“Non-performing loans and capital adequacy in Jordan’s banking sector: Evidence from 2010–H1 2024”

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NON-PERFORMING LOANS AND CAPITAL ADEQUACY IN JORDAN'S BANKING SECTOR: EVIDENCE FROM 2010–H1 2024

Abstract

This study examines aggregate asset quality and capitalization in Jordan's banking sector from 2010 to H1 2024. A source audit showed that the international database values used previously repeated the same non-performing loan (NPL) ratio and capital adequacy ratio for 2010–2014 and were not demonstrably comparable with later supervisory observations. The revised dataset therefore uses Central Bank of Jordan publications consistently for banking indicators, World Development Indicators for macroeconomic variables, and treats H1 2024 as descriptive only. Annual regressions use 2010–2023 year-end data. Pearson correlations and two parsimonious OLS specifications are estimated with HC3 standard errors and t-based finite-sample inference. The NPL ratio averaged 5.743% and the capital adequacy ratio 18.393% over the 14 annual observations. In the contemporaneous model, capital adequacy is positively associated with the NPL ratio (coefficient 1.243, $p = 0.005$), but this association is not interpreted causally because regulation, provisioning, and common trends can generate reverse or simultaneous responses. In the limited dynamic model, the lagged NPL coefficient is 0.769 ($p = 0.001$), whereas lagged capital adequacy is imprecise (0.079, $p = 0.866$). These results indicate short-run persistence in aggregate asset quality, not a comprehensive measure of banking resilience. The small annual sample, influential observations, and incomplete public methodological detail require cautious interpretation.

Keywords asset quality, capital adequacy ratio, credit risk, Jordan, non-performing loans, small-sample inference

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INTRODUCTION

Banks perform maturity transformation, screen borrowers, and maintain payment and credit relationships that are central to economic activity. Those functions also expose banks to liquidity and credit losses. Capital absorbs unexpected losses, while asset-quality indicators reveal whether repayment problems are accumulating. The interaction matters for financial stability, but neither indicator alone measures the full capacity of a banking system to withstand and recover from shocks (Diamond & Dybvig, 1983; Holmström & Tirole, 1997; Berger & Bouwman, 2013).

Jordan is an informative setting because banking is the principal channel of financial intermediation and the economy has faced regional disruption, modest growth, the COVID-19 contraction, global inflation, and monetary tightening during the study period. Supervisors require banks to maintain capital above regulatory minima and to recognize impaired credit. These arrangements can make observed capital adequacy respond to loan problems, rather than serve only as a predetermined constraint. Consequently, positive contemporaneous relation between the NPL ratio and capital adequacy can coexist with prudential behavior and does not by itself show that capital increases credit risk.

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The paper asks three narrow questions. First, how did the aggregate NPL ratio and capital adequacy ratio change between 2010 and H1 2024? Second, what contemporaneous associations appear between the NPL ratio, capital adequacy, and real GDP growth over consistent year-end observations? Third, does the aggregate NPL ratio display short-run persistence after accounting for prior capital adequacy? These questions concern aggregate asset quality and capitalization. They do not constitute a comprehensive measurement of resilience, which would require liquidity, profitability, market, funding, operational, and institutional dimensions.

The revision makes four contributions. It replaces an undocumented international-to-domestic series splice with a banking dataset constructed from one supervisory authority. It documents why repeated 2010–2014 values in the earlier database extract are not treated as observed Jordanian supervisory values. It reduces the econometric design to two predictors per regression and makes HC3/t finite-sample inference primary. Finally, it releases a workbook that separates raw extracts, transformations, model-ready data, source validation, and automated checks, together with executable replication code.

The findings are deliberately modest. The revised annual series shows a large decline in the NPL ratio early in the sample, followed by a lower but variable plateau. The dynamic coefficient indicates persistence, while lagged capital adequacy is too imprecisely estimated to support a directional claim. The contemporaneous capital coefficient is positive and statistically distinguishable from zero, but its interpretation is descriptive because the design cannot separate regulatory response, reverse association, and shared trends.

