

The Effect of Capital Adequacy and Related Risk-Management Disclosure on the Performance of Commercial Banks Listed on the Saudi Exchange

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Abstract: This study examines whether the extent of capital adequacy and related risk-management disclosure (CARMD), as required and encouraged under Basel III Pillar 3, is associated with the performance of commercial banks listed on the Saudi Exchange. We hand-collect a 60-item disclosure index (35 qualitative and 25 quantitative items) from the notes to the financial statements, management commentary and Pillar 3 reports of all 10 listed Saudi commercial banks over 2021–2025 (50 bank-years). We relate the index to four performance measures (ROA, ROE, net interest margin and Tobin's Q), controlling for size, leverage, governance quality, listing age and audit quality. Average disclosure is 64% of index items, and qualitative disclosure is more extensive than quantitative disclosure. CARMD is strongly and positively correlated with all four performance measures. After controlling for bank characteristics, however, CARMD is significantly associated only with net interest margin ($B = 0.126$, $p = 0.024$); the associations with ROA, ROE and Tobin's Q are positive but not statistically significant. The results suggest that the main economic channel of disclosure in Saudi banks runs through funding costs and interest margins rather than through overall profitability or market valuation. The study provides recent evidence from a concentrated, Basel III-compliant emerging banking market, codes disclosure across three reporting channels jointly, and documents the gap between qualitative and quantitative Pillar 3 disclosure in Saudi banks.

Keywords: capital adequacy disclosure, risk disclosure, Basel III, Pillar 3, bank performance, Saudi Arabia

1 Introduction

Banks are among the opaqueness firms in the economy. Their assets consist largely of loans and securities whose quality is difficult for outsiders to observe, and their risk profile can change quickly through trading and funding decisions. Morgan [1] shows that rating agencies disagree more often about banks than about other firms, which is direct evidence of this opacity. Opacity matters because it weakens the ability of shareholders, depositors and creditors to monitor banks and to price their risk, and it can allow weaknesses to accumulate unnoticed until they become systemic. The 2007–2008 global financial crisis exposed precisely these weaknesses in bank governance, risk management and disclosure, and raised doubts about whether reported capital positions conveyed banks' underlying resilience [2, 3].

Regulators responded by making disclosure a pillar of prudential policy. The Basel III reforms tightened the quantity and quality of regulatory capital, introduced liquidity and leverage standards, and expanded the Pillar 3 market-discipline disclosure framework [4]. The premise of Pillar 3 is that investors, depositors and counterparties who can observe a bank's capital and risk profile will price that risk, and that this pricing will discourage excessive risk-taking [5]. Cross-country evidence supports this premise in principle: Nier and Baumann [6] find that market discipline, including discipline enabled by disclosure, induces banks to hold larger capital buffers. Pillar 3 therefore rests on an explicit causal chain running from disclosure, through reduced information asymmetry and market pricing, to bank behaviour and outcomes.

Whether the expected benefits of such disclosure materialise is, however, an open empirical question. Disclosure theory predicts that greater transparency reduces information asymmetry, increases liquidity and lowers the cost of capital [7, 8]. Yet disclosure is costly, may reveal proprietary information and can degenerate into boilerplate statements of policy

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[9,10]. Banks also have incentives to present their risk strategically: Begley et al. [11] show that banks under-report market risk when their capital is low. Theoretical work further shows that disclosure can improve or impair market outcomes depending on what is disclosed and how market participants respond to it [12]. Reviews of the regulatory evidence conclude that the consequences of mandated disclosure depend heavily on enforcement and institutional context [13], and Bischof et al. [14] show that compliance with risk-disclosure rules and the associated liquidity benefits differ according to which supervisor enforces them.

The empirical evidence on bank risk disclosure is correspondingly mixed. Some studies report that risk disclosure is value relevant or positively associated with share prices and credit ratings [15–17]. Others report negative or insignificant associations with value and performance, or adverse effects on lending [18–20]. A review of two decades of risk-reporting research concludes that the literature lacks a consistent conceptualisation of risk disclosure and that the costs and benefits of standard-setters' involvement remain unresolved [21]. Most of this evidence also comes from the United States and Europe, where enforcement institutions, ownership structures and investor bases differ markedly from those of emerging banking markets.

Saudi Arabia offers a useful setting in which to examine these questions, for four reasons. First, the banking sector is small and concentrated, dominated by a few large banks after recent mergers, and combines conventional and Islamic banks under one supervisor, the Saudi Central Bank (SAMA). Second, SAMA has implemented Basel III, including the revised Pillar 3 disclosure templates, so mandatory disclosure is high and the variation that remains reflects how far banks go beyond minimum compliance and how they present information across reports. Third, parts of the Pillar 3 report fall outside the statutory audit, which raises the question of whether such disclosure is credible to market participants [22,23]. Fourth, Saudi banks are funded predominantly by customer deposits, so if disclosure matters, its effect may appear in funding costs and interest margins rather than in equity valuation, a channel that studies focusing on share prices cannot detect.

Following Polizzi and Scannella [24], we code disclosure jointly across the three channels in which banks report capital and risk information: the notes to the financial statements, management commentary and the Pillar 3 report. Examining a single report in isolation understates what banks disclose, because different banks place the same information in different reports and because IFRS 7 disclosures may be cross-referenced rather than repeated in the Pillar 3 report.

This study addresses two research questions. RQ1: What is the extent and composition of capital adequacy and related risk-management disclosure by Saudi listed commercial banks? RQ2: Is the extent of this disclosure associated with bank accounting performance, interest margins and market valuation?

Using a 60-item disclosure index for all ten listed Saudi commercial banks over 2021–2025, we find that banks disclose on average 64% of index items and that qualitative disclosure exceeds quantitative disclosure. Disclosure is strongly correlated with all four performance measures, but after controlling for bank characteristics it is significantly associated only with net interest margin.

The study makes three contributions. First, it extends the bank risk-disclosure literature, which has focused on developed markets and on equity-market outcomes [15, 17], by providing recent evidence (2021–2025) from a concentrated, deposit-funded Gulf banking market after the full implementation of Basel III. Second, by examining four outcome measures within a single framework, it shows that the association between disclosure and performance is specific to net interest margin, which is consistent with a funding-cost channel rather than a broad profitability or valuation effect. This helps reconcile the mixed findings of prior studies, which typically examine only one outcome. Third, it highlights a feature of the Saudi setting that matters for interpreting Pillar 3 evidence: much of the information is mandatory and sits in reports that are only partly audited, so the incremental information content of disclosure is likely to be concentrated in funding markets rather than equity valuation. This offers practical implications for SAMA's supervision of Pillar 3 disclosure and for the debate on assurance of regulatory disclosures.

The remainder of the paper is organised as follows. Section 2 describes the institutional and regulatory background. Section 3 develops the theoretical framework, reviews prior evidence and develops the hypotheses. Section 4 describes the research design. Section 5 presents the results, Section 6 discusses them, and Section 7 concludes.

