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RESEARCH ARTICLE

The Role of Credit Stress Tests in Achieving Financial Sustainability- An Applied Study on Several Commercial Banks in Iraq, Bahrain, and the UAE

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ABSTRACT

This research examines the impact of applying stress testing on achieving financial sustainability for a selected sample of private banks in Iraq, Bahrain, and the United Arab Emirates, covering the period from 2010 to 2022. The research problem centers around the question, "Do credit stress tests contribute to enhancing financial sustainability?" Consequently, the study focuses on measuring and analyzing the effectiveness of credit stress tests in strengthening the resilience and long-term sustainability of the banking system. Using econometric analysis based on a sample of 117 observations, the researchers used a panel data model to explore the nature of the relationship between credit stress tests and financial sustainability. This included measuring the impact of various stress levels (baseline, mild, moderate, severe) on financial sustainability, using selected indicators such as return on assets, self-sufficiency, asset quality, and overall financial sustainability. The study found significant results, indicating the banks' capacity to create financial sustainability and revealing a strong impact of the independent variable (credit stress tests) on the financial sustainability of the selected banks. Any change in stress test levels affects the dependent variable (financial sustainability) by the value of (B) and with a significance level (prob).

INTRODUCTION

The banking system is the cornerstone of the financial structure in any country—whether developed or developing—due to its role in fostering sustainable development and contributing to societal well-being. Banks collect funds from surplus financial units and functioning them to deficit units, effectively serving as intermediaries between savers and investors, in addition to financing international trade.

Because of these operations, banks face numerous risks influenced by political and economic conditions, such as fluctuations in exchange rates, oil prices, and gross domestic product, among others. Thus, risk management has become essential to avoid insolvency and to ensure the sustainability of the banking system in delivering its services. In response, central banks have adopted risk management frameworks aligned with Basel I, II, and III standards, particularly after global financial crises like the 2008 mortgage crisis and the COVID-19 pandemic. Credit stress testing has emerged as a crucial tool for assessing capital resilience and achieving financial sustainability.

1. Research Problem

This research explores the role of banking credit stress testing in risk management and financial sustainability by measuring and analyzing its impact on banks' resilience to potential financial crises. The research problem is encapsulated in the following question:

"Do banking credit stress tests contribute to achieving and enhancing the financial sustainability of selected banks?"

2. Significance of the Research

The significance of this research stems from the crucial role of banking stress tests in enabling banks to withstand financial and economic crises.

3. Research Objectives

This study seeks to achieve several core objectives, including:

- Assessing the ability of the selected commercial banks to withstand severe conditions and the adverse effects of such conditions on banks' capacity to manage uncertainty and achieve financial sustainability.
- Measuring and analyzing the impact of credit stress tests on the financial sustainability of the selected commercial banks.

4. LITERATURE REVIEW AND RESEARCH HYPOTHESIS

Commercial banks manage risks using advanced global best practices, including banking threat management, with a focus on achieving financial sustainability. So the following hypothesis was formulated:

"There is a positive effect of credit stress testing on achieving financial sustainability for the selected commercial banks."

5. METHODOLOGY AND RESULTS ANALYSIS

To investigate the impact of the independent variables (credit stress tests) on the dependent variable (financial sustainability), the researchers used a Panel Data model. This model provides consistent results for determining the effect of stress testing on financial sustainability.

THEORETICAL FRAMEWORK OF THE STUDY

1. Stress Testing

Stress testing is one of the most crucial financial engineering techniques used to assess the banking system's capacity to withstand crises and identify weaknesses and imbalances. It determines the acceptable level of risk and the flexibility required to gauge the sector's sensitivity to economic changes. Stress testing measures a bank's resilience to potential, unexpected losses arising from both normal and rare circumstances; as such, events threaten the financial stability of individual banks and, potentially, the entire banking sector in a country (Arab Banking Supervision Committee, 2021, p. 4).

Stress testing has been defined as a technical tool used by banks to detect risks and emergency conditions impacting bank operations. It assesses the bank's ability to withstand such conditions and take preventive actions to mitigate future impacts. Stress testing is also an essential support tool for risk management, aiming to maintain the bank's financial health and business continuity (Zankana, 2019, p. 44).

