scholars and specialists. The financial operations maintain ethical and normative standards because of these systems which operate under Islamic law rules (Sardar and Farooq Iqbal 2023, 18).

Financial Stability in Islamic Banks

The Concept of Banking Stability

Financial stability together with banking stability emerged as concepts because of the worldwide financial and banking institutions experienced multiple crises. The two concepts remain closely linked which has produced confusion about their meanings so I need to show how they differ from each other.

Financial stability exists as an intricate system which defies accurate definition because its various financial system elements connect to each other through complex systems that also connect to economic activities in the real world. The academic community divides financial stability definitions into two main groups which represent different perspectives. The first definition focuses on financial instability yet the second definition provides a definition which explains what financial stability means. Financial instability exists as a general definition which describes conditions that lead to financial crisis risk through three main factors: financial market imbalances which cause major asset price deviations from their basic worth and financial system breakdowns and credit availability problems and direct negative impacts on the national economy (Odeduntan and Adewale 2015, 2-3).

The second approach bases its definition of financial stability on the absence of financial crises and extreme market fluctuations which matches the definition of financial instability. The analysis fails to show how a well-functioning financial system generates positive effects which strengthen the entire economic framework. The economic literature now uses an expanded definition of financial stability which describes a state where the financial system consisting of financial institutions and markets and infrastructures can handle shocks without affecting its role of directing funds to their proper uses (Gadanecz and Jayaram 2009, 365-366). The definition shows how financial stability operates on a macroeconomic scale because it proves that the financial sector functions through its deep connection to the actual economy.

The International Monetary Fund defines financial stability as a state where the financial system performs its essential functions at peak efficiency through its ability to allocate resources and manage risks and drive economic activities while maintaining its shock absorption capacity to prevent major disruptions which would harm the macroeconomic environment. The system's stability index measures the chance of financial system breakdowns which could result in systemic financial collapse thus serving as a vital measure for assessing the monetary system's viability and durability (Schinasi 2004, 5-6). The definition maintains its

status as a widely recognized concept in present-day academic work because it goes beyond crisis management to focus on how financial institutions maintain operational stability during challenging times which aligns with current research about financial system stability (Ullah et al. 2024).

Financial stability depends on banks because they serve as fundamental institutions which maintain market order. The banking system of a nation needs to operate with solid strength because it serves as the basic requirement which enables economic growth and development and financial stability (Mabkhot et al. 2022). The banking system stability definition remains challenging to establish because it shares many elements with financial stability so experts define it as the banking system's ability to support economic liquidity distribution through its core functions without encountering obstacles which stem from financial system weaknesses. The banking system achieves stability when it distributes financial resources through an effective system which protects the economy from experiencing any worsening of shocks (Saha et al. 2014, 123).

Ferguson identifies three essential characteristics which banking instability depends on: the first characteristic involves extreme changes in financial asset values; the second one shows a shrinking credit market which creates mounting doubts about overdue loan payments; and the third one stems from the previous points which lead to an economic state that diverges strongly from its equilibrium balance because total spending fails to match the nation's production capabilities (Saha et al. 2014, 123).

Banking stability at the individual level requires assessment through the bank failure concept because bank failure occurs when asset values experience a major unusual drop which results in asset liquidation values dipping below deposit amounts. In such circumstances, the bank is considered to be experiencing financial distress (Dadi Addoun and Ammi Said 2014, 17).

The definitions show that banking stability depends on multiple factors because it requires banks to perform their usual duties while staying strong against financial instability. The topic requires a complete understanding of all elements which affect bank operations and their financial security because these elements include their organizational design and their operational rules and their economic environment.

Banking stability depends on four essential components which include proper banking operation oversight and risk management system development and strong crisis management systems and warning systems and financial instability source control (Ali Nasser and Al Husseini 2025). The foundations present a complete banking stability view which shows that proper oversight and risk control systems function as active tools to reduce financial risks while helping banks develop their resistance to shocks. The system requires banks to adopt a forward-looking approach because they need to establish early warning systems and crisis management protocols which will safeguard their financial sustainability and protect the entire financial system from instability. The foundations share common principles with international prudential frameworks because Basel III focuses on making capital and liquidity requirements stronger and enhancing risk management systems.

