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The Role of Bank Credit in Assessing Financial Risk and Predicting Financial Failure Using the Z-Score Model: Evidence from Iraqi Commercial Banks

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Abstract

This paper examined how bank credit can be used to measure financial risk and predict financial failure using the Z-score, drawing on data from Iraqi commercial banks. The research used panel data regression to estimate a sample of banks across the study period, with bank credit (loans) as the primary explanatory variable and total assets and total liabilities as control variables. The experimental findings revealed that bank credit significantly and positively influences financial stability, as indicated by the Z-score ($\beta 1 = 0.0100$, $p = 0.043$). In particular, a rise in bank loans will have a quantifiable positive effect on the Z-score, thereby reducing the likelihood of bankruptcy. Total assets also showed a positive and significant correlation with financial stability (2 = 0.01), indicating that larger banks with diversified asset bases are more resilient to financial risk. Conversely, total liabilities have an adverse, statistically significant effect on Z-Score ($\beta 3$ is negative and $p < 0.05$), indicating that greater leverage implies greater financial risk and undermines banks' solvency. The general model has strong explanatory power, with the adjusted R^2 well above levels deemed acceptable in panel data studies, and the outcomes are also robust across different model specifications. These results confirm that the Z-Score model is effective at forecasting financial failure. That sound credit control is a key factor in improving the financial stability of Iraqi commercial banks. The study recommends calibrate the credit growth in accordance with the internal risk appetite and the macro-financial environment. Set bank-specific ranges of loan growth percentiles, like percentile ranges based on historical volatility, and ensure that executives must approve any variation, and that it is clearly connected to capital planning and liquidity buffers. Increase and strengthen underwriting requirements when cyclical conditions are favourable, thereby eliminating potential weaknesses. Integrate the Z-score into regular risk management, track its patterns on board risk committees, set tolerance limits aligned with stress-test results, and associate violations with automated reactions such as tightening credit conditions, changing charges, or increasing capital.

Keywords: *Bank Credit, Financial Risk, Financial Failure, Z-Score, Iraqi Commercial Banks, and Panel Data.*

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1.0 Introduction

The banking sector experienced significant change since the global financial crisis as cycles of credit expansion and stringent regulatory environments were changing the risk-taking behaviour and solvency profiles. Structural vulnerabilities, information asymmetry and macroeconomic volatility in emerging economies increase these dynamics (A. J. Al-Waeli, Ismail, et al., 2021). The commercial banks that dominate the banking sector in Iraq, in a challenging post-conflict setting, have been expanding credit to fund reconstruction and private-sector operations. Still, loans continue to experience credit risk, lack of a strong credit risk management infrastructure, and periodic liquidity crises (Abbas Jumaah Al-Waeli, 2024). It is against this backdrop that the role of bank credit in financial risk and the probability of economic failure is a policy issue and a management need. Although international evidence indicates that high credit growth and low underwriting standards are associated with poor-quality assets and solvency erosion, few empirical studies have combined credit behaviour with early-warning failure models in the Iraqi context (Hanoon et al., 2020a).

This research paper addresses an obvious issue: the lack of a systematic, evidence-based model to measure the association between the dynamics of bank credit and financial risk, and to evaluate the validity of predictive failure indicators, particularly the Altman Z-Score, in the Iraqi commercial banking system (A. J. Al-Waeli, Khalid, et al., 2021). Regulators and banks do not have localised empirical standards they can use to set credit growth, capital buffers, and provisioning in a manner that provides a predictive level of distress, rather than a reactive one. Consequently, risk can go unnoticed with an upswing, and when it goes down, interventions can be made too late.

The research question has three interrelated objectives: first, to investigate the relationship between the bank credit indicators, including the loan to asset ratio and loan growth and financial risk, which are measured by the asset quality, earnings volatility, and capital adequacy; second, to test how the bank credit is related to financial failure risk; and third, to test the predictive validity of Z-Score model in classifying the Iraqi commercial banks as being in a distress, grey, and safe zone (A. J. Al-Waeli et al., 2020a). The study will help isolate bank-specific effects, in addition to cyclical and structural effects, by incorporating these objectives into a panel-data model to be applied to 20 Iraqi commercial banks over several years (A. Al-Waeli et al., 2022).

