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EVALUATING FINANCIAL PERFORMANCE AND BANKING INSOLVENCY RISKS USING THE DUPONT MODEL AND Z-SCORE INDEX: A COMPARATIVE STUDY OF RESTRICTED AND UNRESTRICTED BANKS IN A SAMPLE OF IRAQI PRIVATE BANKS LISTED ON THE IRAQ STOCK EXCHANGE FOR THE PERIOD 2018–2025

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Abstract. The purpose of this study is to assess financial performance and the bankruptcy risk in a sample of Iraqi private banks that are listed in the Iraq Stock Exchange (ISE), to use DuPont model for breaking ROE and Z-Score index for measuring distances to bankruptcy. It also makes a comparison between restricted and unrestricted banks after the July 2023 implementation of international banking compliance restrictions. The sample consisted of 14 banks (7 restricted and 7 unrestricted) for 2018-25 period that resulted in 112 observations. A two-way fixed-effects Difference-in-Differences (DiD) analysis method was used, in addition to event-study analysis and Wild Cluster Bootstrap (WCB) inference.The two-way fixed-effects Difference-in-Differences (DiD) approach was employed, as well as event-study analysis and Wild Cluster Bootstrap (WCB) inference. The findings showed a negative change of 2.08 percentage points for ROA, 9.06 percentage points for ROE, and approximately 17% for Z-score index for restricted banks, compared to the unrestricted banks. The DuPont decomposition confirmed that it was not financial leverage that was causing the operating profitability to be a problem. The decomposition of the Z score also revealed that the deterioration in profitability was a compounding factor to the deterioration in capitalization, both of which were factors of insolvency risk. No particular patterns emerged between the two groups before 2023 and the results were still strong.

Key words: Financial Performance Evaluation, DuPont Model, Z-Score Index, Banking Insolvency Risk, Banking Compliance Restrictions, Difference-in-Differences, Iraqi Banks.

Introduction

Evaluating financial performance and measuring insolvency risks are among the most important functions of banking financial management, because banks operate primarily with depositors' funds rather than their own capital, meaning that any decline

in profitability can quickly affect their solvency. The literature has expanded its investigation of the determinants of bank profitability following the 2008 financial crisis (Sousa & Almeida, 2025), as well as the development of insolvency measures, particularly the Z-score index (Bouvatier et al., 2023). The situation of the Iraqi private banking sector is unstable due to political instability, governance and macroeconomic conditions, which negatively impact profitability (Jadah et al., 2020; Altaee et al., 2024). This was further complicated by the exclusion of 14 private banks in July 2023 from transactions in the US dollar due to international banking compliance issues. There were thus two categories of banks, one under one set of conditions and the other under another. It is a chance to assess their financial performance applying a quasi-experimental technique which integrates the DuPont model, which recognizes return on investment sources, and the Z-Score index, which measures bank soundness. The Methodological and Theoretical Framework

Research Methodology

Research Problem

In the research sample, seven banks have been suffering from compliance restrictions from overseas since July 2023, thereby losing a substantial part of their operations, while other banks have been operating in the same market without such restrictions. Individual financial ratios fail to show whether variations in returns are more the result of profitability or leverage; and whether those variations have also spread to the financial strength of banks. As such, the following questions can be used to summarize the research problem in the following manner:

1. Are there statistically significant differences in the components of financial performance (ROA, ROE, and EM) between restricted and unrestricted banks after 2023?

2. Are there statistically significant differences in insolvency risks between the two groups after 2023? Which of the two components explains these differences: profitability or capitalization?

3. Were the two groups homogeneous in their performance trends before 2023?

Research Significance

The scientific significance of this research lies in its attempt to contribute to an integrated framework linking the DuPont model with the Z-score index through their shared components, employing a contemporary quasi-experimental approach in a banking environment in which, to the best of the researcher's knowledge, this approach has rarely been applied. Its practical significance lies in providing bank management, the Central Bank of Iraq, and investors with a quantitative assessment of the magnitude and sources of the performance gap, as well as an early warning tool that can be applied periodically.

Research Objectives

This research aims to:

1. Evaluate the financial performance of the banks included in the research sample by decomposing return on equity using the DuPont model and determining whether the differences between restricted and unrestricted banks after 2023 arise from operating profitability or financial leverage.

2. Measure insolvency risks using the Z-score index and decompose it into its profitability and capitalization components to identify which component explains the differences between the two groups after 2023.

3. Test the homogeneity of trends in financial performance and insolvency risks between the two groups before 2023.

Research Hypotheses

1. First Hypothesis (H1): There are statistically significant differences in the components of financial performance (ROA, ROE, and EM) between restricted and unrestricted banks after 2023.

2. Second Hypothesis (H2): There are statistically significant differences in banking insolvency risks (the Z-score and its two components) between the two groups after 2023.

3. Third Hypothesis (H3): There are no statistically significant differences in financial performance and insolvency risk trends between the two groups before 2023.