2 Institutional and Regulatory Background

2.1 Basel III and Pillar 3 Disclosure

Basel III, issued at the end of 2010 and revised several times since, rests on three pillars. Pillar 1 sets minimum capital requirements for credit, market and operational risk; it raised the required quantity and quality of capital, introduced capital conservation and countercyclical buffers based on Common Equity Tier 1, and added a 3% leverage ratio. Basel III also introduced two liquidity standards, the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR),

each with a 100% minimum. Pillar 2 requires banks to assess their own capital needs and supervisors to review those assessments. Pillar 3 sets minimum qualitative and quantitative disclosures on regulatory capital, capital adequacy, risk exposures and risk-management processes, so that market participants can assess a bank's capital adequacy and risk profile. Under the standardised approach, credit risk-weighted assets depend substantially on external credit ratings [25], which makes disclosure about exposures, collateral and credit quality central to users' ability to evaluate reported capital ratios.

2.2 Interaction with Accounting Standards

Capital and risk information also appears in IFRS financial statements. IAS 32 governs the classification of financial instruments as equity or liabilities; IFRS 9 (Financial Instruments) governs classification, measurement, expected-credit-loss impairment and hedge accounting; IFRS 7 (Financial Instruments: Disclosures) requires disclosure of the nature and extent of credit, liquidity and market risks; and IFRS 13 governs fair-value measurement. IFRS 7 disclosures need not be repeated in the Pillar 3 report, and the Basel framework allows cross-referencing. Banks therefore have discretion over where information is located, which is why we code all three reporting channels together. IFRS provide less guidance on operational and strategic risk than the Basel framework, so disclosure of these risks relies mainly on Pillar 3 and governance requirements.

2.3 The Saudi Setting

SAMA supervises Saudi banks and has implemented Basel III, including the revised Pillar 3 disclosure requirements, while the Capital Market Authority (CMA) sets disclosure and governance rules for listed companies. The CMA also required authorised persons to apply Pillar 3-consistent disclosure requirements under its prudential rules from 1 April 2016. All listed banks report under IFRS as endorsed in the Kingdom by the Saudi Organization for Chartered and Professional Accountants (SOCPA). The listed sector comprises 10 banks, four of which operate fully under Islamic finance principles.

3 Theoretical Framework, Prior Evidence and Hypothesis Development

3.1 Theoretical Framework

No single theory fully explains why banks disclose capital and risk information or how such disclosure affects their performance. Prior studies therefore draw on several complementary perspectives [21, 26]. We organise these perspectives around the question this study asks: through which mechanisms could more extensive capital adequacy and risk-management disclosure be associated with better bank performance? Four perspectives are particularly relevant: agency and information-asymmetry theory, signalling and voluntary-disclosure theory, legitimacy and stakeholder theory, and the theory of market discipline that underpins Basel III Pillar 3.

3.1.1 Agency and Information-Asymmetry Theory

Agency theory views the firm as a nexus of contracts between principals and agents whose interests diverge, so that principals incur monitoring costs to limit opportunistic behaviour by agents [27]. Disclosure is one of the main mechanisms for reducing these costs, because it allows outsiders to observe managers' decisions and the risks they take [8]. Agency problems are especially acute in banking. Banks are highly leveraged, their assets are opaque [1], and their creditors are numerous and dispersed, so that managers and shareholders can shift risk onto depositors and, through the safety net, onto taxpayers. Disclosure of capital adequacy and risk management narrows the information gap between bank insiders and these outside claimants [28, 29].

Information-asymmetry theory links this reduction in agency costs to performance. Diamond and Verrecchia [7] show that greater disclosure reduces information asymmetry among investors, increases the liquidity of a firm's securities and lowers its cost of capital. For banks, the relevant cost of capital includes not only the cost of equity but also the cost of deposits and wholesale funding. If disclosure reassures depositors and creditors that a bank is adequately capitalised and prudently managed, they should demand a lower risk premium, which reduces funding costs and widens the margin between lending and funding rates. Bischof et al. [14] provide evidence consistent with this mechanism, showing that enforced Pillar 3 disclosure produced lasting liquidity benefits for European banks.

3.1.2 Signalling and Voluntary-Disclosure Theory

Signalling theory, originally developed for labour markets [30], holds that high-quality agents can distinguish themselves from low-quality agents by sending signals that are costly or impossible for low-quality agents to imitate. Applied to disclosure, it predicts that well-capitalised banks with effective risk management have incentives to disclose more, because disclosure separates them from weaker banks and earns them better terms from investors and creditors [31]. Detailed quantitative disclosure about capital ratios, exposures and risk measures is a particularly credible signal, because it can be verified against subsequent outcomes and is costly to falsify. Voluntary-disclosure theory adds that firms disclose until the marginal benefit of disclosure equals its marginal cost, which includes the risk of revealing proprietary information to competitors [8, 10]. Signalling theory therefore predicts a positive association between disclosure and performance, but it also implies that part of this association may reflect the fact that better-performing banks choose to disclose more [32].

3.1.3 Legitimacy and Stakeholder Theory

Legitimacy theory views organisations as operating under a social contract, so that their survival depends on being perceived as acting in accordance with societal norms and expectations [33]. Banks are particularly exposed to legitimacy pressures, because they hold public deposits, benefit from public safety nets, and were widely blamed for the global financial crisis. Disclosure of capital adequacy and risk management allows banks to demonstrate compliance with regulatory and social expectations and to manage the perceptions of regulators and the public [34, 35]. Stakeholder theory similarly holds that banks disclose to satisfy the information needs of multiple stakeholders, including regulators, depositors, borrowers and rating agencies, and that disclosure increases with stakeholder pressure and visibility, which in turn increase with size [9, 36]. Resource-dependence theory adds that transparency eases access to critical resources such as funding and reduces their cost [37]. These perspectives predict that disclosure strengthens stakeholder confidence and access to resources, with benefits that should appear most directly in the bank's relationships with its funders.

3.1.4 Market Discipline under Basel III Pillar 3

The theory of market discipline provides the explicit rationale for Pillar 3. Market discipline operates when a bank's creditors and shareholders can observe its risk and respond by changing the price or quantity of funds they provide [6]. Three conditions must hold: market participants must have the information to assess bank risk, they must have incentives to act on it, and banks must respond to market signals. Pillar 3 addresses the first condition by mandating standardised disclosure of capital and risk. Nier and Baumann [6] show that market discipline is stronger when more of a bank's funding is uninsured and when its risk choices are more observable, and that banks subject to stronger discipline hold larger capital buffers. Harris and Raviv [5] show theoretically how disclosure requirements can induce banks to take less risk and reveal bad news. Market-discipline theory therefore predicts that disclosure affects banks primarily through the terms on which they obtain funding.

Market-discipline theory also identifies the limits of disclosure. Discipline is weakened where depositors are protected by explicit or implicit government guarantees, where ownership is concentrated or partly held by the state, and where enforcement is weak [13]. Disclosure can also be uninformative if it is largely boilerplate [9], strategically biased [11], or mandated in standardised form so that it does little to differentiate banks. Goldstein and Yang [12] show that disclosure can even impair market efficiency when it crowds out the production of private information. These countervailing arguments imply that the association between disclosure and performance is an empirical question whose answer may depend on the outcome examined and on the institutional setting.