The research is valuable and timely. To bank managers, it provides an empirical foundation for balancing credit expansion and risk appetite, refining underwriting standards, and harmonising capital planning with the actual riskiness of loan portfolios (Hanoon et al., 2021). To regulators and policymakers, it provides a straightforward, replicable method for early warning and supervisory prioritisation, particularly when market-based signals are small or untrustworthy. More consistent indicators of solvency and exposure to failure would help investors and depositors reduce uncertainty and strengthen market discipline (Idan et al., 2021).

The research paper has four contributions to the banking and risk literature. To start with, it provides first-mover evidence in a poorly studied market, where the connections between credit risks and the economy receive little research. Second, it simultaneously analyses credit and failure risk dynamics within a bank-level Z-Score model, providing an integrated analysis rather than treating these aspects separately. Third, it is an experiment on the transportability of the Z-score in a banking system with unique institutional characteristics, which informs the debate on the validity of the models in emerging markets. Lastly, it offers policy-relevant implications that lie

between academic analysis and supervisory practice, continuing the discussion on how to be prudent in granting credit and monitoring solvency in unstable settings.

Bank Credit and Financial Risk

One of the key channels through which risk is created, converted, and passed across banks' balance sheets is bank credit. It is theorised and empirically established that banks' exposure to default risk, the volatility of their earnings, and the pressure on their solvency are jointly determined by the quantity, quality, and composition of credit. On the amount side, the boom in the rapid growth of loans and the high loan-to-asset ratios are usually followed by the decline in the quality of assets caused by adverse selection and eased underwriting criteria during booms; the procyclicality increases the nonperforming loans (NPLs) and loss-given-default in the moments when the situation changes (Borio & Lowe, 2002; Jiménez & Saurina, 2006). Qualitatively, sector, borrower group, or collateral type concentration of credit increases idiosyncratic shocks, and unnatural hedge against foreign-currency lending exposes the bank to further credit-currency mismatch risk (Laeven & Valencia, 2013; Acharya & Yorulmazer, 2007). Compositionally, longer-term and illiquid loans financed by short-term liabilities increase rollover and liquidity risks, which interact with credit risk to stress capital ratios (Diamond & Rajan, 2001).

These mechanisms are exacerbated in emerging and oil-reliant economies, where macro volatility, a shallow secondary market, and less robust contract enforcement are at play. The evidence from cross-country studies indicates that credit booms in such environments tend to result in NPL spikes and bank distress, and that this is more likely with poor buffers and weak governance (Beck, Demirguc-Kunt, and Merrouche, 2013; IMF, 2015). In the case of Iraq, bank credit dynamics are primarily driven by the oil cycle, the fiscal situation, and security uncertainty, which are passed through to borrowers' cash flows and collateral values. According to the reports of the Central Bank of Iraq (CBI), periods of rapid lending have been accompanied by increases in NPL ratios, especially in 2014 2016, around oil price crashes and in 2020, around pandemic-related crises. There has been a concentration in trade, construction, and the SME sectors, with collateral tied to real estate and government payments (CBI Annual Reports 2015).

These tendencies are supported by empirical studies done in Iraq. Al-Tamimi and Al-Muhammadawi (2019) report a positive relationship between NPLs and provisioning intensity, loan growth, and credit concentration in the selected Iraqi commercial banks, suggesting that credit growth is directly associated with asset-quality deterioration. Hameed and Aljubouri (2021) found that high credit growth, along with a low valuation of collateral, significantly increases credit risk indicators and erodes earnings by raising impairment expenses. Abbas and Jaleel (2022) demonstrate that banks with larger loan-to-deposit and loan-to-asset ratios suffered greater returns on assets and deteriorated capital adequacy during stress episodes, suggesting that stringent credit policy can undermine solvency buffers. Other evidence indicates that governance and risk management practices mediate the relationship between credit and risk, with stronger institutions associated with lower NPL sensitivity to loan growth (Al-Zubaidi & Al-Muhanna, 2018).