Research Population, Sample, and Scope

The research population is Iraqi private banks that are listed on the Iraq Stock Exchange (ISE). Given that this study was designed to assess how this problem has evolved over the past five years, complete published annual reports spanning the years 2018-2025 were used to select the sample, and the two comparison groups had equal representation in terms of the number of banks. The sample thus included 14 banks with half of them in each group (Table 1).

Table 1. Research Sample

Group	Banks
Restricted Banks since July 2023 (TR=1)	Erbil Bank for Investment and Finance, Al-Thiqah Islamic Bank, Al-Rajih Islamic Bank, Al-Taif Islamic Bank, Al-Qurtas Islamic Bank, Al-Mustashar Islamic Bank, Trans Iraq Bank for Investment
Unrestricted Banks (TR=0)	National Bank of Iraq, Commercial Bank of Iraq, International Development Bank, Mansour Bank for Investment, Commercial Bank of Iraq (Gulf Commercial Bank), Bank of Baghdad, Cihan Bank for Islamic Investment and Finance

Source: Prepared by the researcher based on statistical data.

The scope of the research is defined as follows:

Geographical Scope: Iraqi private banks listed on the Iraq Stock Exchange.

Time Scope: The period 2018–2025, comprising five years before July 2023 and three years thereafter.

Subject Scope: Evaluating financial performance using the DuPont model in its two-component form (ROA × EM), measuring banking insolvency risks using the Z-score index and its two components, and comparing these measures between restricted and unrestricted banks.

Research Variables and Methods of Measurement

Table 2. Research Variables and Their Measurement Methods

Type	Variable (Symbol)	Measurement Method
Interaction / Comparative	Affiliation with Restricted Banks Post-2023 (DID)	TR×POST, equals 1 for restricted banks in the years 2023–2025
Dependent (DuPont)	Return on Assets (ROA)	Net Profit ÷ Total Assets (%)
Dependent (DuPont)	Return on Equity (ROE)	Net Profit ÷ Equity (%)
Dependent (DuPont)	Equity Multiplier (EM)	Total Assets ÷ Equity (times)
Dependent (Insolvency)	Insolvency Index (Z) and its components (ZP and ZC)	Equation (3)
Control	Bank Size (SIZE)	Natural logarithm of total assets
Control	Deposit Ratio (DEP)	Total Deposits ÷ Total Assets (%)

Source: Prepared by the researcher based on the aforementioned literature.

Previous Studies and the Research Gap

Table 3. Key Previous Studies

Study	Sample and Period	Key Findings
Yoshanti & Kurnia (2024)	11 Indonesian Islamic banks, 2018–2022	Applied the DuPont model to rank banks according to their performance.
Melik-Parsadanyan (2026)	10 Armenian banks, 2023	Operational efficiency followed by leverage explain most of the variation in ROE.
Lamothe et al. (2024)	2,091 banks across 110 countries	Capitalization, efficiency, and non-performing loans are among the most significant determinants of profitability.
Jadah et al. (2020)	18 Iraqi banks, 2005–2017	Size and capital boost profitability, whereas political instability reduces it.
Altaee et al. (2024)	9 Iraqi banks, 2012–2021	Liquidity, leverage, and governance quality are positively associated with ROA.
Bouvatier et al. (2023)	US and European banks, 2007–2008 crisis	Recommended calculating the Z-score using current capital ratios.
Joudar et al. (2023)	Islamic banks in MENA region, 2006–2017	Capital adequacy and liquidity increase the Z-score.
Ibrahim (2025)	5 Iraqi Islamic banks, 2018–2022	Statistically significant relationship between factors—including leverage and cost—and financial stability (Z).
Efing et al. (2023)	German banks, 11 financial restriction events, 2002–2015	Banks reduced their positions in target restricted countries by approximately 38%.
Ebrahimi et al. (2021)	18 Iranian banks, 2013–2019	Capital ratio significantly correlated with financial performance; recommended higher capitalization.

Source: Prepared by the researcher based on the aforementioned literature.

To the researcher's best knowledge, the review shows four gaps in research that this study will help fill. First, in most studies, the DuPont model or the Z-score index was used separately and not the commonality between them regarding the profitability and capitalization components. Secondly, the majority of the studies reviewed in Iraq are based on ratio analysis or simple regression and not a comparative research design. Third, most studies on international restrictions focus on cross-border flows or on the international performance of corporations, but not on the financial performance of the targeted banks. Fourth, quantitative comparisons of the restricted banks in Iraq since 2023, based on data up to 2025, are still limited.