Determinants of Financial Stability in Islamic Banks

Shariah and the Islamic economic system mandate two essential elements for financial stability which include the complete removal of Western financial interest operations and the establishment of profit-and-loss sharing systems together with Islamic law-based contractual financing solutions (Ghassan and Krichene 2025). The factors which determine Islamic bank financial stability stem from Islamic financial system principles that enable these banks to manage financial emergencies while reducing their exposure to potential market dangers:

– The Islamic financial system is founded upon a set of moral and ethical values, including trustworthiness, credibility, transparency, facilitation, cooperation, and solidarity. Islam affirms that "there is no economy without ethics"; accordingly, the presence of such moral values contributes to the realization of security and stability for all economic agents. At the same time, Islamic law prohibits financial and economic transactions grounded in deceit, gambling, fraud, excessive uncertainty (gharar), exploitation, greed, and injustice. Adherence to faith-based and ethical values thus constitutes the normative framework governing the conduct of Muslims whether producers or consumers, sellers or buyers in times of prosperity or recession, and under conditions of stability or crisis (Saidani and Biraz 2023, 484);

– Under Islamic law, the sale of debt for debt does not constitute a valid contract (such as discounting post-dated checks, refinancing debt through rescheduling with an increment, short-term debt securities, or compound interest arrangements). Jurists attribute the rationale for this prohibition to the presence of elements of gambling and excessive uncertainty, in addition to the fact that such transactions encumber the liabilities of both parties in interlinked obligations without generating genuine economic benefit. This contravenes the fundamental Shariah objective of sale contracts, which is premised upon the effective transfer and receipt of benefit (Edress 2020);

– Islamic finance operates under a fundamental rule which forbids all forms of interest-based lending transactions. The law requires that all debt agreements which generate financial benefits through interest

payments become invalid. The financial products which depend on interest rates become forbidden. The Islamic system allows parties to lend money when they agree to return only their original amount (Zamir and Shafiq 2015, 25). The Islamic financial system bases its operations on the principle which allows people who cannot pay their debts because of uncontrollable events to receive debt relief.

– Islamic law forbids people from using standard financial derivatives because these instruments function as debt sales which produce ribā through their debt-based structure that creates excessive market risk. The contracts require buyers to postpone both their payment and asset delivery but they do not receive ownership rights during the agreement which violates Shariah rules that demand both asset transparency and actual possession of assets in financial agreements (Khan and Rashid 2020). The research shows that financial derivatives which markets misuse through complex instruments like credit default swaps and asset-backed securities caused a rapid build-up of systemic risk which led to the 2008 global financial crisis while exposing major weaknesses in worldwide financial supervision and regulatory systems (Zhang 2024).

Mechanisms for Achieving Financial Stability in Islamic Banks

The first phase of the 2008 financial crisis revealed that Islamic banks kept their financial stability because they focused on funding projects which directly supported the real economy and they operated under Sharia principles which ban ribā as previously discussed and protect against dangerous financial activities and dishonest financial dealings. The bank management style-maintained stability during a time when traditional banks suffered major financial damage (Mehdaoui 2021, 897-898). Financial stability in Islamic banks depends on three core mechanisms which function as their fundamental operational framework:

– The financial system based on (PLS) between parties enables Islamic finance to achieve monetary stability because it links banking operations directly to projects which have actual economic worth. The financier faces risk which matches their profit-sharing percentage so no additional expenses will show up in the product's final cost. Islamic finance allows credit expansion or reduction to follow actual economic growth which maintains monetary stability and stops money supply from growing beyond what the economy requires (Al Arabi and Qadi 2016, 17).

– The financial system needs particular mechanisms to build trust between its participants, as Islamic banks distribute risks appropriately according to each participant's ability and financial contribution, as previously discussed, while complying with Islamic Sharia, which prohibits interest-based transactions and margin based sales. The government also needs to implement supportive policies to assist Islamic banking systems during financial crises, as these measures lead to stronger Islamic banking operations and achieve financial stability (Nizam al Din Hussein al Taie and Moussa Hassan Al Maliki n.d., 189).

– The financial market requires specific tools to maintain stable asset values. The foundation of Islamic finance rests on (PLS) because it supports the idea that people should only gain when they face actual risks. The principle establishes boundaries which stop financial assets from separating completely from real assets while it maintains price stability because Islamic finance maintains strong connections to actual economic activities. The financial instrument Sukuk functions through partnership-based asset financing instead of being a conventional debt instrument which allows investors to receive returns that match asset performance while they take on all associated investment risks (Nawaz 2025). The ribā ban establishes limits which stop banks from offering too much credit while it stops financial bubbles from forming during economic upswings. The system which allows debtors to get a break during financial troubles prevents asset prices from dropping too quickly. The system uses these mechanisms to protect financial systems from collapse while keeping markets operational (Al Arabi and Qadi 2016, 18).

Islamic banks proved their ability to handle financial crises while facing fewer market shocks which led to their expanding business operations and their work to create Islamic capital markets. Some governments have also directed their banking sectors toward adopting these mechanisms during financial crises, as evidenced in the United States experience. The financial system requires banks to create new Sharia-compliant financial products which must follow Islamic banking principles to prevent future financial crises from emerging. The development needs jurists and economists and banking experts to work together for creating Sharia-compliant financial products which should reflect Islamic banking principles and work to stop new financial crises from developing.