Specific characteristics of the Iraqi credit market intensify risk transmission. The tail risks are increased by related-party exposures and the concentration of the sector, and the use of credit bureaus in pricing risk is historically constrained by information asymmetry and unequal reporting of financial information, which restricts the banks (World Bank, 2017; CBI, Financial Stability Reports). Besides, collateral-based lending, especially real estate, generates procyclical feedback loops: in booms, credit grows on the back of rising collateral values, which, in downturns, causes

impairment recovery values, lengthening the resolution process and raising the loss rate. Liquidity risk is interdependent with credit risk because funding structures that depend on short-term deposits make public sector cash flows vulnerable to declining deposits and to the need for asset sales or limited lending, which undermine earnings and capital (CBI, 20212023).

The actionable mitigants reported in the international literature align with the local findings. Increased capitalisation and countercyclical provisioning reduce the sensitivity of solvency to loan losses (BCBS, 2010). Concentration risk is reduced through diversification across sectors and borrowers, and the adverse selection associated with rapid credit growth is kept at bay by thorough underwriting, cash-flow analysis, borrower stress testing, and conservative collateral haircuts (Gambacorta & Murcia, 2019). In the case of Iraqi banks, the recent progress in IFRS implementation, increased supervisory review (SREP), and the incremental adoption of the Basel framework is linked to the increase in risk recognition and coverage ratio, but the heterogeneity of implementation remains (CBI, Annual Reports; IMF Article IV, 2022). In general, the facts present a clear thesis: the speed at which bank credit policies develop, underwriting criteria, concentration control, and funding combinations are irrevocable factors in financial risk, and their astute adjustment is imperative for maintaining solvency rates and earnings stability in the Iraqi banking industry.

Financial Failure in Commercial Banks

Interacting credit, liquidity, solvency and governance weaknesses that undermine a bank's ability to absorb losses and satisfy obligations are usually the result of the process of financial failure of commercial banks (Abbas Jumaah Al-Waeli, 2024). It is internationally evidenced that failure should not be viewed as the result of a single shock; instead, a series of unfortunate events such as poor quality of assets, earnings shrinkage, liquidity of funds, and capital loss are standard, and are often amplified by macroeconomic recessions and lax supervisory regulation (Demirguc-Kunt & Detragiache, 1998; Cole & White, 2012). The focus of credit shocks is that accelerating non-performing loans (NPLs) challenge profitability and capital, and raise impairment expenses. Although profitability declines, banks will face higher funding costs and even deposit losses, further exacerbating liquidity strains (Laeven & Valencia, 2013). In underdeveloped risk management systems, concentration risk, lending to the same party, and poor collateral valuation may shorten the slide from vulnerability to distress (Basel Committee on Banking Supervision, 2015).

In emerging and oil-dependent economies, macro-financial channels do enhance those dynamics. The oil price shocks are passed on to borrower cash flows, collateral values (particularly real estate), and government expenditure, which impact payment cycles and liquidity supply to the banking system (Boubaker & Jouini, 2014). The outcome is coordinated stress: NPLs increase, and market sentiment weakens, inhibiting banks' access to stable funding. The lack of timely enforcement of the law and prolonged recovery operations further increase the loss-given-default and extend the balance-sheet strain (World Bank, 2017).

These are some of the features of the commercial banking sector in Iraq. Volatility of oil revenues, fiscal cycles, geopolitical risk, and changes in the capacity to regulate the environment define the operating environment. According to the Central Bank of Iraq (CBI) data, the periods of fiscal contraction and oil prices decline have the most significant impact on the high NPL ratios, profitability pressure, and reduced growth in credit, especially in banks with the concentration of exposure to trade, construction, and SMEs (CBI Annual Reports, 20152022). Empirical evidence

from the Iraqi banks' records shows that poor credit checks, related-party exposures, and collateral against government contracts or real estate exposed the increased risk of default once the public investment dropped, resulting in a long-term delinquency period and reduced recovery rates (Al-Tamimi & Al-Muhammadawi, 2019; Al-Khazali & Al-Dahash, 2020). Hameed and Aljubouri (2021) demonstrate that increasing NPLs had a significant negative impact on returns on assets and capital adequacy, and that liquidity stress, as evidenced by high loan-to-deposit ratios and short-term funding dependence, further contributed to solvency risk. Other types of evidence also indicate that governance weaknesses, board oversight, audit quality, and risk culture are all linked to greater failure propensity because weak institutions are less effective at keeping risk migration on the credit book to capital (Al-Zubaidi & Al-Muhanna, 2018).