Financial Performance and Insolvency Risks

Financial Performance and the DuPont Model

Banking financial performance refers to a bank's ability to utilize its own and borrowed resources to generate an adequate return for shareholders while maintaining an acceptable level of risk. Profitability, risk, and regulation collectively determine this performance (Rastogi et al., 2022). The credit and deposit services on which banking activities are based are linked to the market value of bank shares (Najim et al., 2024) and to economic growth through the stability channel (Mashamba et al., 2023). ROA and ROE are considered the most widely used indicators (Lamothe et al., 2024; Kebede, 2025), and are calculated according to Equation (1):

$$ROA = \frac{Net\ Income}{Total\ Assets} \times 100 \qquad ROE = \frac{Net\ Income}{Equity} \times 100 \qquad (1)$$

ROA measures the efficiency of asset utilization regardless of their financing source, whereas ROE measures the return to shareholders and is affected by financial leverage. Empirical evidence varies regarding the effect of capital on these two indicators: capitalization increases profitability in the studies by Isayas (2022) and Abu Khalaf and Awad (2024), while it reduces ROE in another study (Kebede, 2025). Meanwhile, credit risk reduces profitability (Haris et al., 2024). This variation can be explained by the fact that higher capitalization strengthens ROA but reduces ROE because profits are distributed over a larger equity base. This relationship is revealed by the DuPont model, which decomposes ROE according to Equation (2):

$$ROE = \frac{Net\ Income}{Total\ Assets} \times \frac{Total\ Assets}{Equity} = ROA \times EM \qquad (2)$$

The return on assets reflects operating and pricing decisions, whereas the equity multiplier reflects financing and leverage decisions. The three-component formulation further decomposes ROA into the profit margin and asset turnover ratio; however, it requires revenue data. The model and accounting decompositions of ROE have been applied to banks (Yoshanti & Kurnia, 2024; Melik-Parsadanyan, 2026). It is particularly suitable for banks because of their inherently high leverage resulting from the nature of their activities. Nevertheless, it does not measure risk, as an increase in EM raises both returns and risk. Hence, the need to complement it with the Z-score index.

Insolvency Risks and the Z-Score Index

Insolvency occurs when losses exhaust shareholders' equity, causing assets to fall below liabilities. The Z-score index is used as a measure of banking distress risk (Huynh & Phan, 2024). It measures the number of standard deviations by which ROA must decline before shareholders' equity is exhausted. Accordingly, the higher the Z-score, the further the bank is from insolvency (Kumar et al., 2023). It is calculated and decomposed according to Equation (3):

$$Z_{it} = \frac{ROA_{it} + CAP_{it}}{\sigma(ROA)_i} = \frac{ROA_{it}}{\sigma(ROA)_i} + \frac{CAP_{it}}{\sigma(ROA)_i} = ZP_{it} + ZC_{it} \qquad (3)$$

In this case, CAP is the ratio of shareholders' equity to total assets, and σ(ROA) is the standard deviation of ROA. The index has been used in different banking contexts, such as in the public sector banks in India (Kumar et al., 2023); Islamic banks (Joudar et al., 2023; Mawardi et al., 2024); and Iraqi Islamic banks (Ibrahim, 2025). The calculation of the index is recommended to use the current capital ratio for each year (Bouvatier et al., 2023). A rolling window was used as a robustness test in this study, and σ(ROA) was computed for each bank for the entire study period.

There is a strong link between the two tools because the profitability component (ZP) is ROA divided by its volatility, whereas the capitalization component (ZC) is the reciprocal of the equity multiplier (CAP = 1 ÷ EM). But, this is a double-edged sword because the same leverage can impact these two aspects in positive or negative ways, depending on the circumstances, as seen in Table (4).

Table 4. Impact of Financial Changes on the DuPont Model and Z-score

Change	Impact on ROE (DuPont)	Impact on Z-score
Increase in ROA	Increases	Increases (risk decreases)
Increase in Leverage (EM)	Increases	Decreases (risk increases)
Increase in ROA Volatility	No direct effect shown	Decreases (risk increases)

Source: Prepared by the researcher based on the aforementioned literature.

The findings are consistent with the hypothesis that a higher level of capital will lead to more banking stability (Sodokin et al., 2023; Bawuah, 2024), and that profitability and stability are positively correlated (Nguyen & Le, 2022). The capitalization of Iraqi private banks, especially Islamic banks, is very high, which can apparently boost the Z score index even if the profitability of the banks is weak. Thus, Iraqi researchers are concerned with achieving balance between profitability, liquidity and safety (Alothman and Alktrani, 2025), and between banking stability and banking risks (Abboud and Khaleel, 2025).

International Banking Compliance Restrictions and Banking Performance

International banking compliance restrictions are measures imposed by external regulatory or financial authorities on specific banks, limiting their access to foreign currencies or international correspondent banks due to concerns related to anti-money laundering, while allowing the bank to retain its domestic operating license. Compliance requirements have two dimensions: they support the development of the financial sector up to a certain level, after which they become a burden due to their associated costs (Antwi et al., 2023). They may also reduce the number of bank accounts and branches (Ofoeda et al., 2023), while banking sector experts in Iraq consider them among the most important indicators of banking resilience (Maliki et al., 2026).