1. LITERATURE REVIEW

Bank fragility begins with the mismatch between liquid liabilities and less liquid assets. Deposit discipline can improve monitoring but can also make intermediation vulnerable to coordination failures (Diamond & Dybvig, 1983; Allen & Gale, 2000). Capital changes the allocation of losses and the incentives of owners, creditors, and managers. Well-capitalized banks may have greater capacity to continue lending during stress, although the relation between capital and risk can be shaped by charter value, competition, and regulatory responses (Boyd & De Nicoló, 2005; Laeven & Levine, 2009; Schaeck & Cihák, 2014).

Empirical work commonly treats non-performing loans as an observable manifestation of credit risk. Economic downturns weaken borrower cash flow and collateral values, while rapid credit expansion can lower underwriting standards and reveal losses only later (Rajan, 1994; Jiménez & Saurina, 2006; Schularick & Taylor, 2012). Cross-country and national studies find that weak growth, unemployment, leverage, lending conditions, and bank characteristics can be related to NPL ratios, but signs and magnitudes vary across samples and institutional settings (Louzis et al., 2012; Klein, 2013; Makri et al., 2014; Ghosh, 2015).

NPL ratios can also be persistent. Resolution takes time because banks must identify impairment, negotiate restructuring, enforce collateral, sell distressed assets, or write off exposures. Persistence does not imply an unchanging data-generating process: policy interventions, regulatory forbearance, and classification changes can alter both the stock and the timing of recognition. Dynamic annual models therefore provide a compact description of inertia but are difficult to estimate precisely with short time series (Hamilton, 1994; Davidson & MacKinnon, 1993).

Capital adequacy is economically relevant but potentially endogenous. Supervisors and banks may strengthen capital after risks rise; high capital may also allow earlier recognition or retention of impaired exposures. Conversely, losses can erode capital. The sign of a contemporaneous coefficient is therefore not a simple test of whether capital is protective. Studies of bank performance and diversification similarly emphasize that business models and risk-taking incentives condition observed relations (Athanasoglou et al., 2008; DeYoung & Torna, 2013).

Macroprudential research stresses joint movements in credit, debt-service capacity, and buffers rather than reliance on a single indicator (Borio, 2011; Drehmann & Juselius, 2014). Crisis databases also show that banking distress is multidimensional and institutionally contingent (Laeven & Valencia, 2013). For Jordan, Kharabsheh (2022) reports bank-level evidence on profitability and stability, while Ozili (2018) shows that regional NPL determinants depend on macroeconomic and banking conditions. The present study complements that work with a transparent aggregate series, but its unit of analysis prevents inference about differences among Jordanian banks.

Cross-country databases are valuable for comparison and long-run coverage, but their indicators are not automatically interchangeable with domestic supervisory series. The original financial-development databases were built to assemble broad measures across countries and necessarily involved harmonization choices (Beck et al., 2000). Domestic capital standards also evolve as Basel reforms are implemented through national rules (Basel Committee on Banking Supervision, 2017). A numerical match or common label therefore cannot substitute for documentation of the reporting perimeter, consolidation basis, impairment classification, numerator, denominator, and reference date. This is especially important in a short time series because a single source break can dominate a coefficient and can be mistaken for an economic transition. The present study consequently prioritizes one supervisory authority and preserves unresolved definitional fields as limitations. This choice sacrifices the apparent precision of the earlier international extract but improves the interpretability and auditability of the annual sequence.

This study aims to describe aggregate asset quality and capitalization in Jordan's banking sector and examine NPL persistence and its associations with capital adequacy and real GDP growth.

The directional expectations are correspondingly limited. *H1: The* current NPL ratio is positively associated with its one-year lag. *H2: Prior* capital adequacy is negatively associated with the current NPL ratio. *H3: Real* GDP growth is negatively associated with the contemporaneous NPL ratio. These are associational expectations; the models do not identify causal effects.