3.1.5 An Integrated View

Taken together, these theories suggest that capital adequacy and risk-management disclosure can be associated with performance through two broad channels. The first is a funding channel: by reducing information asymmetry, signalling soundness and supporting legitimacy with depositors and creditors, disclosure lowers the cost of funds, which should be reflected most directly in net interest margin. The second is a valuation channel: by reducing information asymmetry with equity investors, disclosure lowers the cost of equity and raises market value, which should be reflected in Tobin's Q. Both channels should ultimately affect accounting profitability (ROA and ROE). However, the strength of each channel depends on institutional conditions. In a deposit-funded banking system with concentrated and partly state ownership, such as Saudi Arabia, the funding channel is likely to be more important than the valuation channel.

3.2 Prior Evidence

3.2.1 Determinants of Bank Risk Disclosure

A first stream of research examines why banks disclose risk information. Linsley and Shrives [9] find that risk disclosure by UK companies increases with firm size and is dominated by general statements of risk-management policy rather than quantified information, which leaves a 'risk information gap' between firms and their stakeholders. In banking, Oliveira et al. [34] show that voluntary risk reporting by Portuguese banks is driven by legitimacy and reputation concerns. Nahar et al. [38] find that IFRS 7 and Basel II improved the disclosure of market, credit, liquidity and operational risk by Bangladeshi banks, and that disclosure is related to risk committees, leverage, size, board size and auditor size. Charitou [32] finds that more profitable US financial institutions disclose more capital-adequacy information, which highlights the possibility that performance drives disclosure rather than the reverse. In the Saudi context, Habbash et al. [28] show that voluntary disclosure by listed firms is related to firm characteristics and ownership structure. Overall, this stream shows that larger, more visible and better-governed banks disclose more, which implies that studies of the consequences of disclosure must control for these characteristics.

3.2.2 Consequences of Bank Risk Disclosure

A second stream examines whether risk disclosure affects market outcomes. Evidence from equity markets is generally, but not uniformly, positive. Jizi and Dixon [15] find that US banks with more informative risk-management disclosure have higher share prices. Giner et al. [17] construct risk-disclosure indices from IFRS 7 and Pillar 3 requirements for banks listed in five European markets over 2007–2014 and find a positive association between bank value and several categories of risk disclosure, beyond traditional risk measures. Dignah et al. [39] find that risk disclosure moderates the relationship between fair value accounting and the cost of equity capital. Evidence from debt markets is also positive: Elamer et al. [16] show that bank risk disclosure is informative for credit ratings, with the relationship depending on governance quality. Nier and Baumann [6] find that greater disclosure is associated with stronger market discipline and larger capital buffers.

Other studies, however, report weaker or adverse consequences. Alzead [18] reports a negative association between risk disclosure and firm value in Saudi Arabia, and Kamaruzaman et al. [19] report a similar finding for Malaysia, possibly because firms in these markets do not describe risk information clearly. Zelenyuk et al. [20] find that US banks more compliant with mandatory capital-adequacy disclosure reduce lending and liquidity provision, which suggests that disclosure may constrain bank intermediation. Begley et al. [11] show that banks under-report risk when they are close to capital constraints, which casts doubt on the informativeness of self-reported risk measures. The mixed evidence is consistent with the conclusion of Elshandidy et al. [21] that the informativeness of risk reporting depends on whether it is mandatory or voluntary, how it is measured and the institutional setting.

3.2.3 Pillar 3 Regulation, Compliance and Enforcement

A third, more recent stream examines the regulation of bank risk disclosure itself. Polizzi and Scannella [24] find that the largest Italian banks do not fully exploit management commentary or the Pillar 3 report for market-risk disclosure, and that the location of information affects its relevance and understandability. Bischof et al. [14] exploit the overlap between IFRS 7 and Basel II Pillar 3 in Europe and show that banks expanded their risk disclosures after Pillar 3 took effect, that compliance was stronger where the central bank supervises banks and where regulators have more resources, and that lasting liquidity benefits appeared only once banking regulators enforced the rules. Leuz and Wysocki [13] conclude more generally that the effects of disclosure regulation depend on enforcement and complementary institutions. This stream implies that the consequences of Pillar 3 disclosure cannot be assumed to transfer from developed to emerging markets.

3.2.4 Evidence from the Gulf and the Research Gap

Evidence from Gulf banking markets is limited and dated. Elbadry [40] studies 12 Saudi banks over 2012–2014 and links capital adequacy to credit and operational risk. Ellili and Nobanee [31] compare risk disclosure by Islamic and conventional banks, and Al-Hanandeh et al. [41] find that capital adequacy mediates the relationship between IFRS 9 expected credit losses and profitability in Middle Eastern banks. Alzead [18] examines risk disclosure in Saudi Arabia but across listed firms generally and before the full implementation of Basel III.

Three gaps emerge from this review. First, no study examines the association between capital adequacy and risk-management disclosure and bank performance in Saudi Arabia after the full implementation of Basel III and the post-2020 consolidation of the sector. Second, most prior studies measure disclosure in a single report, typically the annual report, although Pillar 3 information is distributed across the financial-statement notes, management commentary and the Pillar 3 report [24]. Third, most studies examine a single outcome, usually market value, so they cannot distinguish between the funding and valuation channels through which disclosure may operate. This study addresses these gaps by coding disclosure across all three reporting channels and relating it to accounting, margin and market-based measures of performance within a single framework.

3.3 Hypothesis Development

Building on the integrated framework in Section 3.1.5, we develop a hypothesis for each performance measure.

Return on assets. Agency and information-asymmetry theory predict that disclosure reduces monitoring costs and the cost of capital, while signalling theory predicts that banks with better risk management disclose more and perform better [8,31]. Lower funding costs and better risk management should translate into higher returns on the bank's asset base. ROA captures the overall efficiency with which a bank uses its assets, independent of its capital structure, and is therefore the broadest accounting measure of the benefits of disclosure. We therefore propose:

H1a: Capital adequacy and related risk-management disclosure is positively associated with return on assets.

Return on equity. ROE measures the return to shareholders, the principals at the centre of agency theory [27]. If disclosure reduces agency costs and the cost of equity, and if the resulting gains accrue to shareholders, banks with more extensive disclosure should earn higher returns on equity. Unlike ROA, ROE also reflects leverage, which is central to banks' capital adequacy, so disclosure of capital strength may be particularly relevant to shareholders' assessment of risk-adjusted returns. We therefore propose:

H1b: CARMD is positively associated with return on equity.

Net interest margin. The funding channel implies that disclosure should be associated most directly with the spread between what a bank earns on its assets and what it pays for its funds. Market-discipline theory predicts that depositors and creditors who can observe a bank's capital and risk will demand a lower premium from banks that disclose more [5,6], and legitimacy and resource-dependence theories predict that transparency strengthens funders' confidence and lowers the cost of funds [37]. Because Saudi banks rely predominantly on customer deposits, this channel should be especially relevant in our setting. A lower cost of funds, holding asset yields constant, widens net interest margin. We therefore propose:

H1c: CARMD is positively associated with net interest margin.