The Central Bank of Iraq (CBI) on July 19, 2023, announced the exclusion of 14 banks in Iraq from using the foreign currency sale window of the Central Bank of Iraq in the US dollar without obtaining the necessary approval. The US Department of State clarified that the measure was not in fact "sanctions" in the formal sense, but rather an exclusion from US dollar services (Kurdistan 24, 2023). Shafaq News reported that these banks are still allowed to operate in Iraqi dinars and other currencies by the Central Bank of Iraq (2023). Eight more banks were barred from availing of these

services in February 2024 (Al Arabiya, 2024).

The literature review shows that restrictions have a negative impact on the cross-border activities of targeted banks (Efing et al., 2023), the capital ratio is significantly correlated with the financial performance of Iranian banks (Ebrahimi et al., 2021), and the impact of restrictions is varying in different sectors (Nivorozhkin, 2025). Moreover, technological investment and planning are linked to survival under restrictions and political instability lowers the profitability of banking (Cheratian et al., 2023; Berhe, 2024). Table (5) shows the channels that affect the components of the two analytical models.

Table 5. Theoretical Channels Between Restrictions, Financial Performance, and Insolvency Risk

Channel	Mechanism	Affected Component
Revenue and Cost	Loss of commissions from foreign transfers and currency sales, while fixed costs persist and compliance costs rise	ROA in DuPont, and ZP in Z-score
Capital and Financing	Losses erode equity, while depositor confidence and deposit volumes fluctuate	EM in DuPont, and ZC in Z-score
Redistribution	Migration of customers to unrestricted banks	Widens the gap in ROA and ZP between the two groups

Source: Prepared by the researcher based on the aforementioned literature.

Practical Framework

Data and Measurement Model

The data were extracted from the published annual reports of the sample banks, and their consistency was examined using the accounting identity in Equation (2). The Difference-in-Differences (DiD) approach with bank and year fixed effects was adopted, according to Equation (4):

$$Y_{it} = \alpha_i + \lambda_t + \beta\,(TR_i \times POST_t) + \gamma_1\,SIZE_{it} + \gamma_2\,DEP_{it} + \varepsilon_{it} \qquad (4)$$

Where αi represents the bank fixed effect, λt represents the year fixed effect, and the coefficient β measures the net difference in the change in the indicator between the two groups after 2023. The treatment initiation year is the same for all restricted banks; therefore, standard Difference-in-Differences estimators are applicable to the model (Callaway & Sant'Anna, 2021; Roth et al., 2023). Standard errors were clustered at the bank level, and the p-value obtained using the Wild Cluster Bootstrap method was adopted (Rademacher weights with the full enumeration of 16,384 replications) (MacKinnon et al., 2023). The year 2023 was considered the first treatment year because the restrictions were imposed on July 19, 2023. The effect of this specification was tested by excluding that year in the robustness tests.

Descriptive Statistics and DuPont Analysis

Table 6. Descriptive Statistics of Research Variables (112 Observations)

Variable	Mean	Standard Deviation	Minimum	Maximum
ROA (%)	1.17	2.71	-8.87	14.52
ROE (%)	4.54	9.29	-11.46	42.17
EM (times)	2.56	1.70	1.04	7.97
CAP (%)	52.54	23.29	12.55	96.01
DEP (%)	35.64	23.27	0.00	79.12
SIZE	27.16	0.83	25.21	29.50
Z-score	45.14	29.81	6.58	162.75

Source: Prepared by the researcher based on statistical data.

ROA exhibits a high degree of dispersion, with its standard deviation being approximately three times its mean. Capitalization averages 52.5%, which is exceptionally high by international standards. Consequently, the Z-score index is composed predominantly of the capitalization component.

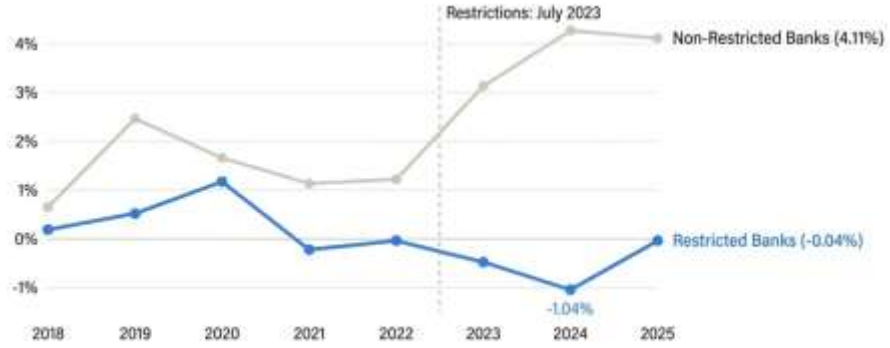

Figure 1. Average Return on Assets of Restricted and Unrestricted Banks, 2018–2025

Source: Prepared by the researcher based on statistical data.

The two groups followed similar trends until 2022, after which they diverged sharply beginning in 2023. Table (7) decomposes this divergence into the DuPont components and the Z-score index.