According to the Kuwait Institute of Banking Studies, stress testing evaluates the bank's ability to manage credit exposures in challenging circumstances, using various financial indicators to assess the impact on capital adequacy and profitability (Institute of Banking Studies, 2010, p. 2). The Basel Committee on Banking Supervision further details stress testing as a means to evaluate a bank's financial position and guide decision-making under severe but plausible scenarios (BCBS, 2009, p. 8).

The researchers agree with scholars such as Al-Akili (2017, p. 34) that stress testing is a risk management tool that provides accurate, in-depth analysis of the bank's financial situation for regulatory and preventive purposes, particularly for central banks.

The significance of stress testing, as highlighted by sources such as the Financial Stability Report (2017, p. 58), BCBS (2014, p. 17), and John (2007, p. 370), includes the following aspects:

- A predictive tool alerting bank management to potential unexpected negative outcomes across a wide range of risks.
- Identifying imbalances and weaknesses within the banking system.
- Focusing on future forecasts rather than historical data, with an emphasis on economic and financial factors that impact banking performance.
- Strengthening risk measurement tools used by banks, based on assumptions and historical data.
- Helping bank management clarify risk concentrations and interdependencies, which may influence banking regulations during crises. Additionally, stress testing supports assessing future risks and suggesting better risk management approaches.
- Enabling the appropriate actions when results indicate vulnerability, aiding the bank in responding to financial crises.
- Serving as an ethical practice that minimizes harm and protects the interests of shareholders, depositors, creditors, and other stakeholders, thus building trust and stability in the banking market, even under adverse conditions.
- Providing bank management with a clear picture of the capital needed to absorb potential losses during more severe crises.

2. Financial Sustainability

The concept of sustainability has evolved and gained traction since 1978, particularly in association with economic development due to various contributions in this field, which the United Nations and its organizations have widely adopted (Buiter & Tobin, 2003, p. 1). In sustainable development, the UN defines it as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs," which requires balancing social, economic, and environmental demands—key pillars of sustainability (UN Report, 1978, p. 8).

In banking, financial sustainability is defined as a bank's ability to meet the needs of direct and indirect stakeholders without compromising its financial capacity to meet future requirements (Hassan & Ismail, 2017, p. 7). Sustainability is the ability of any entity to continue a specific behavior indefinitely, meaning the bank's capacity to achieve its long-term goals regarding lending. It reflects a bank's ability to maintain consistent profitability and return on equity in the long term and retain adequate capital levels to support its operations (Abdel Hafiz & Hussein, 2019, p. 25). Financial sustainability is also described as the capacity to maintain or expand services with increased flexibility to absorb economic shocks in the short term (Zabolotny & Wasilwski, 2019, p. 10).

Banks aiming for financial sustainability drive desirable changes within their institutions, highlighting the following points of significance:

- Enhancing access to funding (Abdullah & Abbadi, 2023, p. 76).
- Enabling banks to continue growing through profitability and long-term development, supported by adopting financial sustainability (Abdel Hafiz & Hussein, 2019, p. 37).
- Supporting competition and innovation (Al-Mashdani et al., 2023, p. 6).
- Reducing risks.
- Activating corporate governance (Rizqi, 2018, p. 24).
- Promoting prosperity and welfare, as financial sustainability positively affects bank efficiency (Vich & Nosratabasi et al., 2020, p. 46).
- Serving as a tool for monitoring banking achievements, aiding in investment decision-making, and guiding investors and stakeholders in making informed choices (Sholikah & Miranti, 2020, p. 42).

Practical Framework

1. **Research Variables:** The study includes stress testing as independent variables and financial sustainability indicators as dependent variables across a selection of banks within the countries studied. The researchers conducted statistical tests using Eviews10 to obtain the results. Table 1 below summarizes the research variables:

Table (1) : **Research variables**

Variable Type	Variable Name	Variable Code
Independent	Default Condition	Original
	Least Intensity	LE
	Medium Intensity	MI
	Highest Intensity	HA
Dependent	Return on Assets	ROA
	Self-Sufficiency	SS
	Asset Quality	AQ
	Financial Sustainability	SY

The researchers formulated econometric equations as follows:

-Mathematical Expressions:

ROA = *f* (Original, LE, MI, HA)

SS = *f* (Original, LE, MI, HA)

AQ = *f* (Original, LE, MI, HA)

SY = *f* (Original, LE, MI, HA)