Market valuation. The valuation channel implies that disclosure should be reflected in market value. By reducing information asymmetry among investors, disclosure increases liquidity and lowers the cost of equity [7], and prior studies find that bank risk disclosure is value relevant [15, 17]. Tobin's Q captures the market's assessment of the bank's value relative to the book value of its assets and therefore incorporates investors' expectations of the future benefits of disclosure. We therefore propose:

H1d: CARMD is positively associated with market valuation (Tobin's Q).

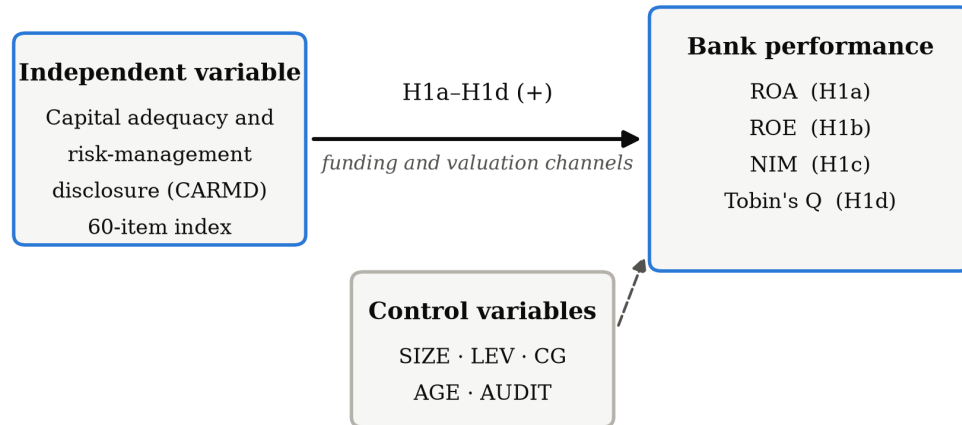
The countervailing arguments reviewed in Section 3.1.4, including proprietary costs, the standardised and largely mandatory nature of Pillar 3 disclosure, and the weakening of market discipline by concentrated and state ownership, imply that some or all these associations may be weak or absent in practice. Testing the four hypotheses together allows us to assess which channels, if any, operate in the Saudi banking market. Figure 1 summarises the research framework.

The framework links capital adequacy and risk-management disclosure (CARMD) to four performance measures through funding and valuation channels (H1a–H1d), controlling for bank size, leverage, governance quality, listing age and audit quality.

4 Research Design

4.1 Sample and Data

The sample comprises all 10 commercial banks listed on the Saudi Exchange over 2021–2025, giving a balanced panel of 50 bank-year observations. Financial, market and governance data were hand-collected from annual reports, Pillar 3 reports, bank websites and Saudi Exchange disclosures.

**Fig. 1:** Research framework

4.2 Measuring Disclosure (CARMD)

CARMD is an unweighted disclosure index of 60 items (Appendix A), adapted from Basel III Pillar 3 requirements and IFRS 7, covering capital structure, capital adequacy, risk management, securitisation, credit, market, liquidity and operational risk. For bank i in year t , the index is

$$\text{CARMD}_{it} = \frac{\sum_{j=1}^{60} X_{ijt}}{60} \quad (1)$$

where X_{ijt} equals 1 if item j is disclosed in any of the three reporting channels and 0 otherwise. The index contains 35 qualitative (QL) and 25 quantitative (QN) items.

4.3 Performance Measures and Controls

We use four performance measures. ROA is net income divided by total assets. ROE is net income divided by shareholders' equity. NIM is net interest income (net financing income for Islamic banks) divided by average interest-earning (financing) assets. Tobin's Q is the market value of equity plus the book value of total liabilities, divided by the book value of total assets, with the market value measured on the first trading day after the auditor's report date.

Controls follow prior banking-disclosure studies: bank size (SIZE, natural logarithm of total assets), leverage (LEV, total liabilities divided by total assets), governance quality (CG, a composite index from 0 to 6), listing age (AGE, natural logarithm of years since listing) and audit quality (AUDIT, 1 if the bank's auditor is a Big Four network firm, 0 otherwise).

4.4 Empirical Model

For each performance measure $\text{PERF} \in \{\text{ROA}, \text{ROE}, \text{NIM}, \text{TQ}\}$, we estimate:

$$\text{PERF}_{it} = \beta_0 + \beta_1 \text{CARMD}_{it} + \sum \beta_k \text{Controls}_{it} + \varepsilon_{it} \quad (2)$$

where i indexes banks, t indexes years and ε_{it} is the error term. The models are estimated by pooled ordinary least squares (OLS) over the 50 bank-year observations.

Endogeneity: more profitable and better-governed banks may disclose more [32], so the estimates should be interpreted as associations rather than causal effects.

Table 1: Variable definitions

Variable	Symbol	Definition	Source
Capital adequacy and risk-management disclosure	CARMD	Disclosed items / 60 (Appendix A)	Annual report, Pillar 3 report
Return on assets	ROA	Net income / total assets	Annual report
Return on equity	ROE	Net income / shareholders' equity	Annual report
Net interest margin	NIM	Net interest (financing) income / average earning assets	Annual report
Tobin's Q	TQ	(Market value of equity + total liabilities) / total assets	Saudi Exchange, annual report
Bank size	SIZE	Ln (total assets)	Annual report
Leverage	LEV	Total liabilities / total assets	Annual report
Governance quality	CG	Composite governance index, 0–6	Annual report
Listing age	AGE	Ln (years since listing)	Saudi Exchange
Audit quality	AUDIT	1 if Big Four auditor, 0 otherwise	Annual report

5 Results

5.1 Descriptive Statistics

Table 2 summarizes the variables. The disclosure index (CARMD) has a mean of 0.638 and a median of 0.650, so the average bank-year discloses about 38 of the 60 index items. Disclosure ranges from 0.450 (27 items) to 0.790 (47 items); no bank discloses the full index in any year. The standard deviation of 0.112 corresponds to a coefficient of variation of about 18%, which indicates moderate but meaningful cross-sectional and temporal variation for testing the hypotheses. The fact that even the best-disclosing bank omits about one-fifth of the items shows that, despite the Basel III and SAMA requirements, there remains room to improve capital adequacy and risk-management disclosure in the Saudi market.

Among the performance measures, ROA has a mean of 0.367 and a median of 0.378, with a relatively narrow spread ($SD = 0.108$). NIM averages 0.118 ($SD = 0.057$) and Tobin's Q averages 2.384 ($SD = 1.652$, median 2.350), so mean market valuation exceeds one. ROE is the most dispersed measure: its standard deviation (1.187) is almost three times its mean (0.412), and its maximum (5.350) lies far above the median (0.314). Consistent with this, the pre-estimation diagnostics show that raw ROE is strongly right-skewed (skewness 2.770; kurtosis 6.860). ROE was therefore log-transformed before estimation, which reduced skewness to 1.454 and kurtosis to 1.844; Table 2 reports ROE before transformation.