The Z-Score as a Measure of Financial Stability and Soundness in Islamic Banks

Economic research uses different analytical tools and performance indicators to evaluate banking financial stability through capital adequacy ratios and liquidity ratios and non-performing asset ratios and the Z-score. The banking sector needs these evaluation methods to determine its resistance level because they help design supervisory approaches which protect the entire financial network from instability. The research study uses Z-score as its primary financial stability assessment tool for banks because it remains one

of the most important and current models available.

The World Bank uses the Z-score as an alternative banking stability measurement which predicts financial institution insolvency by showing how likely their asset values will drop below their total liabilities. The index shows higher values when financial distress or insolvency becomes less likely but lower values indicate greater chances of these financial problems occurring (Lu'lu Firdaus et al. 2023, 20).

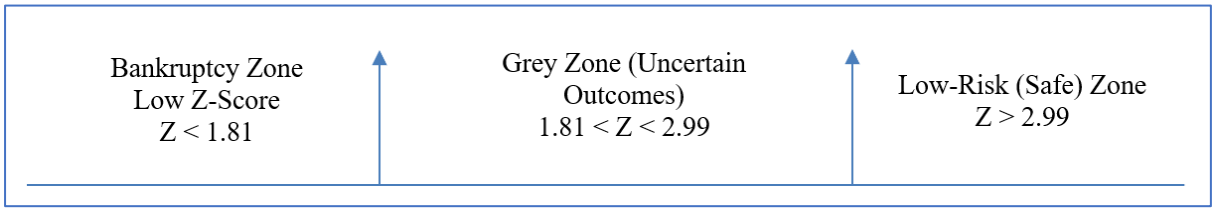
The Z-score rises when banks show better profitability results and stronger capital positions but it falls down when their returns onto investments become lower. It is calculated by adding the average return on assets (μROA) to the equity-to-total-assets ratio (E/A), and dividing the result by the standard deviation of return on assets (δROA), which should be computed over a period of at least five years. The formula is expressed as follows (Saidani and Biraz 2023, 490):

$$Z = \frac{\mu ROA + E/A}{\delta(ROA)} \quad (1)$$

Where:
Z: Financial stability and soundness indicator;
ROAμ: Mean return on the bank's assets;
E/A: Ratio of equity to total assets;
δROA: Standard deviation of return on assets.

The financial stability assessment through Z-score depends on three basic elements which include asset returns and capital strength and asset return volatility. A bank's economic shock resistance before insolvency becomes measurable through the combination of these dimensions which serves as a strong tool for banking stability assessment.

The Z-score model analysis included 66 public companies from the United States which split into 33 successful companies and 33 failed companies. Research results show that institutions which have Z-scores below 1.88 become highly vulnerable to financial collapse which probably leads to bankruptcy. Financial stability in banking operations emerges at institutions which maintain Z-scores above 2.92. The Z-score range which stretches from 1.81 to 2.99 creates an uncertain zone that institutions occupy during what experts call their "grey zone" period (Saidani and Biraz 2023, 489).
The following figure illustrates the ranges of variation in Z-score values:



Source: (Saidani and Biraz 2023, 489).
Figure 1. Z-Score Classification Zones

The Z-score formulation expresses the probability of financial failure in conventional banks; however, it requires reconsideration in the context of Islamic banks. In conventional banking, capital constitutes the primary line of defence for depositors' funds against various risks. In contrast, depositors in Islamic banks—particularly holders of unrestricted and restricted investment accounts—share in the outcomes of investment activities, whether profits or losses. This risk-sharing mechanism mitigates the impact of investment-related losses on the erosion of bank capital, unless the Islamic bank is negligent in managing funds (Mahboub and Sanousi 2020, 415).

Accordingly, the conventional Z-score financial stability indicator is to be modified and adapted to measure financial soundness in Islamic banks by transforming it into two distinct indicators. The first assesses the degree of financial stability in an Islamic bank from the perspective of profit-sharing investment account holders, denoted $ISLB(Z)_{PSIA}$. The second measures financial stability from the perspective of shareholders or potential investors in Islamic bank equity, denoted $ISLB(Z)_{SharH,Invest}$, as follows:

– The Islamic Banking Stability Indicator $ISLB(Z)_{PSIA}$, from the perspective of profit-sharing investment account holders, aims to measure the stability of returns generated for these account holders. It is calculated using the following relationship (Saidani and Biraz 2023, 490).

$$ISLB(Z)_{PSIA} = \frac{\left(\frac{R_{PSIA}}{A_{PSIA}}\right) \times 100 + \frac{E}{A_{PSIA}}}{\delta\left(\frac{R_{PSIA}}{A_{PSIA}}\right) \times 100} \quad (2)$$

Where:
$ISL(Z)_{PSIA}$: Islamic banking stability indicator relating to profit-sharing investment accounts;
R_{PSIA}: Net returns realized by holders of profit-sharing investment accounts;
A_{PSIA}: Volume of assets financed by holders of profit-sharing investment accounts;
(E/A_{PSIA}): Ratio of the bank shareholders' equity to the total volume of assets financed by profit-sharing investment accounts;
$(R_{PSIA}/A_{PSIA}) \times 100$: Standard deviation of the rate of return on assets attributable to profit-sharing investment account holders, calculated over a period of no less than five years to ensure greater statistical reliability.