The failure risk in Iraq also measures the structural frictions. The recovery and resolution procedures and secondary markets for stressed assets are shallow and restricted, and banks have few alternatives for disposing of problem loans (Hanoon et al., 2020a). Despite its movement towards adopting IFRS and Basel standards, adoption of these instruments has been spotty, and provisioning practices have sometimes lagged behind underlying asset quality (CBI, Financial Stability Reports; IMF Article IV Consultations on Iraq, various years). Such loopholes can delay the identification of losses, undermining market discipline and timely mitigation measures.

The early warning tools for Iraq, including rising NPL ratios, declining coverage ratios, negative earnings, and declining capital buffers, need to be adjusted to the local context. The accounting-based measures, such as Z-Score and other distress indices by Altman, which are syntheses of profitability, leverage and liquidity indicators, can be used to identify the risk of failure when there are not reliable market prices, but their thresholds and contents should be related to the balance-sheet structures of Iraqi banks and the high rates of state-related exposures (Altman, 2000; CBI, 2021). Finally, the transmission of credit risk to solvency stress in Iraqi commercial banks will be prevented by improving underwriting and collateral practices, diversifying loan portfolios, strengthening capital and liquidity cushions through the cycle, and improving the enforcement of supervision to promote the recognition of losses on time and the actions to address them.

Z-Score Model and Bankruptcy Prediction

Z-Score model, first created by Altman (1968) and later tailored to fit the needs of the private firms and non-manufacturing organizations (Altman, 2000; Altman, Iwanicz-Drozdowska, Laitinen, and Suvas, 2017), is an accounting-based early-warning system that integrates profitability, leverage, liquidity, and activity ratios into one index that can be used to discriminate between the healthy firms and those that are at risk of failure. Although the original specification was aimed at industrial firms, later versions for financial institutions acknowledge the differences between banks' balance-sheet structure and the centrality of capital adequacy and asset quality. Bank-adjusted variants of Z-score, or alternative, complementary insolvency proxies, are commonly used by researchers in banking applications to measure the buffer of capitalization and earnings relative to volatility: the distance-to-default style Z-score is a banking Z-score variant of ROA + Equity/Assets/standard deviation of ROA (Boyd & Graham, 1986; Laeven & Levine, 2009; Čihak & Schaeck, 2010). Such methods have demonstrated strong predictive performance in both developed and developing markets, primarily when used alongside credit quality and funding structure indicators (Betz, Oprică, Peltonen, and Sarlin, 2014).

It is expected that empirical evidence tends to back up the use of Z-score as an early-warning measure of bank performance, under context-dependent calibration. Z-score measures in emerging

economies are used to monitor cyclical declines in asset quality and profitability and to indicate the increased risk of default many quarters before distress (Ghosh, 2016; IMF, 2015). In the case of MENA and oil-related banking systems, the studies indicate that Z-Score dynamics are sensitive to oil price shocks and the fiscal cycle, with borrower cash flows and collateral value affected (Boubaker & Jouini, 2014). Risk-based supervision, as well as Basel-compliant capital requirements that align with the Z-Score focus on solvency buffers and earnings stability, have been promoted by the Central Bank of Iraq (CBI Annual Reports, 2015–2023). Local scholarly research based on Altman-type models or bank solvency metrics indicates that Z-Scores of Iraqi commercial banks declined throughout the 2014-2016 oil price shock and the 2020 pandemic, which is correlated with increases in nonperforming loans and reductions in profitability (Al-Saadi, 2020; Al-Janabi, 2021). Accounting ratio studies similar to components of Z-Score profitability, leverage, and liquidity are related to distress types and supervisory ratings (Hameed & Aljubouri, 2021; Abbas & Jaleel, 2022).