2. METHOD

2.1. Empirical scope and data audit

The observation unit is the aggregate Jordanian banking sector by year. The descriptive window covers 2010–H1 2024. Regressions use 14 comparable year-end observations from 2010 through 2023; H1 2024 is displayed but not treated as an annual observation. Banking variables come only from Central Bank of Jordan (CBJ) supervisory publications (Central Bank of Jordan, 2018, 2021, 2024). GDP growth and consumer-price inflation come from World Development Indicators (World Bank, 2026). No observation is interpolated, carried forward, winsorized, or reconstructed.

The data audit changed the series materially. FRED/GFDD tables contain separate annual entries of 6.6999998% for the NPL ratio and 19.6% for the capital adequacy ratio for each year from 2010 through 2014. Thus, the repetition was present in the database extract rather than introduced by rounding in the manuscript. The public metadata does not establish whether those entries originated from repeated reporting or an upstream carry-forward. More importantly, the CBJ's Table No. (16) reports distinct values for the same years: NPL ratios of 8.2%, 8.5%, 7.7%, 7.0%, and 5.6%, and capital adequacy ratios of 20.3%, 19.3%, 19.0%, 18.4%, and 18.4%. The earlier FRED series also diverges from CBJ values after 2014.

Because the FRED/GFDD perimeter, consolidation basis, and regulatory definitions were not shown to be identical to later CBJ data, the revision does not splice them. The repeated entries are preserved in the workbook's Raw_FRED_Audit sheet for transparency but excluded from every calculation. CBJ data for 2010–2018 come from the financial-soundness workbook; 2019–2020 come from the Financial Stability Report 2020; and 2021–2024 come from the December 2024 Monthly Statistical Bulletin. The 2017–2018 workbook values are marked preliminary; the 2018 figures are confirmed in the later report. The source publications do not disclose every requested detail about bank type, consolidation, buffers, or methodology on the cited pages, so Table 1 records those fields as not fully specified rather than assuming equivalence.

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Table 1. Data sources, treatment, and comparability decisions

Series	Years/period	Primary source and location	Treatment	Known limitation
NPL ratio and capital adequacy ratio	2010–2018; year-end	CBJ, Table No. (16), rows 13-14	Retained; exact published one-decimal values	2017–2018 marked preliminary in workbook; public table does not fully state perimeter or consolidation
NPL ratio and capital adequacy ratio	2019–2020; year-end	CBJ, Financial Stability Report 2020, pp. III and 35	Retained; bridges CBJ publications	Cited passages do not reproduce all regulatory-definition details
NPL ratio and capital adequacy ratio	2021–2023 year-end; H1 2024	CBJ, Monthly Statistical Bulletin, Dec. 2024, p. 12	2021–2023 retained in models; H1 2024 descriptive only	2024 is not a full-year observation
GDP growth and inflation	2010–2024; calendar year	World Bank, WDI codes NY.GDP.MKTP.KD.ZG and FP.CPI.TOTL.ZG	Retained to source precision	WDI may be revised after access
Earlier international banking series	2009–2019	FRED/GFDD series DDSI02JOA156NWDB and DDSI05JOA156NWDB	Audited and excluded	Repeated 2010–2014 entries; comparability with CBJ series not established

Note: The supplementary workbook provides year-variable values, original source precision, source table or page, URL, access date, transformation log, and validation checks. CBJ = Central Bank of Jordan; WDI = World Development Indicators.

2.2. Variables and statistical design

The NPL ratio is non-performing loans divided by total loans in the aggregate supervisory series, using the CBJ Table's published label; the cited public table does not explicitly state gross versus net treatment. The capital adequacy ratio is the aggregate ratio published by the CBJ; the cited pages do not restate every numerator, denominator, buffer, or consolidation component. GDP growth and inflation are annual percentages. Inflation is retained for description and correlation but is omitted from the regressions to preserve residual degrees of freedom. GDP growth is the only macroeconomic control in the contemporaneous model because borrower repayment capacity is directly linked to real activity. The dynamic model retains only the lagged NPL ratio and lagged capital adequacy, the two variables required to evaluate persistence and prior capitalization.