Table 7. Average of Indicators Before Restrictions (2018–2022) and After (2023–2025)

Indicator	Restricted Before	Restricted After	Unrestricted Before	Unrestricted After	Difference in Differences
ROA (%)	0.32	−0.52	1.43	3.83	−3.24
EM (times)	1.45	1.84	3.25	3.97	−0.33
ROE (%)	0.34	−0.07	4.26	16.62	−12.77
CAP (%)	72.36	59.22	38.11	36.91	−11.94
Z-score	61.53	47.94	33.65	34.19	−14.13

Difference-in-Differences = (After − Before) for restricted banks − (After − Before) for unrestricted banks.

Source: Prepared by the researcher based on statistical data.

The decline in ROE among restricted banks was attributable to profitability rather than leverage. Their equity multiplier increased from 1.45 to 1.84 times; however, ROA turned negative. In contrast, ROE among unrestricted banks increased approximately fourfold as a result of the combined rise in profitability and leverage. The Z-score index of restricted banks declined from 61.53 to 47.94 due to the simultaneous deterioration in capitalization and profitability, whereas it remained stable among unrestricted banks.

Estimation Results and Hypothesis Testing

Homogeneity of the Two Groups Before 2023 (H3)

To test the homogeneity of the two groups before 2023, an event-study model was estimated according to Equation (5), using 2022 as the reference year:

$$Y_{it} = \alpha_i + \lambda_t + \sum_{k \neq 2022} \delta_k (TR_i \times D_k) + \gamma_1 SIZE_{it} + \gamma_2 DEP_{it} + \varepsilon_{it} \qquad (5)$$

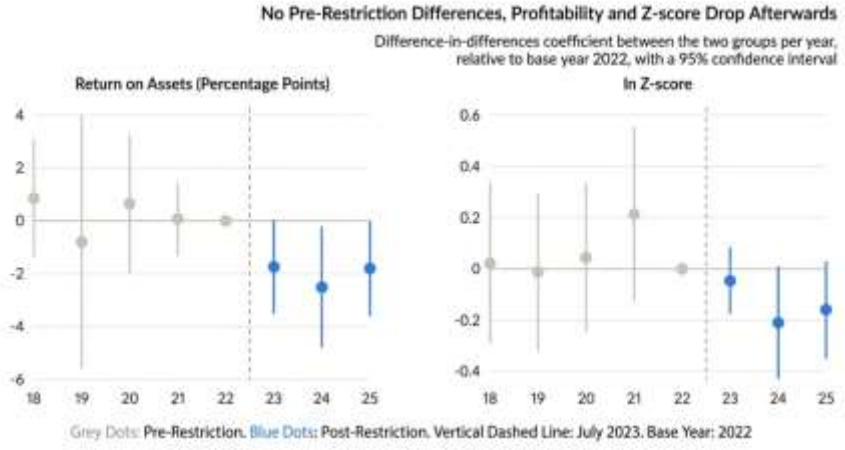

Figure 2. Event-Study Coefficients for Return on Assets and the Z-Score Index (2022 as the Reference Year, 95% Confidence Interval)

Source: Prepared by the researcher based on statistical data.

The pre-restriction coefficients were not statistically significant together, with F-statistic=0.632 and p=0.648 for ROA and F-statistic=0.859 and p=0.514 for ln Z. As a result, this hypothesis (H3) is accepted. After restrictions were put in place, the ROA

coefficients were negative in all three years (p = −1.74, −2.51, and −1.80) with the highest being made in 2024 (p = 0.034). The Z score index behaved similarly, with a one year time lag at the 10% level of significance, with the effects of restrictions building up over time in capitalization.

Differences in Financial Performance and Insolvency Risks (H1 and H2)

Table 8. Differences Between the Two Groups Post-2023 (DID Coefficient)

Dependent Variable	β Without Control Variables	β With Control Variables	Standard Error (With Controls)	p (Wild Bootstrap, With Controls)
ROA	-3.251**	-2.077**	0.820	0.019
ROE	-12.771**	-9.059**	3.817	0.015
ln EM	0.095	0.112	0.071	0.117
ln Z-score	-0.206	-0.190**	0.074	0.015
ZP (Profitability Component)	-1.594***	-1.208**	0.390	0.014
ZC (Capitalization Component)	-12.532	-10.728**	4.183	0.023

All models include bank and year fixed effects, N = 112, and 14 clusters. Control variables: SIZE and DEP. *** Significant at the 1% level, ** significant at the 5% level.

Source: Prepared by the researcher based on statistical data.

ROA for restricted banks fell by 2.08 percentage points, which had a significant impact compared to the mean of the sample, of 1.17%, and ROE fell by 9.06 percentage points. The equity multiplier, however, did not have a significant effect. The first hypothesis (H1) is accepted as there are statistically significant differences in profitability in favour of unrestricted banks, while there are no statistically significant differences in leverage. This means that the drop in ROE was due to operating profits, not to leverage.