– The Islamic Banking Stability Indicator $ISLB(Z)_{SharH,Invest}$, relating to capital providers or prospective equity investors, aims to measure the degree of stability in the returns realized by shareholders of the Islamic bank and its investors. It is calculated using the following relationship (Mehdaoui 2021, 418):

$$\mathrm{ISLB(Z)_{SharH,Invest}} = \frac{\left(\mathrm{R_{SharH,Invest}/\ A_{SharH,Invest}}\right) \times 100 + \ \mathrm{E/\ A_{SharH,Invest}} + \mathrm{U_{Annual/R\ SharH,Invest}}}{\delta\left(\left(\mathrm{R_{SharH,Invest}/\ A_{SharH,Invest}}\right) \times 100\right)} \quad (3)$$

Where:
$ISLB(Z)_{SharH,Invest}$: the financial stability index of Islamic banks pertaining to capital holders or prospective equity investors;
$R_{SharH,Invest}$: the net returns realized by equity holders;
$A_{SharH,Invest}$: the volume of assets financed by equity holders;
$E/A_{SharH,Invest}$: the ratio of equity to total assets financed by equity holders;
$\mu_{Annual}/\ R_{SharH,Invest}$: the average annual growth rate of net profits attributable to equity holders;
$(R_{SharH,Invest/}\ A_{SharH,Invest}) \times 100$: the standard deviation of the rate of return attributable to equity holders. This indicator should be calculated over a period of no less than five years to ensure greater statistical significance.

Measuring the Financial Stability and Soundness of Al Salam Bank Algeria during the Period (2015–2024)

Overview of Al Salam Bank Algeria

Al Salam Bank Algeria is a banking institution operating under Algerian law and in full compliance with the provisions of Islamic Sharia in all its transactions. The bank was licensed by the Bank of Algeria in September 2008 and subsequently commenced operations with the objective of providing innovative banking services.

Al Salam Bank Algeria operates in accordance with a clearly defined strategy aligned with the requirements of economic development across all vital sectors in Algeria, through the provision of modern banking services aimed at meeting the needs of the market, clients, and investors. Its transactions are supervised by a Sharia Supervisory Board composed of prominent scholars in Islamic jurisprudence and economics (Al Salam Bank 2023, 03).

METHODS AND DATA

This study adopted a descriptive-analytical approach to evaluate the financial stability of Islamic banks using a modified Z-Score framework. The study focuses on a single case study, specifically Al Salam Bank Algeria, covering the period from 2015 to 2024. The ten-year timeframe provides sufficient breadth to observe trends and variations in financial stability under different economic conditions.

The study focuses on the period (2015-2024) due to the availability of consistent financial data and the relevance of this timeframe for analysing the evolution of financial stability. This period captures different macroeconomic conditions, including economic fluctuations and external shocks such as Covid-19 pandemic, which allows for a more comprehensive assessment of the bank's resilience using the Z-Score indicator.

The study relies on secondary data obtained from the bank's annual financial statements for the period (2015-2024), the dataset includes key financial indicators such as: Total assets, Shareholders' equity, Net income, Profit Sharing Investment Accounts (PSIA) and Relevant reserves and risk provisions.

All variables were calculated on an annual basis. To ensure accuracy and reliability, the data were carefully checked for consistency and comparability across the study period, allowing for a robust and methodologically sound analysis.

RESULT AND DISCUSSION

Key Activity Indicators of Al Salam Bank Algeria

The evolution of the principal activity indicators of Al Salam Bank Algeria during the period (2015–2024) can be summarized in the following table:

Table 1. Evolution of the Principal Activity Indicators of Al Salam Bank Algeria during the Period (2015–2024) (million DZD)

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Assets	40,575	53,104	85,775	110,109	131,019	162,626	237,804	261,693	333,886	389,396
Shareholders' Equity	14,301	15,381	16,563	17,305	19,012	18,900	27,263	27,312	33,088	39,578
Customer Deposits	30,120	34,512	64,261	85,431	103,792	129,320	195,031	215,076	279,098	362,185
Net Income	301	1,080	1,181	2,418	4,007	3,069	3,389	4,393	5,834	6,672
Return on Equity (%)	4%	7%	7%	14%	21%	15%	15%	16%	19%	20%

Source: Prepared by the two researchers based on the annual financial reports of Al Salam Bank Algeria for the period (2015–2024).