The analysis proceeds in three layers. First, a descriptive framework reports the two banking indicators separately; the earlier Banking Resilience Index is removed because its equal weights, sample-dependent normalization, and capital component did not establish a comprehensive or independently validated resilience construct. Second, a parsimonious contemporaneous regression relates the NPL ratio to capital adequacy and GDP growth. Third, a limited dynamic regression relates the NPL ratio to its one-year lag and lagged capital adequacy.

$$NPL_t = \alpha + \beta_1 CAR_t + \beta_2 GDPG_t + \varepsilon_t. \quad (1)$$

In Equation (1), t indexes calendar years 2010–2023; NPL_t is the NPL ratio in percent (CBJ); CAR_t is the published aggregate capital adequacy ratio in percent (CBJ), with an ex ante negative expectation but potentially ambiguous contemporaneous sign; $GDPG_t$ is real GDP growth in annual percent (WDI), expected to be negative; α is the intercept; and ε_t is the unexplained annual disturbance. No variable is standardized or differenced.

$$NPL_t = \alpha + \rho NPL_{t-1} + \beta_1 CAR_{t-1} + \varepsilon_t. \quad (2)$$

In Equation (2), NPL_{t-1} and CAR_{t-1} are the prior year's CBJ ratios in percent. The persistence coefficient ρ is expected to be positive and β_1 is expected to be negative. Creating the lags removes 2010, leaving 13 usable observations for 2011–2023. With an intercept and two predictors, the dynamic model has 10 residual degrees of freedom. It is treated as exploratory because a short aggregate annual series cannot support rich dynamics or strong causal inference.

Pearson product-moment correlations are primary because the regressions are linear and the variables are measured continuously. For each pair, the coefficient, exact two-sided t-based p-value, and N are reported. Spearman rank correlations are calculated as a sensitivity check because the sample is small and contains unusual macroeconomic observations. Neither correlation method corrects serial dependence.

2.3. Inference, diagnostics, and reproducibility

All regressions are OLS with HC3 heteroskedasticity-consistent covariance and t-based finite-sample inference as the primary method. Tables report coefficients, HC3 standard errors, t-statistics, exact two-sided p-values, 95% confidence intervals, N, residual degrees of freedom, R-squared, adjusted R-squared, and a robust Wald F test. HC1/t estimates are secondary sensitivity results. Significance symbols use *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$ based on the displayed finite-sample p-values (MacKinnon & White, 1985; Long & Ervin, 2000).

Diagnostics include the Breusch-Pagan test for heteroskedasticity, the Breusch-Godfrey lag-1 test and Durbin-Watson statistic for residual serial dependence, the Jarque-Bera statistic, leverage, and Cook's distance. The highest-leverage and highest-influence years are re-estimated one at a time. Because diagnostic tests have low power in such a small sample, their p-values are descriptive warnings rather than proof that assumptions hold.

The analysis was executed on 26 July 2026 in Python 3.12.13 on Linux 6.12.13 (x86_64), using statsmodels 0.14.5, pandas 2.2.3, NumPy 2.3.5, SciPy 1.17.0, openpyxl 3.1.5, and Matplotlib 3.10.8. The supplied script reads the Excel workbook, checks sample sizes, reproduces every empirical table and figure, and writes machine-readable outputs. A fixed seed of 20260726 is set, although the reported procedures do not depend on random simulation.

3. RESULTS

3.1. Descriptive evidence

Table 2 describes the 14 year-end observations used in the annual models. The NPL ratio averaged 5.743% and ranged from 4.2% to 8.5%. Capital adequacy averaged 18.393% and ranged from 16.9%

Table 2. Descriptive statistics for the year-end model sample, 2010–2023

Variable	N	Mean	SD	Minimum	Median	Maximum
NPL ratio (%)	14	5.743	1.470	4.200	5.050	8.500
Capital adequacy ratio (%)	14	18.393	0.856	16.900	18.350	20.300
Real GDP growth (%)	14	2.300	1.108	–1.103	2.485	3.656
Inflation (%)	14	2.581	2.088	–0.877	3.112	4.846

Note: H1 2024 is excluded because it is not a year-end observation.