Econometric Models:

$$\mathrm{ROA}_{i,t} = \alpha + \beta_1 Orginal_{i,t} + \beta_2 \mathrm{LE}_{i,t} + \beta_3 \mathrm{MI}_{i,t} + \beta_4 \mathrm{HA}_{i,t} + \varepsilon_{i,t} \dots\dots$$

$$\mathrm{SS}_{i,t} = \alpha + \beta_1 Orginal_{i,t} + \beta_2 \mathrm{LE}_{i,t} + \beta_3 \mathrm{MI}_{i,t} + \beta_4 \mathrm{HA}_{i,t} + \varepsilon_{i,t} \dots\dots\dots$$

$$\mathrm{AQ}_{i,t} = \alpha + \beta_1 Orginal_{i,t} + \beta_2 \mathrm{LE}_{i,t} + \beta_3 \mathrm{MI}_{i,t} + \beta_4 \mathrm{HA}_{i,t} + \varepsilon_{i,t} \dots\dots$$

$$\mathrm{SY}_{i,t} = \alpha + \beta_1 Orginal_{i,t} + \beta_2 \mathrm{LE}_{i,t} + \beta_3 \mathrm{MI}_{i,t} + \beta_4 \mathrm{HA}_{i,t} + \varepsilon_{i,t} \dots\dots$$

1. Correlation Relationships between Model Variables

A. Correlation between Credit Stress Testing and Financial Sustainability Variables

Table (2) illustrates the correlation between the independent variables (credit stress testing) and the dependent variable (Return on Assets, ROA) individually, reflecting the effect of each independent variable on the dependent variable without the influence of other factors. The data show that the correlations between ROA and the independent variables are generally weak. The correlation between pre-shock stress testing and ROA is approximately 22%, with low-intensity stress testing showing a correlation of 22.6%, moderate-intensity stress testing at 20%, and high-intensity stress testing at 18.7%. All correlations are statistically significant, as indicated by the probability values (prob 0).

Table2:**Correlation Between Credit Stress Testing and Financial Sustainability Variables**

Probability	ROA	SS	AQ	SY
ORGINAL	0.225146	-0.107695	0.390280	0.286873
	0.0147	0.2478	0.0000	0.0017

LE	0.226553	-0.117978	0.438272	0.277153
	0.0140	0.2052	0.0000	0.0025
MI	0.202622	-0.134071	0.445030	0.267641
	0.0285	0.1495	0.0000	0.0035
HA	0.187235	-0.141547	0.457205	0.252991
	0.0432	0.1279	0.0000	0.0059

Source: Compiled by the researcher based on Eviews-10 output

The correlation between the independent variables (credit stress testing stages: pre-shock, low, moderate, high intensity) and the dependent variable (Self-Sufficiency, SS) individually shows that all correlations are weak, with a negative association. The correlation between pre-shock testing and SS is approximately 11%, low-intensity testing shows 12%, moderate-intensity testing 13%, and high-intensity testing 14%. All correlations are non-significant, indicating an inverse relationship between the variables in the second model, yet this association remains unexplained.

The correlation between the independent variables (credit stress testing stages: pre-shock, low, moderate, high intensity) and the dependent variable (Asset Quality, AQ) is individually examined. The findings show generally weak correlations between AQ and the stress test levels. Pre-shock testing has a correlation with AQ of approximately 39%, low-intensity testing 36%, moderate-intensity testing 36%, and high-intensity testing 53.4%. All correlations are positive and statistically significant, suggesting a direct relationship between the variables in the third model.

The correlation between the independent variables (credit stress testing stages: pre-shock, low, moderate, high intensity) and the dependent variable (Financial Sustainability, SY) is weak. The correlation between pre-shock testing and SY is approximately 28.8%, low-intensity testing shows 27.4%, moderate-intensity testing 27%, and high-intensity testing 26.7%. All correlations are positive and statistically significant, supporting a direct relationship between the variables in the fourth model.

B. Estimation and Analysis of the Impact of Stress Testing According to the Credit Variable on Financial Sustainability

Table (3) presents the results of estimating stress tests for the first sub-variable (credit) on financial sustainability. It shows the result of the (F) test, indicating high statistical significance for the model used, which suggests that the model is adequate in explaining the relationship between the stress test and (ROA). The computed (F) value is 30.75440, which exceeds the critical value of 8.40. Additionally, the (R-squared) value is 0.78, indicating that the explanatory power of the first model is 78%, with the remaining 22% attributed to random variables not included in the research model. It is observed that the relationship between capital adequacy in the pre-shock condition (Original) is affected by -0.048100, meaning that to increase the return on assets, the capital adequacy ratio must be reduced, consistent with financial management theories, and the relationship is statistically significant (prob < 0.05).