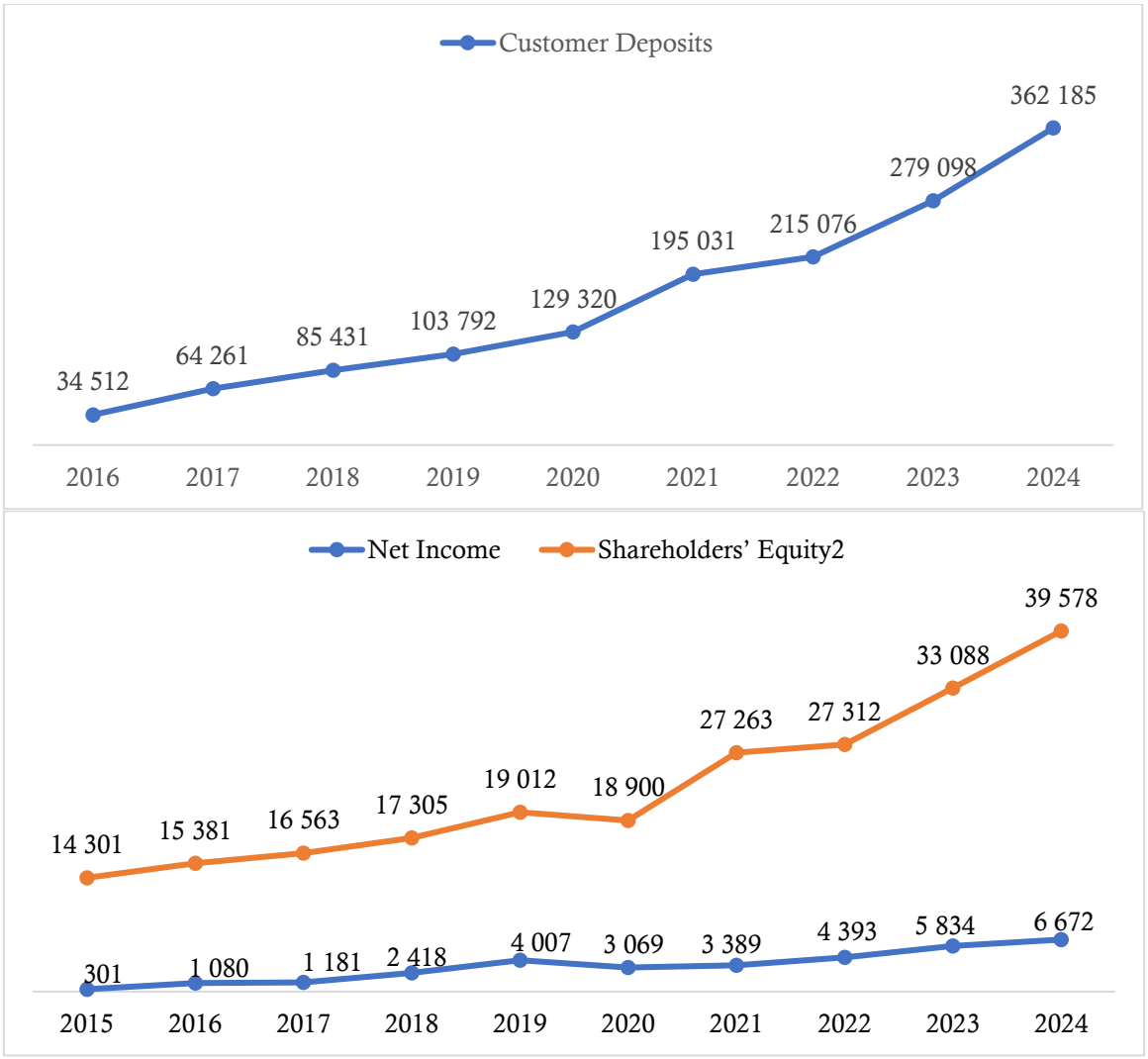
From the preceding table, the following conclusions may be drawn:

During the period (2015–2024), Al Salam Bank recorded sustained growth in its operations, as reflected in the marked increase in total assets, which rose from 40 million DZD in 2015 to 389 million DZD in 2024. The expansion of customer financing portfolio through client base expansion serves as the main reason for this growth. The value of shareholders' equity showed steady growth throughout the entire period except for the year 2020 because the COVID-19 pandemic caused a small decrease of 0.6% in this financial metric.

Total customer deposits exceeded 300 thousand in 2024, compared with 30 million DZD in 2015. The banking sector experienced positive growth in all deposit categories which included current accounts and investment accounts and savings accounts. The bank's deposit category experienced growth because of two main factors which included their promotional activities that encouraged savings and their practice of giving incentive-based returns to their deposit holders. The bank shows signs of better client perception because its customers have developed higher levels of trust toward their banking establishment. The bank achieved a 100 billion DZD liquidity level during 2023 because its deposit and financing balances expanded to reach 187% of the planned target (Al Salam Bank 2023).