Model specification is one of the major methodological factors in banking. Either (i) researchers re-estimate Altman-style estimates with bank samples, (ii) the banking Z-score (capital plus profitability over volatility) is inevitably based on panel data, or (iii) researchers incorporate the output of the Z-score into the larger framework of early-warning systems that include market-based and macro-financial covariates (Betz et al., 2014; Čihák & Schaeck, 2010). In banks in Iraq with limited market and accounting information, major accounting-based Z-Scores, and the banking Z-score in particular, are particularly feasible. They can be calculated from audited IFRS financial statements and tracked alongside prudential ratios (capital adequacy, NPLs, and liquidity coverage). In addition, the classification thresholds (safe, grey, distress) might need to be recalibrated to capture both the structural characteristics of Iraq in terms of credit concentration, state-related exposures, and recovery lags in such a way that Type I and Type II errors are evenly distributed to be used by supervisors.

In general, the literature frames the Z-score as a predictor of bank distress that is both data-efficient and highly transparent, and explains distress in emerging markets, such as Iraq, by accounting for sectoral realities and the support of credit quality and funding measures. Its incorporation into the Iraqi risk assessment systems can enhance early warning, necessary provisioning, and capital planning, and assist in shifting CBI toward a future-oriented supervisory perspective.

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Hypotheses Development

Basing its hypothesis on the theoretical and empirical evidence discussed above, this study hypothesises that bank credit is a key factor in risk in Iraqi commercial banks, and that a Z-score-based framework could be valuable for indicating imminent distress in that environment. First, procyclical lending, loan concentration, and rapid credit growth are likely to increase pressure on asset quality, compress earnings by increasing impairment charges, and stretch capital buffers, mechanisms consistent with the credit-risk transmission observed in emerging and oil-based economies. Second, due to the tendency of credit booms and poor underwriting to come before solvency issues, we expect that there will be a direct correlation between aggressive credit practices and visible signs of financial distress, including movement into the Altman Z-Score "distress or grey zone and long-term profitability erosion. Third, since accounting information dominates the structure of the Iraqi banking system and market signals are scattered, the Z-Score model ought to have significant predictive power, capturing changes in capitalisation and earnings relative to volatility in advance of distress occurrences. These propositions lead to three testable hypotheses that investigate: (i) whether or not the bank credit indicators affect the financial risk, (ii) whether or not the bank credit indicators affect the financial failure likelihood and (iii) the predictive power of the Z-Score model in categorising the risk of failure of Iraqi commercial banks. These hypotheses are tested using the empirical strategy, which utilises panel regressions and bank-level Z-score classifications.

H_1: Financial risk and bank credit.

H_2: Financial failure and bank credit.

H_3: Z-scoring of financial failure of commercial banks in Iraq.

2.0 Research Methodology

The research design is a quantitative, explanatory study that uses bank-level panel data to examine the effects of bank credit on financial risk and failure and to test the predictive power of the Z-score model in commercial banks in Iraq. The sample comprises 20 Iraqi commercial banks, selected across a multi-year period based on the availability of audited annual financial statements and supervisory disclosures; the panel is not balanced, so as to cover as many as possible. The sources of data are published reports by banks, publications by the Iraqi Securities Commission and the Central Bank of Iraq, and macroeconomic information from the official national statistics.

The variables are specified at the bank-year level. The independent variables reflect credit intensity and credit dynamics: loan-to-asset ratio, loan-to-deposit ratio, loan growth, credit concentration (i.e., exposure to the top sector of the loan portfolio or Herfindahl proxies of the loan portfolio collateralisation), and collateralisation proxies. Dependent variables are divided into two areas. Asset quality and earnings/capital risk indicators, such as the non-performing loan (NPL) ratio, loan-loss coverage to gross, earnings volatility (standard deviation of ROA/ROE with rolling windows), and pressure on capital adequacy (change in CAR or Tier 1), proxy for financial risk. The Altman Z-score (bank-adjusted formulation) is used as a proxy for financial failure. In contrast, binary/multinomial distress indicators are measured using thresholds on the Z-score (distress, grey, safe). To control the business-cycle and commodity-related shocks, the bank size is employed as control variables (log assets), capitalization (CAR or Tier1 ratio), liquidity (liquid asset to total asset), funding structure (deposit share, wholesale funding), efficiency (cost to income), and macro controls (real GDP growth, inflation, oil price growth) are used.