In the case of the stress test conducted at 50% (denoted as LE), it indicates an inverse relationship with the dependent variable (ROA). Specifically, if the bank wishes to increase the return on assets by one unit, it would require a reduction in the capital adequacy ratio at this lower pressure level (50%) by -0.000714, with statistical significance (prob < 0.05). When the stress test is conducted at a medium level of 100% (denoted as MI), it shows a positive relationship, meaning that an increase in the risk-weighted assets (100%) leads to positive results on (ROA) by 0.165612, with statistical significance (prob < 0.05). However, under the highest stress level of 200% (denoted as HA), the result shows an inverse relationship, with a (β) value of -0.117123, indicating that higher pressure on risk-weighted assets results in a negative effect on (ROA).

The regression equation for the analysis is as follows:

$$\mathbf{ROA_{i,t}} = \mathbf{2.401348} - \mathbf{0.048100}\boldsymbol{original} - \mathbf{0.000714}\boldsymbol{LI} + \mathbf{0.165612MI} - \mathbf{0.117123HA} + \boldsymbol{\varepsilon_{i,t}}$$

For the Self-Sufficiency Index (SS) , the (F) test result indicates high statistical significance for the model used, suggesting the model is appropriate in explaining the relationship between stress tests and (SS). The computed (F) value is 182.4307, which exceeds the critical value of 8.40, and the (R-squared) value is 0.95, meaning the model explains 95% of the variation, with the remaining 5% due to random variables not included. The results of the stress test before the shock (Original) show a (β) value of -0.009973, and a statistical significance (prob < 0.05), implying that a decrease in capital adequacy leads to an increase in self-sufficiency by one unit.

For the 50% stress test (LE), the results indicate an inverse relationship with the dependent variable (SS), with a decrease in the capital adequacy ratio leading to an increase in self-sufficiency. The (β) value is -0.000859, with statistical significance (prob < 0.05). When the stress test is performed at 100% (MI), the result is positive, suggesting that an increase in risk-weighted assets results in a positive effect on self-sufficiency, with a (β) value of 0.125219 and statistical significance (prob < 0.05). At the 200% stress level (HA), the relationship is inverse, with a (β) value of -0.109770.

The regression equation for the analysis is as follows:

$$\mathbf{SS}_{i,t} = \boldsymbol{\alpha}\mathbf{1.896484} - \mathbf{0.009973}\boldsymbol{Orginal}_{i,t} - \mathbf{0.000859LE}_{i,t} + \mathbf{0.125219MI}_{i,t} - \mathbf{0.109770HA}_{i,t} + \boldsymbol{\varepsilon}_{i,t}$$

For the Asset Quality Index (AQ), the (F) test result again indicates high statistical significance for the model, with the computed (F) value of 45.86497, which exceeds the critical value of 8.40. The (R-squared) value is 0.84, indicating an 84% explanatory power, with the remaining 16% attributable to other random variables. The results of the stress test show that a decrease in the capital adequacy ratio before the shock (Original) leads to an increase in asset quality by one unit, with a (β) value of -0.004946 and statistical significance (prob < 0.05).

The 50% stress test (LE) indicates an inverse relationship with asset quality, while the 100% risk-weighted asset stress test (MI) shows a positive relationship, with a (β) value of 0.002136 and statistical significance (prob < 0.05). Under the 200% stress test (HA), the result shows a positive relationship, with a (β) value of 0.004826 and statistical significance.

The regression equation for the analysis is as follows:

$$\mathrm{AQ}_{i,t} = 0.128843 - 0.004946Orginal_{i,t} - 0.000588\mathrm{LE}_{i,t} + 0.002136\mathrm{MI}_{i,t} + 0.004826\mathrm{HA}_{i,t} + \varepsilon_{i,t}$$

For Financial Sustainability (SY), the (F) test results indicate the model's high statistical significance, with the computed (F) value of 32.75884, which exceeds the critical value of 8.40. The (R-squared) value is 0.79, meaning the model explains 79% of the variation, with the remaining 21% attributed to random variables not included. The results show that a decrease in capital adequacy before the shock (Original) leads to an increase in financial sustainability, with a (β) value of -12.51165 and statistical significance (prob < 0.05).