The results from the previous section along with other factors led Al Salam Bank to achieve steady net profit growth during most of the research period except for 2020 when the COVID-19 pandemic caused worldwide economic challenges which affected the Algerian market. Net income declined from 4 million DZD in 2019 to 3 million DZD in 2020; however, it increased in subsequent years, exhibiting a consistent upward trajectory. The bank achieved net profits of 6,672,000 DZD during 2024 which represented a 14.5% increase from its 2023 financial results. The new development led to an overall boost in the return on shareholders' equity.

The foregoing results may be summarized in the following figure:



Source: Prepared by the two researchers based on the data presented in Table No. 1.
Figure 2. Evolution of Activity Indicators of Al Salam Bank Algeria during the Period (2015–2024)

Analysis of the Financial Stability and Soundness Indicator (Z-Score) of Al Salam Bank Algeria during the Period (2015–2024)

The Z-Score indicator for Al Salam Islamic Bank will be measured and analysed for both profit-sharing investment account holders and equity holders, based on the specific formula applicable to each indicator.

Analysis of the Evolution of the Z-Score for Profit-Sharing Investment Account Holders of Al Salam Bank during the Period (2015–2024)

The following table illustrates the evolution of the Z-Score for profit-sharing investment account holders of Al Salam Bank over the period (2015–2024). To measure this indicator, the Equation (2) is applied.

Based on the annual reports of Al Salam Bank Algeria over the period (2015–2024), the financial data were collected to compute the $ISLB(Z)_{PSIA}$ index, and the results are presented in the following table:

Table 2. Evolution of the Z-Score index for profit-sharing investment accounts at Al Salam Bank Algeria during the period (2015–2024)

Statement	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Depositors' profits from investment accounts	126000	205547	297918	595517	1064986	1358344	1717260	2315607	2735849	2941928
Net returns realized for investment account holders (R_{PSIA})	126000	205547	297918	595517	1064986	1358344	1717260	2315607	2735849	2941928
Net Islamic financing and investment assets	6430485	7866447	8171368	10487621	11333094	10335272	13950009	16760405	18123874	14887556
Bank equity (E)	14301000	15381000	16563000	17305000	19012000	18900000	27263000	27312000	33088259	39578947
Customer deposits (savings accounts and investment deposits)	2253596	4101081	6026287	7762247	11794091	19201561	32234042	42362802	54143064	64792854
Total	16554596	19482081	22589287	25067247	30806091	38101561	59497042	69674802	87231323	104371801
Financing ratio from investment account holders' funds	0.13613	0.2105	0.26677	0.30965	0.38284	0.50395	0.54177	0.608	0.62068	0.62078
Volume of assets financed by profit-sharing investment account holders (A_{PSIA})	875381.92	1655887.09	2179875.84	3247491.84	4338761.7	5208460.32	7557696.37	10190326.2	11249126.1	9241897.01
E/A_{PSIA}	16.3368	9.2886	7.5981	5.3287	4.3818	3.6287	3.6073	2.6801	2.9413	4.2825
$(R/A_{PSIA}) \times 100$	14.3937	12.4131	13.6667	18.3377	24.5458	26.0795	22.722	22.7235	24.3205	31.8325
$d\ (R_{PSIA}/A_{PSIA}) \times 100 = 6.7148$										
Average value of the financial stability and soundness index for profit-sharing investment account holders $ISLB(Z)_{PSIA} = 4.4861$										

Source: Prepared by the two researchers based on the annual financial reports of Al Salam Bank Algeria for the period (2015–2024).

From the results presented in the preceding table, the value of the financial stability and soundness index for profit-sharing investment account holders $ISLB(Z)_{PSIA}$ is derived as follows:

The arithmetic mean of return on assets: $\overline{RPSIA/APSIA}$= 23.44833

The arithmetic mean of the ratio of equity to total assets financed by investment accounts:

$$\overline{E/APSIA} = 6.6749$$

The standard deviation of the rate of return attributable to profit-sharing investment account holders: $\delta\ (R_{PSIA}/A_{PSIA}) \times 100 = 6.7148$.

Substituting into the ISLB(Z)PSIA index equation, we obtain:

$$ISLB(Z)_{PSIA} = \frac{R_{PSIA}/\ A_{PSIA} \times 100 + E/\ A_{PSIA}}{\delta(R_{PSIA}/\ A_{PSIA}) \times 100} \quad (4)$$

$$ISLB(Z)_{PSIA} = (23.44833+6.6749) \ / \ 6.7148 = 4.4861$$

The Financial Stability and Soundness Index for Profit-Sharing Investment Account holders ($ISLB(Z)_{PSIA}$) showed an average value of 4.4861 during the assessment. The bank needs to reduce its profit by more than 4.4861 times its standard deviation before its equity will vanish which makes the bank unable to pay its creditors. The bank operates under financial stability according to its Z-score which exceeds 2.99 and its insolvency risk remains at a minimal level. The bank follows Islamic Sharia principles through its financing methods which have created positive effects on various elements of this index which I will now examine in detail.