This resulted in a decrease in the Z-score index of around 17.3% and the profitability component of 1.21, which was the largest statistically significant change, significant with and without the control variables. The capitalization portion fell by 10.73. Therefore, the second hypothesis (H2) can be accepted that the risks of insolvency among restricted banks rose in two directions: the drop in profitability and the capitalization deterioration. As the restricted banks were smaller than unrestricted banks and less deposit-dependent, the effects of these two factors remained statistically significant after controlling for bank size and the deposit ratio.

Robustness Tests

Table 9. Robustness Tests (With Control Variables)

Test	Dependent Variable	β (DID)	p (Wild Bootstrap)	N
Excluding 2023 (Partial Treatment)	ROA	−2.156**	0.017	98
Excluding 2023 (Partial Treatment)	ln Z-score	−0.254***	0.004	98
Winsorizing Outliers at 5%	ROA	−1.972***	0.002	112
Winsorizing Outliers at 5%	ROE	−7.698**	0.017	112
Placebo Test: Hypothetical Restrictions in 2021	ROA	−0.311	0.795	70
Z with Rolling Standard Deviation (3 Years)	ln Z-score	0.548	0.380	84

Source: Prepared by the researcher based on statistical data.

The results did not change when 2023 was excluded and were still statistically significant when outliers were removed. There was no effect in the placebo test, thus the effect found is due to the actual timing of the restrictions. The rolling-window Z-score index was not statistically significant, however, due to the small size of the window (three observations), the year 2018 and 2019 were lost. Additionally, the quick rise in the gains of unrestricted banks made them more volatile, and the enhancement was perceived as risk. Therefore, the Z score result must be taken with a grain of salt, and the profitability result is the strongest result.

Discussion of Results

The operating profitability was reduced in line with the type of restrictions: restricted banks were unable to transact in USD and make external transfers. These activities are some of the most crucial activities for non-credit income of Iraqi private banks. This meant a fall in income with no change in fixed costs. The impact then trickled down to capitalization, as the average capitalization ratio slipped from 72.4% to 59.2%, with the former due to losses that led to a decline in part of shareholders' equity in banks like Al-Qirtas and Erbil, while the latter was attributable to an increase in asset funded by deposits in banks like Al-Mustashar and Al-Taif. The absolute strength of these banks was high at the time they were established, but they had become somewhat weaker by about 17%.

Part of the gap can be attributed to the increased profitability of unrestricted banks. The banks of Baghdad, Al-Ahli and Al-Mansour saw a ROA increase by double after 2023, likely due to customers and external transactions shifting from the limited banks to these banks. Thus, it was not possible to say that there was no interference between the different units (SUTVA) and the control group was therefore indirectly affected by the restrictions. It is therefore best to consider the estimated coefficient as a relative difference between the two groups, rather than the absolute difference in loss suffered by limited banks.

Conclusions and Recommendations

Conclusions

1. Following 2023, a statistically significant profitability gap emerged between restricted and unrestricted banks, amounting to 2.08 percentage points in ROA and 9.06 percentage points in ROE. This gap was attributable to operating profitability

rather than financial leverage.

2. Insolvency risk increased among restricted banks, as the Z-score declined by approximately 17% due to the combined erosion of profitability and decline in capitalization, with the profitability component exerting the strongest effect.

3. The gap emerged in the year the restrictions were imposed, reached its peak in 2024, and persisted throughout 2025, indicating that its effects were prolonged rather than temporary.

4. The profitability of unrestricted banks increased substantially after 2023, indicating that the restrictions contributed to the redistribution of profits within the private banking sector.

Recommendations

1. Central Bank of Iraq:

- Closely monitor the solvency and profitability of restricted banks by adopting the Z-score and DuPont components as early warning indicators.

- Incorporate international banking compliance risks into the financial risk supervision frameworks applied to all banks.

- Publish periodic performance indicators for restricted banks to help investors account for the prolonged impact of restrictions when evaluating their shares.

2. Bank Management:

- Diversify income sources in restricted banks by expanding domestic dinar-denominated financing, electronic banking services, and salary domiciliation.

- Control fixed costs in restricted banks in line with the scale of their new business activities.

- Incorporate international compliance risks into the financial risk management framework and periodically monitor the Z-score and DuPont components as early warning indicators.

3. Researchers:

- Apply the same integrated framework to banks covered by the February 2024 decision.

- Employ the three-step DuPont model by decomposing ROA into profit margin and asset turnover.

- Examine the impact of restrictions on the share prices of restricted banks.