Turning to the controls, the governance index averages 4.381 out of a maximum of 6 (about 73% of the governance attributes), ranging from 3 to 6, which indicates generally sound but uneven governance practices across banks. AUDIT has a mean of 0.429, so roughly 43% of bank-year observations are audited by a Big Four network firm. SIZE averages 13.142 and LEV averages 0.418, while AGE averages 46.254.

Table 2: Descriptive statistics

Variable	N	Mean	SD	Median	Min	Max
CARMD	50	0.638	0.112	0.650	0.450	0.790
ROA	50	0.367	0.108	0.378	0.214	0.651
ROE	50	0.412	1.187	0.314	0.125	5.350
NIM	50	0.118	0.057	0.124	0.041	0.196
TQ	50	2.384	1.652	2.350	0.274	5.770
SIZE	50	13.142	1.847	13.450	8.510	15.750
LEV	50	0.418	0.987	0.423	0.854	1.950
CG	50	4.381	1.124	4.000	3.000	6.000
AGE	50	46.254	14.328	44.000	20.000	72.000
AUDIT	50	0.429	0.496	0.000	0.000	1.000

5.2 Correlations

Table 3 reports Pearson correlations. CARMD is positively and significantly correlated ($p < 0.01$) with all four performance measures: ROA (0.670), ROE (0.682), NIM (0.782) and Tobin's Q (0.763). The association is strongest for NIM, where disclosure alone accounts for about 61% of the shared variation ($r^2 = 0.782^2 \approx 0.61$), compared with about 45% for ROA. At the bivariate level, therefore, banks that disclose more capital adequacy and risk-management

information are also more profitable, earn wider margins and are valued more highly, which is consistent in direction with H1a–H1d.

CARMD is also positively correlated with SIZE (0.685), CG (0.696) and AUDIT (0.664), and negatively correlated with LEV (−0.764). Larger, better-governed banks audited by Big Four firms thus disclose more, which is consistent with stakeholder and agency arguments that such banks face greater monitoring and visibility [28, 36]. The negative correlation with leverage suggests that more highly leveraged banks disclose less, possibly because disclosing capital and risk information is less attractive when capital buffers are thinner. AGE is not significantly correlated with CARMD (0.186) or with any performance measure, which indicates that listing age plays little role in either disclosure or performance.

Because CARMD shares much of its variation with the controls, the bivariate correlations cannot be read as independent effects of disclosure. Several correlations among the regressors are also high: CG and LEV (−0.825), SIZE and LEV (−0.785), SIZE and CG (0.765) and SIZE and AUDIT (0.764). The first of these exceeds the 0.80 rule of thumb commonly used to flag multicollinearity, and the others approach it. High collinearity inflates standard errors and makes it harder to isolate the separate contribution of each regressor, which is relevant when interpreting the multivariate results below.

Table 3: Pearson correlation matrix

	CARMD	ROA	ROE	NIM	TQ	SIZE	LEV	CG	AGE	AUDIT
CARMD	1.000									
ROA	0.670***	1.000								
ROE	0.682***	0.453***	1.000							
NIM	0.782***	0.835***	0.298**	1.000						
TQ	0.763***	0.821***	0.292**	0.896***	1.000					
SIZE	0.685***	0.797***	0.273*	0.848***	0.840***	1.000				
LEV	−0.764***	−0.743***	−0.212	−0.843***	−0.860***	−0.785***	1.000			
CG	0.696***	0.753***	0.299**	0.848***	0.903***	0.765***	−0.825***	1.000		
AGE	0.186	0.111	0.040	0.137	0.176	0.404***	−0.005	0.059	1.000	
AUDIT	0.664***	0.779***	0.374***	0.830***	0.858***	0.764***	−0.728***	0.732***	0.197	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Lower triangle of the correlation matrix in Table 3. Blue cells indicate positive and red cells negative correlations; colour intensity reflects strength. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

5.3 Regression Results

Table 4 reports the four regressions, with two-sided p -values based on 43 residual degrees of freedom. All four models are jointly significant at the 1% level ($F = 21.45, 4.42, 51.86$ and 84.77 , each with 6 and 43 degrees of freedom), so the regressors jointly explain a significant share of the variation in each performance measure. Explanatory power is high for Tobin's Q ($R^2 = 0.922$; adjusted $R^2 = 0.911$), NIM ($R^2 = 0.879$; adjusted $R^2 = 0.862$) and ROA ($R^2 = 0.750$; adjusted $R^2 = 0.715$), and lower for ROE ($R^2 = 0.382$; adjusted $R^2 = 0.295$), which is consistent with the greater dispersion of ROE noted above. The small gap between R^2 and adjusted R^2 in models (1), (3) and (4) indicates that the explanatory power is not driven by the number of regressors.

R^2 and adjusted R^2 for the four models in Table 4, with the F -statistic of each model (6 and 43 degrees of freedom). *** $p < 0.01$.

Model (1): ROA. The CARMD coefficient is positive ($B = 0.141$; standardised $\beta = 0.125$) but not statistically significant ($t = 0.990$; $p = 0.328$), so H1a is not supported. In economic terms, a one-standard-deviation increase in CARMD (0.112) is associated with an increase in ROA of about 0.016, roughly 4% of the sample mean, and this estimate cannot be distinguished from zero. ROA is instead explained mainly by bank size ($B = 0.033$; $\beta = 0.550$; $p = 0.004$), which has the largest standardised coefficient in the model, and by audit quality ($B = 0.067$; $\beta = 0.303$; $p = 0.024$). Listing age is positive and marginally significant ($p = 0.060$), while leverage ($p = 0.573$) and governance ($p = 0.425$) are not significant. The comparison with Table 3 is informative: the bivariate correlation between CARMD and ROA (0.670) shrinks to a standardised coefficient of 0.125 once size and audit quality are controlled for, which indicates that much of the raw association reflects the fact that larger banks both disclose more and earn higher returns. The Durbin–Watson statistic of 0.93 also points to positive serial correlation in the residuals, which tends to understate standard errors, so the ROA results should be interpreted with caution.