Depositors earned rising profits throughout the research period between 2015 and 2024 when their earnings increased from DZD 126,000 in 2015 to DZD 2,941,928 in 2024. The profit increase resulted from higher distribution of earnings to savings account owners and investment certificate holders who follow the mudarabah contract. The total profit which profit-sharing investment account holders obtained matched the total profit which investment account depositors received because investment account holders did not face any expenses during the research period.

The indicator measuring the volume of assets financed by investment account holders (A_{PSIA}) recorded significant growth over the period (2015–2024), rising from DZD 875,381.92 in 2015 to DZD 9,241,897.01 in 2024. The financial results demonstrate investment accounts operate as authentic funding sources which show how investors trust their bank and how well the bank distributes its investment funds for financial security and business growth.

The ratio between equity and total assets funded by profit-sharing investment account holders (E/A_{PSIA}) showed a continuous decrease from 16.33% in 2015 to 4.28% in 2024 according to the analysis of data from 2015 to 2024. The bank needs funds from its investment account holders to support its operations because Islamic banking follows a profit-and-loss sharing system. The ongoing pattern will create solvency problems which need investment account holder protection through improved risk control systems.

The ratio of returns to investment account holders relative to the volume of assets financed by them (R/A_{PSIA}) exhibited fluctuations during the period (2015–2024). The indicator reached its lowest value in 2016 (12.41%), subsequently increased, declined again in 2020 due to the COVID-19 crisis, and then rose to attain its highest level in 2024 (31.83%). The bank has improved its investment fund management which leads to better financial stability and increased profitability.

Analysis of the Evolution of the Z-Score Index for Equity Holders of Al Salam Bank during the Period (2015–2024)

The following table presents the evolution of the Z-Score index for the equity holders of Al Salam Bank over the period (2015–2024). To measure this index, the Equation (3) is applied.

Table 3. Evolution of the Z-Score Index for the Equity Holders of Al Salam Bank of Algeria during the Period (2015–2024)

Statement	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Net Profits Attributable to Equity Holders $R_{ShareH,Invest}$	2214284	2769196	3989527	7015658	9226913	7701109	9267164	11134236	13685796	16866884
Net Islamic Financing and Investment Assets	6430485	7866447	8171368	10487621	11333094	10335272	13950009	16760405	18123874	14887556
Bank Equity (E)	14301000	15381000	16563000	17305000	19012000	18900000	27263000	27312000	33088259	39578947
Customer Deposits (Savings Accounts and Investment Deposits)	2253596	4101081	6026287	7762247	11794091	19201561	32234042	42362802	54143064	64792854
Total	16554596	19482081	22589287	25067247	30806091	38101561	59497042	69674802	87231323	104371801
Financing Ratio from Equity Holders	0.86386	0.78949	0.73322	0.69034	0.61715	0.49604	0.45822	0.39199	0.37931	0.37921
Volume of Assets Financed by Equity Holders $A_{sharh,\ invest}$	412166	461997	517871	636284	689138	860455	872259	958161	1009084	1131122
The annual growth rate in shareholders' equity	0.02	0.075	0.08	0.045	0.1	-0.01	0.44	0.002	0.21	0.2
					μAnnual /E = 0.0962					
$(R_{SharH,Invest}/A_{SharH,Inves}) \times 100$	537.1	599.4	770.37	1102.6	1338.9	895	1062.43	1162.04	1356.26	1491.16
$E/A_{sharh,invet}$	3.4697	3.3292	3.1982	2.7196	2.7588	2.1965	3.1255	1.8067	32.7903	34.9908
					$\delta\ (R_{SharH,Invest}/A_{SharH,Invest}) \times 100 = 340.53$					
					The Average Z-Score Value for Equity Holders $ISLB(Z)_{SharH,Inves} = 3.3955$					

Source: Prepared by the two researchers based on the annual financial reports of Al Salam Bank of Algeria for the period (2015–2024).