Table 3. Validated annual data and period treatment

Year	Banking reference period	NPL ratio (%)	CAR (%)	GDP growth (%)	Inflation (%)	Annual model
2010	Year-end	8.2	20.3	2.31	4.85	Yes
2011	Year-end	8.5	19.3	2.74	4.16	Yes
2012	Year-end	7.7	19.0	2.43	4.52	Yes
2013	Year-end	7.0	18.4	2.61	4.82	Yes
2014	Year-end	5.6	18.4	3.38	2.90	Yes
2015	Year-end	4.9	19.1	2.50	–0.88	Yes
2016	Year-end	4.3	18.5	1.99	–0.78	Yes
2017	Year-end	4.2	17.8	2.47	3.32	Yes
2018	Year-end	4.9	16.9	1.92	4.46	Yes
2019	Year-end	5.0	18.3	1.75	0.76	Yes
2020	Year-end	5.5	18.3	–1.10	0.33	Yes
2021	Year-end	5.0	18.0	3.66	1.35	Yes
2022	Year-end	4.5	17.3	2.65	4.23	Yes
2023	Year-end	5.1	17.9	2.88	2.08	Yes
2024	H1 (end-June)	5.6	17.6	2.49	1.56	No

Note: Banking values are CBJ observations. Macroeconomic values are WDI. 2024 banking indicators refer to H1 (end-June) and are descriptive only.

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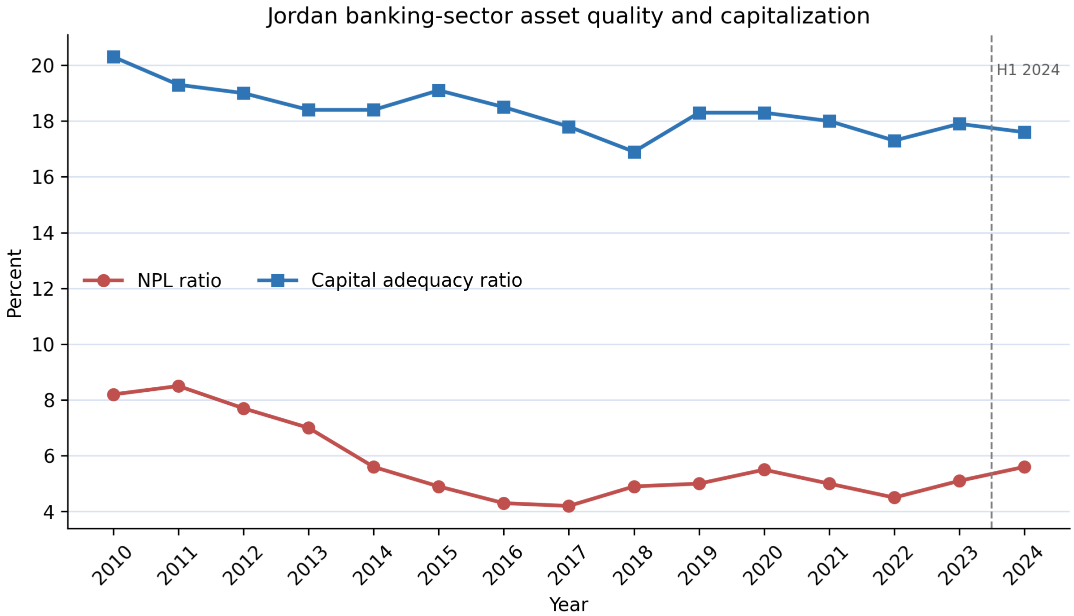

Note: The dashed divider separates the H1 2024 update from year-end model observations.