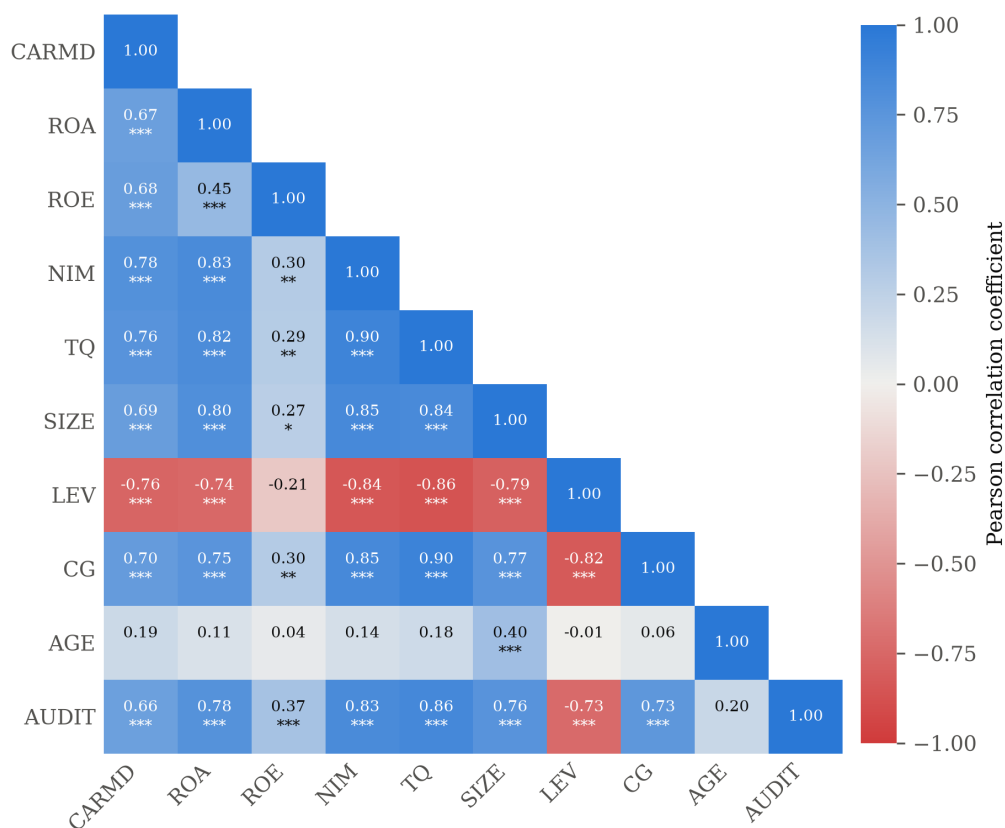


Fig. 2: Heat map of Pearson correlations

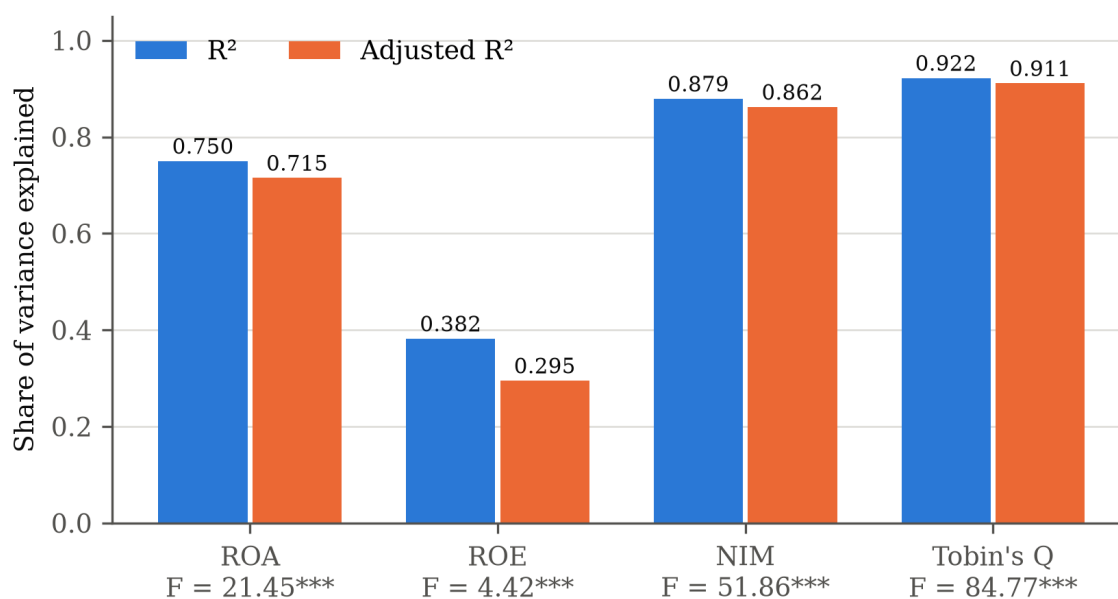


Fig. 3: Explanatory power of the regression models

Table 4: CARMD and bank performance: pooled OLS

	(1) ROA	(2) ROE	(3) NIM	(4) Tobin's Q
Constant	0.181 (0.187) [$p = 0.337$]	2.413 (2.436) [$p = 0.328$]	0.156** (0.070) [$p = 0.032$]	2.277 (1.514) [$p = 0.140$]
CARMD	0.141 (0.143) [$p = 0.328$]	2.548 (1.859) [$p = 0.177$]	0.126** (0.054) [$p = 0.024$]	1.197 (1.155) [$p = 0.306$]
SIZE	0.033*** (0.011) [$p = 0.004$]	0.152 (0.143) [$p = 0.292$]	0.012*** (0.004) [$p = 0.007$]	0.074 (0.089) [$p = 0.407$]
LEV	-0.012 (0.021) [$p = 0.573$]	-0.068 (0.279) [$p = 0.808$]	-0.003 (0.008) [$p = 0.736$]	-0.282 (0.173) [$p = 0.112$]
CG	0.014 (0.017) [$p = 0.425$]	0.211 (0.221) [$p = 0.343$]	0.013** (0.006) [$p = 0.041$]	0.697*** (0.137) [$p < 0.001$]
AGE	0.002* (0.001) [$p = 0.060$]	0.006 (0.011) [$p = 0.587$]	0.015 (0.007) [$p = 0.141$]	0.005 (0.007) [$p = 0.472$]
AUDIT	0.067** (0.029) [$p = 0.024$]	0.758* (0.375) [$p = 0.050$]	0.030*** (0.011) [$p = 0.009$]	0.984*** (0.233) [$p < 0.001$]
R^2	0.750	0.382	0.879	0.922
Adjusted R^2	0.715	0.295	0.862	0.911
F	21.45***	4.42***	51.86***	84.77***
Durbin-Watson	0.93	1.13	1.88	1.94
N	50	50	50	50

Unstandardised coefficients; standard errors in parentheses; two-sided p -values in brackets.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Model (2): ROE. The CARMD coefficient is positive ($B = 2.548$; $\beta = 0.272$) and is the largest standardised disclosure coefficient across the four models, but it is not statistically significant ($t = 1.371$; $p = 0.177$), so H1b is not supported. Audit quality is the only regressor at the conventional significance threshold ($B = 0.758$; $\beta = 0.411$; $p = 0.050$), while size ($p = 0.292$), leverage ($p = 0.808$), governance ($p = 0.343$) and age ($p = 0.587$) are not significant. The model explains about 38% of the variation in ROE, and the Durbin-Watson statistic (1.13) again suggests some positive autocorrelation. The large but imprecisely estimated disclosure coefficient is consistent with the high dispersion of ROE and the limited sample size, which reduce the power of the test.