From the results of the preceding table, the value of the Financial Stability and Soundness Index for equity holders, ISLB(Z) $_{SharH,Invest}$ is derived as follows:

Arithmetic mean of the return on assets:

$$\left(\overline{R/A_{SharH,Invest}}\right) = 1146.14$$

Arithmetic mean of the ratio of equity to total assets financed by equity holders:

$$\overline{E/A_{SharH,Invest}} = 10.0428$$

Standard deviation of the rate of return attributable to equity holders:

$$\delta(R_{SharH,Invest}/\ A_{SharH,Invest}) \times 100 = 340.53$$

By substituting into the ISLB(Z) $_{SharH,Invest}$ index equation, we obtain:

$$ISLB(Z)_{SharH,Invest} = \frac{\left(R_{SharH,Invest}/\ A_{SharH,Invest}\right) \times 100 + \ E/\ A_{SharH,Invest} + U_{Annual/R\ SharH,Invest}}{\delta\left(\left(R_{SharH,Invest}/\ A_{SharH,Invest}\right) \times 100\right)} \quad (5)$$

$$ISLB(Z)_{SharH,Invest} = (1146.14+10.0428+0.0962) \ / \ 340.53 = 3.3955$$

The Financial Stability and Soundness Index for profit-sharing investment account holders $ISLB(Z)_{SharH,Invest}$ shows an average value of (3.3955). The value falls into the low-risk zone because it exceeds 2.99 which shows that Al Salam Bank has achieved its service delivery objectives while keeping its financial position stable.

The table results indicate a consistent upward trend in net profits attributable to equity holders over the period (2015–2024), rising from DZD 2,214,284 in 2015 to DZD 16,866,884 in 2024. Al Salam Islamic Bank shows a continuous positive trend in its financial results. The present situation demonstrates that equity usage has become more efficient because Sharia-compliant financing and investment operations have grown which supports financial stability through controlled risk levels maintained by the Islamic banking system based on profit-and-loss sharing.

The return on assets financed by equity holders ($R_{SharH,Invest}/\ A_{SharH,Invest}$) exhibited an upward trajectory during the period (2015–2024), increasing from 537 in 2015 to 1491 in 2024. The bank has improved its own capital deployment efficiency according to the data. The relative limitation of fluctuations further indicates a degree of operational stability that has reinforced overall financial soundness.

The $E\ /\ A_{SharH,\ Invest}$ ratio showed irregular changes throughout the years spanning from 2015 to 2024. The ratio experienced no major changes between 2015 and 2017 when the capitalization level averaged 3.33 which demonstrates the company used equity to fund its assets equally. The COVID-19 pandemic caused the value to decrease between 2018 and 2020 with the most significant drop occurring in 2020. The structure went through a major transformation during 2023 and 2024 because equity showed a strong upward trend. The bank protects investment account holders from risk through its precautionary capitalization policy which also reduces financial leverage.

CONCLUSION

The research study used the Z-Score indicator to evaluate financial stability levels which Islamic banks maintain while studying Al Salam Bank of Algeria under Islamic banking institutional conditions. The research aimed to prove this indicator functions well for Islamic banking operations because it matches their operational structure which follows the profit-and-loss sharing system that sets these banks apart.

The research results showed that $ISLB(Z)_{PSIA}$ had a value of -4.4861 which demonstrated Al Salam Bank of Algeria maintained strong financial stability. The bank receives its core strength from investment account holders because they determine its ability to handle financial losses and protect against banking failures. The research shows Islamic banks maintain their stability through profit-and-loss sharing systems which also defend the whole banking system from collapsing.

The value of ISLB(Z) $_{SharH,\ Invest}$ =3.3955 = 3.3955 shows that Al Salam Bank operates in a low-risk environment because self-capitalization as a risk indicator does not provide sufficient information about Islamic banks' risk levels. The two indicators demonstrate that ignoring Islamic funding source characteristics will result in incorrect evaluations of Islamic banks' stability.

Furthermore, the empirical results indicate that the calculated Z-Score values remained above the critical threshold throughout the study period. Which reflects the bank's strong solvency position and its capacity to withstand potential financial distress. This stability is largely attributed to the relatively high

capitalization level and the prudent risk-management practices adopted by the bank.

In addition, the analysis confirms that the institutional characteristics of Islamic banking particularly the profit and loss sharing mechanism and the reliance on investment accounts, contribute significantly to enhancing financial resilience. These factors reduce the likelihood of insolvency and reinforce the bank's ability to maintain sustainable financial performance over time.

The research finds that Islamic banking needs specialized financial stability assessment tools which will provide more accurate banking risk evaluations than standard methods. The system transformation enables banks to obtain better decision support from their monitoring systems which simultaneously helps maintain financial system stability. The study suggests that future research should use advanced econometric methods to analyse larger samples which include various Islamic banks while researchers should use more indicators to study liquidity and asset quality for better understanding of Islamic banking stability patterns.

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Data Available Statement

The data used in this study were obtained from the official website of Al Salam Bank Algeria: https://www.alsalamalgeria.com/, and are publicly accessible.

Conflict of interest

The authors declare no conflict of interest.

AI Tools Statement

authors confirm that no AI tools were used in the preparation of this manuscript.

Author contribution (as applicable):

Zourkata Meriem and Damene Ouahiba contributed equally to all aspects of this research, including conceptualization, methodology, data curation, and formal analysis. Both authors participated in writing the original draft, as well as the subsequent review and editing process.

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