Figure 1. Jordan banking-sector NPL and capital adequacy ratios, 2010–H1 2024

to 20.3%. GDP growth includes the 2020 contraction, whereas inflation ranges from mild deflation to 4.846%. These statistics differ from the earlier manuscript because the revised banking series uses CBJ observations rather than the mixed FRED/CBJ splice.

Table 3 and Figure 1 show the sequence. The NPL ratio fell from 8.2% in 2010 to 4.2% in 2017, rose to 5.5% in 2020, and was 5.1% at end-2023. The H1 2024 update is 5.6%. Capital adequacy remained above the CBJ's 12% minimum discussed in the Financial Stability Report, but that fact does not establish immunity to losses. The 2024 H1 ratio was 17.6%.

3.2. Correlations

The NPL ratio is positively correlated with capital adequacy ($r = 0.725$, $p = 0.003$, $N = 14$) and inflation ($r = 0.567$, $p = 0.035$, $N = 14$), while its correlation with GDP growth is small ($r = 0.070$, $p = 0.813$, $N = 14$). The rank sensitivity is weaker but directionally similar: Spearman coefficients are 0.617 ($p = 0.019$) for capital adequacy, 0.471 ($p = 0.089$) for inflation, and 0.159 ($p = 0.588$) for GDP growth. These are descriptive co-movements in a trending, serially ordered sample.

Table 4. Pearson correlation matrix with exact two-sided p-values and N

Variable	NPL ratio	CAR	GDP growth	Inflation
NPL ratio	1.000	0.725	0.070	0.567
	[0.000; 14]	[0.003; 14]	[0.813; 14]	[0.035; 14]
CAR	0.725	1.000	0.020	0.009
	[0.003; 14]	[0.000; 14]	[0.945; 14]	[0.977; 14]
GDP growth	0.070	0.020	1.000	0.300
	[0.813; 14]	[0.945; 14]	[0.000; 14]	[0.297; 14]
Inflation	0.567	0.009	0.300	1.000
	[0.035; 14]	[0.977; 14]	[0.297; 14]	[0.000; 14]

Note: Each cell reports r [p-value; N]. Diagonal p-values are shown as 0.000 by convention. Annual dependence is not removed by the correlation calculation.

3.3. Parsimonious regression estimates

Table 5 reports Equation (1). The contemporaneous capital adequacy coefficient is 1.243 (HC3 SE = 0.351, t = 3.546, p = 0.005; 95% CI [0.471, 2.015]). GDP growth is 0.073 (p = 0.649). The model has N = 14, 11 residual degrees of freedom, and adjusted R-squared of 0.444. The contemporaneous capital coefficient does not test H2, which concerns lagged capital adequacy; given simultaneity and common trends, it is reported only as a conditional contemporaneous association.

Table 6 reports Equation (2). The lagged NPL coefficient is 0.769 (HC3 SE = 0.177, t = 4.348, p = 0.001; 95% CI [0.375, 1.162]), supporting *H1*'s persistence expectation. Lagged capital adequacy is 0.079 (p = 0.866; 95% CI [–0.934, 1.092]), so *H2* is not supported. The wide interval includes economically meaningful negative and positive associations. The model has 13 observations and 10 residual degrees of freedom. Its adjusted R-squared of 0.789 is descriptive fit, not proof of stable predictive performance.

3.4. Sensitivity and diagnostics

HC1/t inference in Table 7 does not change the qualitative conclusions: the contemporaneous capital coefficient remains positive and the lagged NPL coefficient remains positive, while

Table 5. Contemporaneous OLS model with primary HC3/t inference

Predictor	Coefficient	HC3 SE	t	p	95% CI
Intercept	–17.289**	6.515	–2.654	0.022	[–31.629, –2.949]
Capital adequacy ratio	1.243***	0.351	3.546	0.005	[0.471, 2.015]
GDP growth	0.073	0.156	0.468	0.649	[–0.270, 0.416]

Note: N = 14; residual df = 11; R2 = 0.529; adjusted R2 = 0.444; robust Wald F(2, 11) = 6.627, p = 0.013. *** p < 0.01; ** p < 0.05; * p < 0.10.