References

1. Abboud, H. A.-L., & Khaleel, D. H. (2025). The impact of banking risks on banking stability: An analytical study of a sample of private banks listed on the Iraq Stock Exchange for the period (2011–2023). *Al-Ghary Journal of Economic and Administrative Sciences, 21*(3), 445–467. https://doi.org/10.36325/ghjec.v21i3.19341
2. Abu Khalaf, B., & Awad, A. B. (2024). Exploring the bearing of liquidity risk in the Middle East and North Africa (MENA) banks. *Cogent Economics & Finance, 12*(1), Article 2330840. https://doi.org/10.1080/23322039.2024.2330840

3. Alothman, H. A. S., & Alktrani, S. H. M. (2025). The role of financial soundness indicators in assessing banking financial stability: An analytical study of the Iraqi banking sector. *Al-Ghary Journal of Economic and Administrative Sciences, 21*(4), 284–312. https://doi.org/10.36325/ghjec.v21i4.19973
4. Altaee, H. H. A., Ghani, N. H., Azeez, S. J., & Abdulwahab, S. A. (2024). Factors influencing commercial bank profitability in Iraq: A quantile regression approach. *Banks and Bank Systems, 19*(2), 172–183. https://doi.org/10.21511/bbs.19(2).2024.14
5. Antwi, S., Tetteh, A. B., Armah, P., & Dankwah, E. O. (2023). Anti-money laundering measures and financial sector development: Empirical evidence from Africa. *Cogent Economics & Finance, 11*(1), Article 2209957. https://doi.org/10.1080/23322039.2023.2209957
6. Bawuah, I. (2024). Bank stability and economic growth in Sub-Saharan Africa: Trade-offs or opportunities? And how do institutions and bank capital affect this trade-off? *Cogent Economics & Finance, 12*(1), Article 2381695. https://doi.org/10.1080/23322039.2024.2381695
7. Berhe, A. G. (2024). Determinants of bank profitability in Ethiopia: Does political stability matter? *Cogent Business & Management, 11*(1), Article 2410406. https://doi.org/10.1080/23311975.2024.2410406
8. Bouvatier, V., Lepetit, L., Rehault, P.-N., & Strobel, F. (2023). Time-varying Z-score measures for bank insolvency risk: Best practice. *Journal of Empirical Finance, 73*, 170–179. https://doi.org/10.1016/j.jempfin.2023.06.002
9. Callaway, B., & Sant'Anna, P. H. C. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics, 225*(2), 200–230. https://doi.org/10.1016/j.jeconom.2020.12.001
10. Cheratian, I., Goltabar, S., & Farzanegan, M. R. (2023). Firms persistence under sanctions: Micro-level evidence from Iran. *The World Economy, 46*(8), 2408–2431. https://doi.org/10.1111/twec.13378
11. Ebrahimi, P., Fekete-Farkas, M., Bouzari, P., & Magda, R. (2021). Financial performance of Iranian banks from 2013 to 2019: A panel data approach. *Journal of Risk and Financial Management, 14*(6), Article 257. https://doi.org/10.3390/jrfm14060257
12. Efing, M., Goldbach, S., & Nitsch, V. (2023). Freeze! Financial sanctions and bank responses. *The Review of Financial Studies, 36*(11), 4417–4459. https://doi.org/10.1093/rfs/hhad043
13. Haris, M., Yao, H., & Fatima, H. (2024). The impact of liquidity risk and credit risk on bank profitability during COVID-19. *PLOS ONE, 19*(9), Article e0308356. https://doi.org/10.1371/journal.pone.0308356
14. Huynh, J., & Phan, T. M. H. (2024). Uncertainty and bank risk in an emerging market: The moderating role of business models. *PLOS ONE, 19*(2), Article e0297973. https://doi.org/10.1371/journal.pone.0297973
15. Ibrahim, S. S. (2025). Examining of some of factors affecting financial stability in a sample of Islamic banks in Iraq for the period 2018–2022. *Koya University Journal of Humanities and Social Sciences, 8*(1), 330–336. https://doi.org/10.14500/kujhss.v8n1y2025.pp330-336
16. Isayas, Y. N. (2022). Determinants of banks' profitability: Empirical evidence from banks in Ethiopia. *Cogent Economics & Finance, 10*(1), Article 2031433. https://doi.org/10.1080/23322039.2022.2031433
17. Jadah, H. M., Alghanimi, M. H. A., Al-Dahaan, N. S. H., & Al-Husainy, N. H. M. (2020). Internal and external determinants of Iraqi bank profitability. *Banks and Bank Systems, 15*(2), 79–93. https://doi.org/10.21511/bbs.15(2).2020.08
18. Joudar, F., Msatfa, Z., Metwalli, O., Mouabid, M., & Dinar, B. (2023). Islamic