For the 50% stress test (LE), the relationship is positive, indicating that higher capital adequacy results in higher financial sustainability, with a (β) value of 0.403051 and statistical significance (prob < 0.05). At the 100% risk-weighted asset test (MI), the result is again positive, indicating that an increase in risk-weighted assets leads to positive effects on financial sustainability with a (β) value of 67.01568 and statistical significance (prob < 0.05). However, under the 200% stress test (HA), the relationship is negative, with a (β) value of -51.29121, indicating a negative impact under high pressure.

The regression equation for the analysis is as follows:

$$\mathrm{SY}_{i,t} = -\alpha 59.92833 - 12.51165Orginal_{i,t} + 0.403051\mathrm{LE}_{i,t} + 67.01568\mathrm{MI}_{i,t} - 5129121\mathrm{HA}_{i,t} + \varepsilon_{i,t}$$

Table (3): Impact Relationship Between Stress Testing (Credit) and Financial Sustainability Variables.

Dependent variable	Original	LE	MI	HA	R-squared	F-statisic	Observations
ROA	-	-0.000714	0.16561	-	0.78	30.754	117

	0.048100*** (0.0075)	(0.0216)	2*** (0.0375)	0.117123*** (0.0226)		40	
SS	-0.009973* (0.0040)	-0.000859 (0.0051)	0.125219*** (0.0168)	-0.109770*** (0.0121)	0.95	182.4307	117
AQ	-0.004946*** (0.0009)	-0.000588 (0.0018)	0.002136 (0.0029)	0.004826* (0.0022)	0.84	45.86497	117
SY	-12.51165*** (1.3091)	0.403051 (4.44374)	67.01568*** (8.5335)	-51.29121*** (4.6075)	0.79	32.75884	117
Notes: standard errors in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively Method: panel EGLS (cross-sectional weights). Source: own elaboration using the Eviews							

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

2. The stress tests play a crucial role in explaining the "financial sustainability of the banks in the research sample."
3. The results of the econometric analysis show an influential relationship between the independent variable (credit risk) and the dependent variable (return on assets). This relationship is inverse in terms of the sign, but the effect is positive. As the independent variables decrease by (β), the dependent variable (return on assets) increases by 1%. The explanatory power of this effect is 78%, while the remaining percentage is attributed to variables not included in the model.
4. The econometric analysis results reveal an influential relationship between the independent variables (credit risk) and the dependent variable (self-sufficiency). This relationship is inverse in terms of the sign, but the effect is positive. As the independent variables decrease by (β), the dependent variable (self-sufficiency) increases by 1%. The explanatory power of this effect is 95%, while the remaining 5% is attributed to variables not included in the model.
5. The econometric analysis results indicate an influential relationship between the independent variables (credit risk) and the dependent variable (asset quality). This relationship is inverse at lower stress levels (before the shock, least severe), but direct at higher stress levels (medium and most severe). The effect remains positive, where a decrease in the independent variable by (β) increases the dependent variable (asset quality) by 1%. The explanatory power of this effect is 84%, with the remaining percentage attributed to un-modeled variables.
6. The econometric analysis results show an influential relationship between the independent variables (credit risk) and the dependent variable (financial sustainability).This relationship is inverse in terms of the sign for parameters (before the shock and most severe), but the effect is positive. As the independent variables decrease by (β), the dependent variable (non-performing loans ratio to total loans) increases by 1%. The explanatory power of this effect is 79%, while the remaining 21% is due to un-modeled variables.

Recommendations:

1. It is essential for banks to adopt effective strategies for managing their financial resources efficiently and rationally to ensure financial sustainability and avoid potential financial crises.
2. The sample banks should comply with the "Basel III" regulations to enhance banking stability and mitigate the negative consequences of the banking crisis by adhering to the new standards and rules for financial stability.

3. All banks should start managing their risks by using stress tests as a tool to evaluate their capacity to withstand potential risks according to predefined scenarios for this purpose.
4. The sample banks should review their strategies and focus on performance in three stress conditions (least severe, medium severity, most severe), which will improve overall performance and enhance "financial sustainability."

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