Table 6. Limited dynamic OLS model with primary HC3/t inference

Predictor	Coefficient	HC3 SE	t	p	95% CI
Intercept	–0.354	7.768	–0.046	0.965	[–17.662, 16.954]
Lagged NPL ratio	0.769***	0.177	4.348	0.001	[0.375, 1.162]
Lagged capital adequacy ratio	0.079	0.455	0.174	0.866	[–0.934, 1.092]

Note: N = 13; residual df = 10; R2 = 0.824; adjusted R2 = 0.789; robust Wald F(2, 10) = 14.141, p = 0.001. *** p < 0.01; ** p < 0.05; * p < 0.10.

Table 7. HC1/t sensitivity estimates

Model	Predictor	Coefficient	HC1 SE	t	p	95% CI
Contemporaneous	Intercept	–17.289**	5.695	–3.036	0.011	[–29.823, –4.755]
Contemporaneous	Capital adequacy ratio	1.243***	0.309	4.023	0.002	[0.563, 1.923]
Contemporaneous	GDP growth	0.073	0.091	0.805	0.438	[–0.127, 0.273]
Dynamic	Intercept	–0.354	5.378	–0.066	0.949	[–12.338, 11.630]
Dynamic	Lagged NPL ratio	0.769***	0.147	5.230	0.000	[0.441, 1.096]
Dynamic	Lagged capital adequacy ratio	0.079	0.321	0.246	0.810	[–0.635, 0.793]

Note: Finite-sample t reference distributions are used. *** p < 0.01; ** p < 0.05; * p < 0.10.

Table 8. Residual and influence diagnostics

Model	Durbin-Watson	BP LM p	BG(1) LM p	JB p	Max leverage (year)	Max Cook's D (year)
Contemporaneous	1.095	0.527	0.067	0.824	0.797 (2020)	0.199 (2018)
Dynamic	1.236	0.476	0.310	0.682	0.454 (2011)	1.206 (2011)

Note: BP = Breusch-Pagan; BG = Breusch-Godfrey; JB = Jarque-Bera. Tests are based on conventional OLS residuals and have low power at these sample sizes.

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GDP growth and lagged capital adequacy remain imprecise. HC1 standard errors are smaller than HC3, as expected in this high-leverage small sample; HC3 therefore remains primary.

For the contemporaneous model, the Breusch-Pagan p-value is 0.527, the BG(1) p-value is 0.067, and Durbin-Watson is 1.095. The 2020 observation has leverage 0.797; removing it leaves the capital coefficient positive at 1.246 (HC3 $p = 0.013$) and GDP growth imprecise ($p = 0.741$). For the dynamic model, the Breusch-Pagan p-value is 0.476, BG(1) $p = 0.310$, and Durbin-Watson = 1.236. The 2011 observation has Cook's distance 1.206. Excluding 2011 leaves the lagged NPL coefficient at 0.758 (HC3 $p = 0.001$) and changes lagged capital adequacy to −0.258 ($p = 0.274$). The latter instability reinforces the decision not to draw a directional capital conclusion.

4. DISCUSSION

The revised evidence is narrower and more defensible than the earlier resilience framing. Jordan's aggregate NPL ratio improved substantially between 2010 and 2017 and subsequently fluctuated in a lower range. Capital adequacy remained well above the minimum cited by the CBJ. Together, those facts describe asset quality and loss-absorption capacity, but they do not measure liquidity, profitability, market funding, governance, operational continuity, or the speed of recovery after shocks.

The dynamic result is consistent with the institutional process through which impaired loans are recognized and resolved. A lag coefficient below one but well above zero indicates that changes in the aggregate NPL ratio are not absorbed within a single annual period. This supports continued attention to early classification, provisioning, restructuring capacity, and collateral enforcement. It should not be interpreted as a structural law: the confidence interval is wide, the series is short, and one annual lag cannot represent the full adjustment process.