Model (3): NIM. CARMD is positively and significantly associated with NIM ($B = 0.126$; $\beta = 0.205$; $t = 2.337$; $p = 0.024$), supporting H1c. A one-standard-deviation increase in disclosure is associated with an increase in NIM of about 0.014, or roughly 12% of the sample mean, which is economically meaningful. Equivalently, disclosing six additional index items (an increase of 0.10 in CARMD) is associated with a NIM higher by about 0.013. NIM is also positively associated with bank size ($B = 0.012$; $\beta = 0.359$; $p = 0.007$), audit quality ($B = 0.030$; $\beta = 0.248$; $p = 0.009$) and governance ($B = 0.013$; $\beta = 0.220$; $p = 0.041$), while leverage ($p = 0.736$) and age ($p = 0.141$) are not significant. In terms of standardised coefficients, disclosure ranks close to governance and audit quality and behind size, so it makes an independent contribution of similar importance to other bank attributes. The model explains 88% of the variation in NIM, and the Durbin-Watson statistic of 1.88 is close to 2, indicating no serious autocorrelation.

Model (4): Tobin's Q. The CARMD coefficient is positive ($B = 1.197$) but small in standardised terms ($\beta = 0.073$) and not statistically significant ($t = 1.036$; $p = 0.306$), so H1d is not supported. Market valuation is driven mainly by governance quality ($B = 0.697$; $\beta = 0.425$; $p < 0.001$) and audit quality ($B = 0.984$; $\beta = 0.305$; $p < 0.001$), which have the largest standardised coefficients in the model. Leverage is negative but not significant ($B = -0.282$; $p = 0.112$), and size ($p = 0.407$) and age ($p = 0.472$) are not significant. The Durbin-Watson statistic of 1.94 indicates no autocorrelation concern. The contrast between the strong bivariate correlation of CARMD with Tobin's Q (0.763) and its small multivariate coefficient suggests that investors value the governance and audit attributes that accompany disclosure, rather than the disclosure itself.

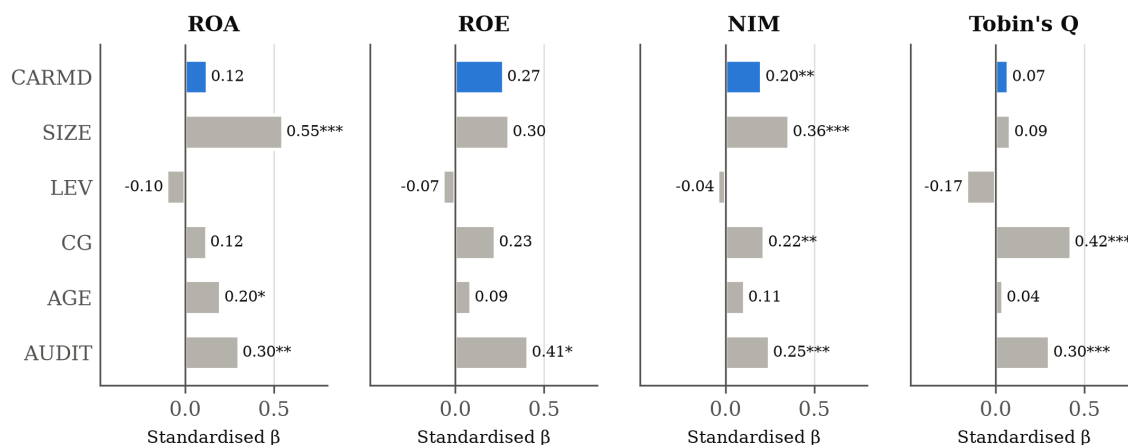


Fig. 4: Standardised regression coefficients by model

Standardised coefficients (β) from the estimation of the four models in Table 4; CARMD is highlighted. Significance is based on the two-sided p -values in Table 4: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

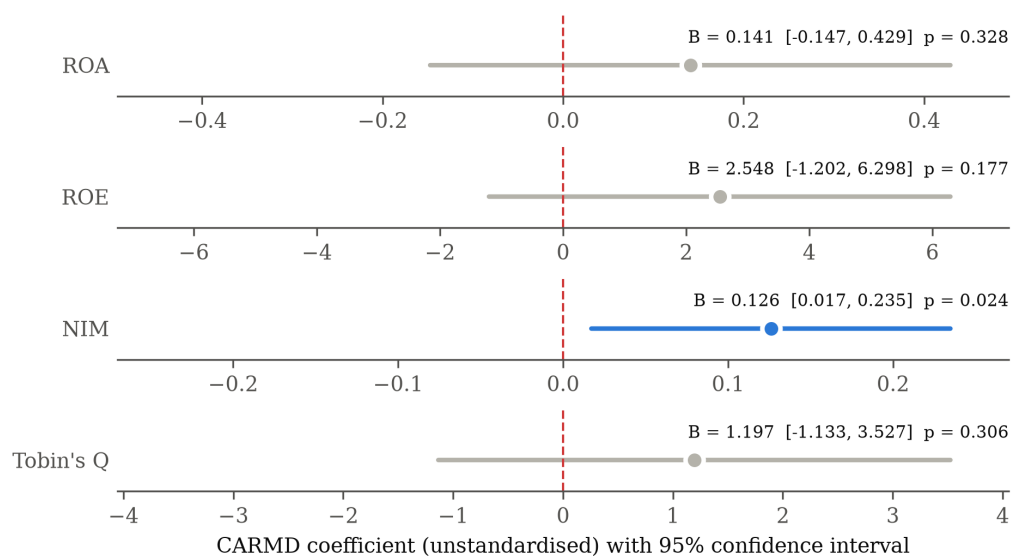


Fig. 5: CARMD coefficients with 95% confidence intervals

Unstandardised CARMD coefficients from Table 4 with 95% confidence intervals ($B \pm 2.017 \times SE$, 43 degrees of freedom). The dashed line marks zero. Each panel has its own scale because the dependent variables are measured in different units.

Figure 4 compares the standardised coefficients across the four models. Taken together, the control variables behave consistently across models. Size is positive in all four models and significant for ROA and NIM, which is consistent with economies of scale and with the greater market power of large banks. Audit quality is positive and significant or marginally significant in every model, which suggests that the credibility provided by a Big Four auditor is associated with both accounting and market performance. Governance is significant for NIM and Tobin's Q, and leverage is negative in all four models but never significant, which may reflect its high collinearity with governance and size noted in Section 5.2.

Overall, the multivariate evidence supports H1c but not H1a, H1b or H1d (Table 5). Figure 5 shows this pattern directly: the 95% confidence interval of the CARMD coefficient excludes zero only in the NIM model (0.017 to 0.235), while the intervals for ROA, ROE and Tobin's Q all include zero. The NIM finding is consistent with Jizi and Dixon (2017) and Elamer et al. (2020), who show that bank risk disclosure is informative to capital and debt markets, and it points to a funding-cost channel through which disclosure benefits banks. The absence of significant associations with ROA, ROE and Tobin's Q after controls is in line with studies reporting insignificant or negative consequences of risk disclosure (Alzead, 2017; Kamaruzaman et al., 2019; Zelenyuk et al., 2019), and contrasts with the positive share-price association reported by Jizi and Dixon (2017) for US banks.