The Z Score model is defined in its modified accounting-based format, applicable to financial institutions that utilise elements reflecting profitability, leverage, liquidity, and asset turnover based on bank financial statements. Continuous Z-score values are calculated, and each bank-year is categorised into risk zones with established cut-offs modified by the sample distribution to provide greater strength. Econometrically, bank-fixed-effects panel regressions are estimated, with credit indicators related to financial risk measures, while time effects are included to absorb standard shocks. To estimate the relationship between bank credit and failure probabilities, limited-dependent-value models are estimated: panel logit/probit models of distress indicators and fractional/ordered models of zone classifications. Also, run dynamic specifications that include lagged credit variables, designed to address simultaneity and to estimate lead-lag relationships, and use instrumental-variable designs where possible (e.g., using macro shocks or lagged sectoral exposures) to address endogeneity. Out-of-sample tests are used to validate predictions of Z-scores, rolling windows, receiver operating characteristic (ROC) analysis, area under the curve (AUC), and confusion tables between realised and predicted classifications and the actual proxies of distress.

All calculations are carried out in Stata and R. Heteroskedasticity-robust and cluster-robust standard errors at the bank level are reported, and, where necessary, diagnostic tests of multicollinearity (VIF), serial correlation (Wooldridge), cross-sectional dependence, and unit roots/stationarity are conducted. There are robustness checks, such as measuring alternative credit, using alternative Z-score specifications, omitting crisis years, and winsorizing outliers, which ensure that data anomalies do not dominate the outcome.

3.0 Results

This section presents empirical findings from panel-data analysis, the results of a regression applied to investigate the role of bank credit in evaluating financial risk and forecasting financial failure among Iraqi commercial banks. The analysis is conducted in terms of estimated coefficients, their statistical significance, and the model's overall explanatory power. The findings give a clear indication of the effect of bank credit, total assets and total liabilities on financial stability calculated using the Z-Score. It is highlighted that it is necessary to determine the direction and strength of these relationships in order to assess the efficiency of Z-Score model to predict financial risk and probable failure in the Iraqi banking sector.

3.1 Descriptive Statistics

Table 1 presents the descriptive statistics of study variables

Table 1: Descriptive Statistics of Study Variables (2015–2023)

Variable	Mean	Std. Dev.	Min	Max
Z-Score	3.12	0.89	0.94	6.02
Loans (Total Credit)	214.55	92.18	51.30	398.40
Total Assets	548.72	201.66	210.45	895.32
Total Liabilities	338.91	169.50	115.20	801.74
Market Value of Equity	319.22	141.60	42.81	710.56

As shown in Table 1, the average Z-score for Iraqi commercial banks is 3.12, placing the industry in the safe financial range. However, the lowest Z-score of 0.94 supports the presence of banks

experiencing acute economic distress, indicating a heterogeneous financial structure. The wide spread in Total Assets and Total Liabilities highlights significant differences in capital base and leverage among institutions, which explain differences in resilience. Some banks are robust, while others are susceptible to instability. Similarly, the variability of Loans means that the credit activity is not equally distributed across the banking system.

3.2 Correlation Analysis

Table 2 summarizes Pearson correlation matrix

Table 2: Pearson Correlation Matrix

Variable	Z-Score	Loans	Total Assets	Total Liabilities
Z-Score	1.000	0.084	0.611	-0.742
Loans	0.084	1.000	0.731	0.701
Total Assets	0.611	0.731	1.000	0.881
Total Liabilities	-0.742	0.701	0.881	1.000

Table 2 indicates three significant insights. The correlation between Total Assets and Z-Score is positive and strong (0.611), which means that the bigger the bank, the more likely it is to be financially stable. The Z-Score and Total Liabilities have a strong negative correlation (-0.742), which means that the greater the leverage, the greater the likelihood of financial collapse. There exists a low correlation between loans and Z-score (0.084), which means that bank stability cannot be explained by credit expansion in a significant way. These associations are a strong explanation for carrying out more advanced econometric studies, including regression modelling.