The positive contemporaneous capital coefficient requires particular caution. Capital can rise when banks retain earnings or supervisors require buffers in response to perceived risk; recognition of non-performing loans can also occur alongside stronger capital. Common downward movements early in the sample can generate a positive level association. The estimate therefore does not show that higher capital causes the NPL ratio to rise, nor does it invalidate the loss-absorption role of capital. The near-zero and unstable lagged-capital coefficient provides no reliable evidence for *H2* in this sample.

GDP growth does not have a stable conditional coefficient, so *H3* is not supported. This differs from multi-country and bank-panel studies that have greater variation and many more observations (Louzis et al., 2012; Klein, 2013; Ghosh, 2015). At the aggregate Jordanian level, loan classification, policy support, sectoral composition, and delayed recognition may weaken the same-year relation between GDP growth and the NPL stock.

The source audit is itself consequential. The repeated FRED/GFDD values appear as separate database entries, but the CBJ publishes different year-specific observations. Treating the database entries as ordinary Jordanian supervisory values would obscure the early improvement in asset quality and materially change regression results. Using one supervisory authority reduces, but does not eliminate, comparability risk. The public source pages do not fully document bank-type coverage, consolidation, capital buffers, or classification changes for every year.

For regulators and bank managers, the practical implication is to examine NPL migration and capital planning jointly while keeping them analytically separate. Persistence warrants forward-looking provisioning and workout capacity. Capital adequacy supplies an important buffer, yet an aggregate ratio cannot reveal concentrations, risk-weighting choices, or bank-level dispersion. Stress testing, borrower-level monitoring, liquidity analysis, and bank-level data are needed before broader resilience judgments.

CONCLUSION

The study aimed to describe aggregate asset quality and capitalization in Jordan's banking sector and examine NPL persistence and its associations with capital adequacy and real GDP growth. Using a fully re-audited series, this study finds that Jordan's aggregate NPL ratio displays substantial annual persistence during 2011–2023. Lagged capital adequacy is estimated imprecisely. Capital adequacy is positively associated with the NPL ratio in the contemporaneous model, but the design does not separate regulatory response, reverse association, or common trends; no causal interpretation is warranted. GDP growth is not a stable conditional predictor in the parsimonious specification.

The evidence concerns two indicators: aggregate asset quality and capitalization. It does not provide a comprehensive assessment of banking-sector resilience or financial management. The broader capacity to absorb and recover from stress depends on liquidity, profitability, funding, governance, operational continuity, and the distribution of risk across banks, none of which is modeled here.

Several limitations define the boundary of the findings. The annual sample is small, leaving 11 residual degrees of freedom in the contemporaneous model and 10 in the dynamic model. HC3 and HC1 produce similar signs here, but their standard errors differ, and influence measures identify unusual years. Public source documentation does not resolve every historical coverage and regulatory-definition detail. Repeated early international-database observations were excluded rather than justified or imputed, and H1 2024 is descriptive because it is not year-end. Aggregate results cannot be generalized to individual Jordanian banks.

Future research should use bank-level supervisory or audited data, document classification and consolidation rules, and incorporate liquidity, profitability, funding, and stress-loss measures. Longer or higher-frequency series may permit richer dynamics, but only if period definitions and regulatory breaks are reconciled. Until then, the present estimates are best read as transparent descriptive and conditional evidence on NPL dynamics and capital adequacy.

CONFLICT OF INTEREST

The author declares no conflict of interest.

DECLARATION OF GENERATIVE-AI USE

ChatGPT (OpenAI, accessed July 2026) was used for language refinement, structural editing, formatting support, and assistance in drafting reproducible Python code. The author executed and verified the data, calculations, code outputs, citations, originality, analysis, and final content and assumes full intellectual responsibility. The AI tool is not an author and was not assigned responsibility for source verification, data analysis, or scholarly judgment.

DATA AVAILABILITY STATEMENT

Dataset available at https://doi.org/10.5281/zenodo.21261429

AUTHOR CONTRIBUTIONS

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