Table 5: Summary of hypothesis tests

Hypothesis	Outcome	CARMD coefficient	p-value	Result
H1a	ROA	0.141	0.328	Not supported
H1b	ROE	2.548	0.177	Not supported
H1c	NIM	0.126	0.024	Supported
H1d	Tobin's Q	1.197	0.306	Not supported

6 Discussion

The results indicate that disclosure in Saudi banks is associated with interest margins but not, after controls, with overall profitability or market valuation. The NIM result is consistent with the funding-cost argument of agency and resource-dependence theories: banks that disclose more about their capital strength and risk management may reassure depositors and wholesale funders and so raise funds more cheaply, widening their margins. This interpretation is consistent with Jizi and Dixon [15] and Elamer et al. [16], who show that risk disclosure is informative to capital and debt markets.

The absence of a significant association with ROA, ROE and Tobin's Q has several possible explanations. First, much of the index reflects mandatory disclosure under IFRS 7 and SAMA's Pillar 3 rules, which may carry limited incremental information for investors. Second, in a concentrated market dominated by a few large, partly state-owned banks, size and governance may dominate investors' assessment of bank value, leaving little independent role for disclosure. Third, with 50 observations and highly correlated regressors, the tests have limited power, so the insignificant coefficients should not be read as evidence of no effect. These findings are in line with studies reporting mixed or insignificant consequences of risk disclosure [18, 20].

7 Conclusion

This study examines capital adequacy and related risk-management disclosure by the 10 commercial banks listed on the Saudi Exchange over 2021–2025, and its association with bank performance. Banks disclose on average 64% of a 60-item index, with qualitative information on objectives, policies, measurement methods and governance disclosed more extensively than quantitative and historical risk information. Disclosure is strongly correlated with all four performance measures, but after controlling for bank characteristics it is significantly associated only with net interest margin.

For banks, the results suggest that the benefits of more transparent capital and risk disclosure may appear mainly in funding costs, which supports improving quantitative disclosure. For SAMA, the gap between qualitative and quantitative disclosure suggests a role for guidance on the content of Pillar 3 quantitative disclosures and for monitoring compliance. Because parts of the Pillar 3 report are unaudited, regulators could also consider whether external assurance would increase its credibility.

The study has limitations. The sample is small (10 banks, 50 observations), which limits statistical power and generalisability. The disclosure index measures the presence of items, not their quality or specificity. The models are estimated by pooled OLS on a short panel, and the design identifies associations, not causal effects; reverse causality cannot be ruled out. Future research could extend the analysis to a multi-country Gulf or MENA panel, use quality-weighted or textual measures of disclosure, examine market-based outcomes such as the cost of equity, bid–ask spreads and bond or deposit spreads, compare Islamic and conventional banks, and exploit changes in Pillar 3 requirements to strengthen identification.

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Data Availability Statement: The data were hand-collected from publicly available annual reports and Pillar 3 reports. The coded disclosure index and the variables used in the analysis are available from the corresponding author on reasonable request.

Conflict of Interest: The authors declare no conflicts of interest.

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A Capital Adequacy and Related Risk-Management Disclosure Index

Table 6: Disclosure index items

No.	Category	Disclosure item	Type
1	Capital structure	Key features of issued capital instruments	QL
2	Capital structure	Terms and conditions of the bank's capital instruments	QL
3	Capital structure	New capital instruments issued during the period	QL
4	Capital structure	Material changes in capital instruments	QL
5	Capital structure	Amount and composition of Common Equity Tier 1 capital	QN
6	Capital structure	Total amount of Tier 2 capital	QN
7	Capital structure	Other deductions from regulatory capital	QN
8	Capital adequacy	Policy for assessing capital adequacy in support of current and future activities	QL
9	Capital adequacy	Capital requirements for credit, market, and operational risk	QN
10	Capital adequacy	Total capital, Tier 1 capital, and common-equity ratios	QN
11	Risk management	General definition of risk and explanation of how the bank assumes risk	QL
12	Risk management	Risk-governance structure	QL
13	Risk management	Scope and key features of risk-measurement systems	QL

14	Risk management	Process for reporting risk information to the board and senior management	QL
15	Risk management	Qualitative information about stress testing	QL
16	Risk management	Strategies and processes for managing and hedging risks arising from business model	QL
17	Securitization	Objectives and policies for managing securitization risk	QL
18	Securitization	Objectives relating to securitization and resecuritization activity	QL
19	Credit risk	Description and sources of credit risk	QL
20	Credit risk	Risk-management objectives, policies, processes, and measurement methods	QL
21	Credit risk	Changes in credit-risk exposure during the preceding period	QL
22	Credit risk	Credit quality of financial assets	QN
23	Credit risk	Amount that best represents maximum credit-risk exposure at the reporting date	QN
24	Credit risk	Policies and processes for valuing and managing collateral	QL
25	Credit risk	Ageing analysis of past-due financial assets	QN
26	Credit risk	Analysis of financial assets impaired at the reporting date	QN
27	Credit risk	Nature and carrying amount of relevant assets	QN
28	Credit risk	Policies for disposing of acquired assets or using them in bank operations	QN
29	Credit risk	Methods used to establish specific provisions	QL
30	Credit risk	Methods used to test loans for impairment	QL
31	Credit risk	Description of restructured debt	QL
32	Credit risk	Policies and mechanisms for netting on- and off-balance-sheet items	QL
33	Credit risk	Geographic distribution of credit-risk exposures	QN
34	Credit risk	Eligible financial collateral by credit-risk portfolio	QN
35	Credit risk	Total exposures covered by guarantees	QN
36	Credit risk	Credit-derivative transactions that create credit exposure	QN
37	Market risk	Description and sources of market risk	QL
38	Market risk	Risk-management objectives, policies, processes, and measurement methods	QL
39	Market risk	Changes in market-risk exposure during the preceding period	QL
40	Market risk	Sensitivity analysis for each material market-risk category at the reporting date	QN
41	Market risk	Methods and assumptions used in sensitivity analysis	QN
42	Market risk	Explanation of the method used to prepare sensitivity analysis	QN
43	Market risk	Explanation when disclosed information does not fully reflect fair value	QN
44	Market risk	Whether sensitivity analyses are unrepresentative of inherent risk and why	QN
45	Liquidity risk	Description and sources of liquidity-risk exposure	QL
46	Liquidity risk	Risk-management objectives, policies, processes, and measurement methods	QL
47	Liquidity risk	Changes in liquidity-risk exposure during the preceding period	QL
48	Liquidity risk	Maturity analysis of derivative financial liabilities	QN
49	Liquidity risk	How inherent liquidity risk is managed	QN
50	Liquidity risk	Liquidity-risk governance	QL
51	Liquidity risk	Funding strategies	QL
52	Liquidity risk	Methods used to mitigate liquidity risk	QL
53	Liquidity risk	Sources of funding	QN
54	Liquidity risk	On- and off-balance-sheet items by maturity and resulting liquidity gaps	QN
55	Operational risk	Operational-risk management policies and principles	QL
56	Operational risk	Structure and organization of operational-risk management and control	QL
57	Operational risk	Scope and framework for reporting operational risk to board and audit committee	QL
58	Operational risk	Human-resource risks	QL
59	Operational risk	Deficiencies in the internal-control structure	QL
60	Operational risk	Operational losses incurred	QN

QL = qualitative; QN = quantitative.