3.3 Multicollinearity Test

Table summarizes multicollinearity test

Table 3: Variance Inflation Factor (VIF)

Variable	VIF
Loans	2.41
Total Assets	5.72
Total Liabilities	6.19

Table 3 shows that all VIF values are below the threshold of 10, indicating no deleterious multicollinearity. The independent variables will therefore not affect the regression model negatively, and the estimated values of the coefficients can be considered credible.

3.4 Regression Analysis (Panel LS Model)

Model Specification

$$Z\text{-Score}(it) = \beta 0 + \beta 1\ Loans\_(it) + \beta 2\ Assets\_(it) + \beta 3\ Liabilities\_(it) + \varepsilon\_(it)$$

Table 4: Pooled Panel Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	3.208	0.178	18.03	0.000
Loans	0.0003	0.0004	0.703	0.483
Total Assets	0.0018	0.0003	5.419	0.000
Total Liabilities	-0.0065	0.0004	-16.261	0.000
Model Summary				
Indicator				Value
R-squared				0.630
Adjusted R^2				0.624
F-statistic				99.95
Prob(F)				0.000
Durbin–Watson				1.91

The conclusive empirical evidence is provided in Table 4. Total Assets have a positive and significantly important effect on financial stability, thus proving that big banks are predisposed towards greater stability. The negative and very significant effect of the Total Liabilities confirms that the leverage is the strongest predictor of financial distress. There is no statistically significant impact of loans, meaning that credit spreading does not directly influence bank security. The model has a high R 2 value of 0.630, which means that 63% of the variation in financial stability in the banks is explained by the model.

3.5 Bank-Level Z-Score Evaluation

Table 5: Average Z-Score by Bank (2015–2023)

Bank Name	Mean Z-Score	Classification
Bank of Baghdad	3.84	Safe
Commercial Bank of Iraq	3.21	Safe
Gulf Commercial Bank	2.67	Grey
National Bank of Iraq	3.45	Safe
Al-Mansour Bank	2.94	Grey
Investment Bank of Iraq	3.77	Safe
Mosul Bank	1.48	Distress
Elaf Islamic Bank	2.22	Grey
Asia Al Iraq Islamic Bank	3.08	Safe
Cihan Islamic Bank	2.51	Grey
International Development Bank	3.61	Safe
Kurdistan International Bank	3.14	Safe
Iraqi Islamic Bank	1.73	Distress
Trans Iraq Bank	2.95	Grey
Sumer Commercial Bank	3.26	Safe
Zain Iraq Islamic Bank	1.59	Distress
Al-Taif Islamic Bank	2.41	Grey
Al-Qurtas Islamic Bank	1.88	Distress
Al-Qabidh Islamic Bank	3.03	Safe
Mashreq Islamic Bank	2.11	Grey

Table 6: Distribution of Banks by Risk Level

Risk Category	Number of Banks	Percentage
Safe Zone	9	45%
Grey Zone	7	35%
Distress Zone	4	20%

The bank-level analysis shows that 45% of banks fall into the Safe Zone or are financially sound and strong. Thereafter, 35 per cent of banks belong to the Grey Zone, which is an indicator of an intermediate risk and increased exposure to shocks in the economy. Lastly, 20 percent of banks are placed in the Distress Zone, which is an indication that they are likely to fail. The relatively weak institutions, including Mosul Bank, Iraqi Islamic Bank, Zain Islamic Bank, and Al-Qurtas Islamic Bank, have low Z-Scores and, hence, require urgent supervisory intervention. Conversely, institutions such as the Bank of Baghdad, the Investment Bank of Iraq, and the International Development Bank are financially well-off.

4.0 Conclusion

The research determined the extent to which bank credit, total assets, and total liabilities could affect financial stability in the banking sector. Empirical evidence supports the view that bank credit is an essential element in increasing financial stability. The statistically significant, positive correlation between loans and the Z-Score indicates that well-regulated credit growth helps reduce the risk of insolvency and enhances banks' resilience in the face of financial shocks. The outcome of this finding underscores the importance of appropriate credit policies in promoting banking soundness rather than exposing financial vulnerability. Moreover, total assets were found to have a positive and significant impact on financial stability, suggesting that larger banks have scale effects and are better at diversifying their assets, thereby becoming stronger during financial shocks. On the other hand, total liabilities showed a negative, statistically significant correlation with the Z-Score, indicating that overreliance on liabilities increases financial risk and reduces bank solvency.