financial stability factors: An econometric evidence. *Economies, 11*(3), Article 79. https://doi.org/10.3390/economies11030079
19. Kebede, T. N. (2025). Unveiling the drivers of bank profitability: Insights from Ethiopian banks. *Humanities and Social Sciences Communications, 12*. https://doi.org/10.1057/s41599-025-05031-3
20. Kumar, P., Verma, P., Bhatnagar, M., Taneja, S., Seychel, S., Todorović, I., & Grima, S. (2023). The financial performance and solvency status of the Indian public sector banks: A CAMELS rating and Z index approach. *International Journal of Sustainable Development and Planning, 18*(2), 367–376. https://doi.org/10.18280/ijsdp.180204
21. Lamothe, P., Delgado, E., Solano, M. A., & Fernández, S. M. (2024). A global analysis of bank profitability factors. *Humanities and Social Sciences Communications, 11*. https://doi.org/10.1057/s41599-023-02545-6
22. MacKinnon, J. G., Nielsen, M. Ø., & Webb, M. D. (2023). Cluster-robust inference: A guide to empirical practice. *Journal of Econometrics, 232*(2), 272–299. https://doi.org/10.1016/j.jeconom.2022.04.001
23. Maliki, A. H. A., Rostami, A., & Rahrovi Dastjerdi, A. (2026). Prioritizing financial resilience indicators for banking stability in Iraqi banks: An integrated AHP-TOPSIS framework. *Journal of Risk and Financial Management, 19*(9), Article 726. https://doi.org/10.3390/jrfm19090726
24. Mashamba, T., Magweva, R., & Gani, S. (2023). Bank profitability and economic growth in the emerging markets: The mediating role of stability [Special issue]. *Corporate & Business Strategy Review, 4*(2), 386–401. https://doi.org/10.22495/cbsrv4i2siart18
25. Mawardi, I., Al Mustofa, M. U., Widiastuti, T., Fanani, S., Bakri, M. H., Hanafi, Z., & Robani, A. (2024). Comparative stability analysis of Indonesian banks: Markov switching—dynamic regression for Islamic and conventional sectors. *PLOS ONE, 19*(4), Article e0301398. https://doi.org/10.1371/journal.pone.0301398
26. Melik-Parsadanyan, V. (2026). Accounting-based assessment of bank ROE: Evidence from Armenian banks. *Banks and Bank Systems, 21*(2), 64–77. https://doi.org/10.21511/bbs.21(2).2026.05
27. Najim, S. I., Abdullah, Y. A., & Khan, M. N. (2024). The role of credit and deposit services in enhancing the market value of stocks (the case of Baghdad Bank). *Journal of Economics and Administrative Sciences, 30*(144), 373–385. https://doi.org/10.33095/e73a4n91
28. Nguyen, D. T., & Le, T. D. Q. (2022). The interrelationships between bank profitability, bank stability and loan growth in Southeast Asia. *Cogent Business & Management, 9*(1), Article 2084977. https://doi.org/10.1080/23311975.2022.2084977
29. Nivorozhkin, E. (2025). Sectoral adaptation and strategic resilience: The impact of sanctions on Russian corporate performance (2014–2021). *Economics of Transition and Institutional Change*. Advance online publication. https://doi.org/10.1111/ecot.70012
30. Ofoeda, I., Tuffour, J. K., & Nketia, E. A. (2023). The impact of anti-money laundering regulations on inclusive finance: Evidence from Sub-Saharan Africa. *Cogent Economics & Finance, 11*(2), Article 2235821. https://doi.org/10.1080/23322039.2023.2235821
31. Rastogi, S., Sharma, A., Pinto, G., & Bhimavarapu, V. M. (2022). A literature review of risk, regulation, and profitability of banks using a scientometric study. *Future Business Journal, 8*, Article 28. https://doi.org/10.1186/s43093-022-00146-4
32. Roth, J., Sant'Anna, P. H. C., Bilinski, A., & Poe, J. (2023). What's trending in

difference-in-differences? A synthesis of the recent econometrics literature. *Journal of Econometrics, 235*(2), 2218–2244. https://doi.org/10.1016/j.jeconom.2023.03.008
33. Sodokin, K., Egbeleo, E., Kuessi, R., Couchoro, M. K., & Agbodji, A. E. (2023). Regulation, institutional quality, and stability of the banking system in West African Economic and Monetary Union. *Cogent Economics & Finance, 11*(2), Article 2256127. https://doi.org/10.1080/23322039.2023.2256127
34. Sousa, F., & Almeida, L. (2025). Banking profitability: Evolution and research trends. *International Journal of Financial Studies, 13*(3), Article 139. https://doi.org/10.3390/ijfs13030139
35. Yoshanti, G., & Kurnia, R. (2024). The study of DuPont model and financial performance of sharia banks. *Tamwil, 10*(2), 118–127. https://doi.org/10.31958/jtm.v10i2.13817
36. Kurdistan24. (2023). The U.S. State Department responds to Kurdistan24 regarding sanctions against 14 Iraqi banks. https://www.kurdistan24.net/ar/story/320822
37. Shafaq News. (2023). The Central Bank of Iraq comments on U.S. sanctions against 14 banks. https://shafaq.com/ar/
38. Al Arabiya. (2024). Iraq bans eight local banks from conducting U.S. dollar transactions. https://www.alarabiya.net/aswaq/economy/2024/02/04/