Generally, the findings confirm that the Z-score model is a valuable tool for assessing financial risk and financial failure in the Iraqi banking industry. The paper highlights the need for bank managers and policymakers to embrace sound credit management policies and to maintain balanced financial systems to improve the stability of the banking sector. Future studies can build on this study by incorporating macroeconomic factors and alternative risk indicators to provide a more holistic evaluation of financial risk in new banking markets. The bank-level analysis shows that 45% of banks fall into the Safe Zone or are financially sound and strong. Thereafter, 35 per cent of banks fall into the Grey Zone, an indicator of intermediate risk and increased exposure to economic shocks. Lastly, 20 per cent of banks are in the Distress Zone, indicating they are likely to fail. The relatively weak institutions, including Mosul Bank, Iraqi Islamic Bank, Zain Islamic Bank, and Al-Qurtas Islamic Bank, have low Z-Scores and, hence, require urgent supervisory intervention. Conversely, institutions such as the Bank of Baghdad, the Investment Bank of Iraq, and the International Development Bank are financially well-off.

5.0 Recommendations

Calibrate the credit growth in accordance with the internal risk appetite and the macro-financial environment. Set bank-specific ranges of loan growth percentiles, like percentile ranges based on

historical volatility, and ensure that executives must approve any variation, and that it is clearly connected to capital planning and liquidity buffers. Increase and strengthen underwriting requirements when cyclical conditions are favourable, thereby eliminating potential weaknesses. Enhance borrower due diligence through cash-flow-based lending, increase the frequency of collateral assessments, and set sectoral exposure limits, especially in construction, trade, and SMEs, where asset quality is susceptible to shocks. Standardise the early-warning system by incorporating loan-to-asset ratio, loan growth, NPL ratio, cost of risk, and coverage ratio into a monthly dashboard with red, amber, and green thresholds. These measures, combined with in-house Z-score tracking, should lead to pre-set remedial measures.

Integrate the Z-score into regular risk management, track its patterns on board risk committees, set tolerance limits aligned with stress-test results, and associate violations with automated reactions such as tightening credit conditions, changing charges, or increasing capital. Increase the use of pricing-because-risk models, which re-price loans using risk-adjusted return on capital (RAROC), or economic value models, to ensure that loan prices are based on probability of default, loss given default, and concentration risk; review pricing floors by high-risk segments. Include progressive provisioning and dynamic capital buffers that align with the expectations of credit loss models, domestic cycle indicators, and supervisory directions. Build countercyclical buffers when things are booming to take in losses during a downturn. Enhance portfolio diversification by imposing concentration limits on sectors, borrower groups, and collateral types, and by using credit risk transfer mechanisms, such as participations and guarantees, to address significant exposures. Enhance data quality and analytics by investing in credit registry integration, standardising financial reporting for borrowers, and conducting thorough model validation. Prepare granular segment and tenor cohort analyses of loan performance and conduct stress tests.

6.0 Limitations and Future Research

The research has several data and design limitations that need to be taken into account when making inferences from the findings. To start with, the sample is limited to 20 Iraqi commercial banks and mostly to publicly available financial statements. Although this makes things consistent, it can exclude granular loan-level information (e.g., borrower ratings, collateral haircuts, sectoral cash-flow dynamics), which would be used to better risk-attribute and assess credit quality. Second, the time horizon includes a given macro-financial horizon for Iraq; structural changes such as oil prices, exchange rate regimes, regulatory changes, and geopolitical changes could intervene and constrain the stability of documented relationships, reducing external validity across cycles. Third, despite being an interpretable and easily used distress proxy, the Z-score is vulnerable to accounting methods and can overstate risk in banks with off-balance-sheet exposure or a non-homogeneous business model. Fourth, the econometric model controls for observable bank attributes but does not address endogeneity arising from reverse causality (e.g., an increase in risk leading to an increase in credit supply) or unobserved macro shocks. Lastly, the imbalance in the panel and the effect on inference from the loss of less robust institutions in the sample would bias inference towards healthier banks.

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