

Government Securities and Bank Balance Sheets

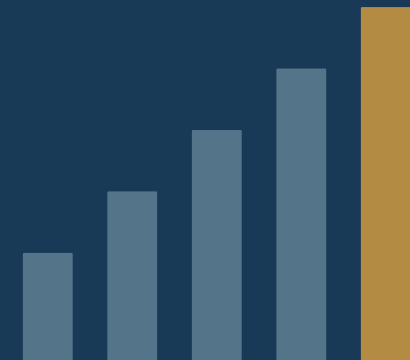
Ghana's Sovereign–Bank Link

Sovereign exposure. Capital. Asset quality. Private investment.

Primary-source evidence, balance-sheet accounting and explicit stress tests

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RESEARCH BRIEFING | PUBLICATION EDITION | SEPTEMBER 2026



EVIDENCE CUT-OFF
20 SEPTEMBER 2026

Banking / securities: end-2025
Historical context: 2020–2025

Read sovereign exposure, bank resilience and investment finance together

Three linked analytical pillars; public observations and conditional stress models are kept separate.

01 SOVEREIGN EXPOSURE

Issuer-specific government holdings, the investor base, post-DDEP valuations and the difference between a debt-holder share and a bank-asset share.

02 CAPITAL & ASSET QUALITY

Capital and Tier 1 ratios, NPLs, provisioning, earnings, liquidity and the assumptions behind published bank stress tests.

03 PRIVATE INVESTMENT

Capital headroom, new-lending capacity, cash-flow constraints, enterprise access, causal research design and an auditable reporting programme.

Exposure | pp. 9–17 • Capital, quality and liquidity | pp. 18–28 • Financing and stress | pp. 29–46

[Causal design 47–57](#) | [Empirical extension 58–73](#) | [Technical annex 74–84](#) | [References 85–88](#) | [Synthesis 89](#)

Question, evidence, method, findings and decision use

Dated Ghanaian evidence • exact accounting • conditional stress tests • explicit causal boundaries

QUESTION	How do government-security exposures, capital and asset quality interact with banks' capacity to finance private investment?	SCOPE & INTERPRETATION Cut-off: 20 September 2026 Main endpoints: December 2025 Stress results are conditional, not forecasts or bank valuations. Colombian estimates are not Ghanaian effects. Data and code: companion ZIP.
EVIDENCE	Ghana: six December and eight quarterly soundness observations, 2020–2025; debt holdings for 2024–2025 and 12 DDEP securities.	
METHOD	Source-reconciled ratio and stock–share accounting; conditional capital, leverage and liquidity tests; external causal evidence.	
FINDINGS	In 2025, bank GoG holdings rose 8.6%; CAR rose 3.51 pp with reliefs. Core/broad liquidity fell from 54.1% to 42.4%.	
DECISION USE	Assess bank-level capital and cash constraints together; link new lending to all-lender firm finance and actual capital expenditure.	

Authored by Dr. Felix Larry Essilfie | Independent IDER research | No external certification claimed

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Sources: FSC Ghana, FSR 2025; MoF, 2025 debt report; Önder et al. (2024); IDER calculations. [S01](#), [S02](#), [S09](#).

Government holdings, capital ratios and liquidity tell different stories

End-2025 observations; one separately labelled published stress comparison.

BANKS' GOG HOLDINGS	REPORTED CAR	GROSS NPL RATIO	PUBLISHED STRESS
83.83 bn	17.51%	18.92%	21 / 11
GHS; marketable domestic debt	FSR series: with reliefs	NPLs / gross loans	Banks surviving 4% daily runoff

The last comparison changes the assumed liquidity of government bonds—not their issuer. A security can support cash access in one state and transmit valuation or funding pressure in another.

Stress counts: 23 banks; 30-day test; 0% versus 100% of GoG bonds assumed illiquid. Not default probabilities.

Each conclusion requires its own evidence and denominator

The report separates descriptive measurement, exact identities and counterfactual questions.

Table 1. Research questions and evidence boundaries

Research question	Completed here	Not established
What government claims do banks hold?	Issuer-labelled holdings; holder shares and changes	Complete security-level bank exposure or maturity ladder
What changed in resilience?	Capital, asset-quality and liquidity comparisons	Fully loaded capital of every institution
What can losses do to lending capacity?	Exact conditional capital and funding calculations	Observed national credit displaced by sovereign exposure
What reaches private investment?	Access context and a linked-outcome study protocol	Additional firm capex caused by a financing shock

Separate the issuer, holder, instrument and valuation basis

“Government exposure”, “investment assets” and “bank liquidity” are not synonyms.

Table 2. Exposure definitions and reporting perimeters

Record	Scope to retain	Error avoided
Government of Ghana security	Sovereign issuer; security, currency and maturity identified	Treating all bank investments as GoG debt
Bank of Ghana instrument	Central-bank issuer and monetary-operation function	Adding BoG instruments to budget financing
Debt-holder share	Holder’s government securities / government debt stock	Calling it government securities / bank assets
Bank exposure share	Defined government claims / corresponding bank assets	Equating face-value holdings and carrying-value assets
Liquid resources	Available, unencumbered cash and monetisable assets	Assuming face value can always be sold immediately

Sovereign and bank risks can move in both directions

The channels are hypotheses and accounting mechanisms, not separately estimated effects.

Sovereign → bank

Price losses, restructuring, payment delays and changing collateral values can affect capital, liquidity and funding costs.

Bank → sovereign

Public recapitalisation, guarantees and crisis support can create fiscal commitments and additional government claims.

Bank → enterprise

Capital and liquidity constraints can change approvals, loan terms and cash drawdowns. Firms may substitute lenders or defer investment.

The observation window is explicit—not extended by assumption

Research cut-off: 20 September 2026. Principal banking and security endpoints: December 2025.

Table 3. Data windows and verification scope

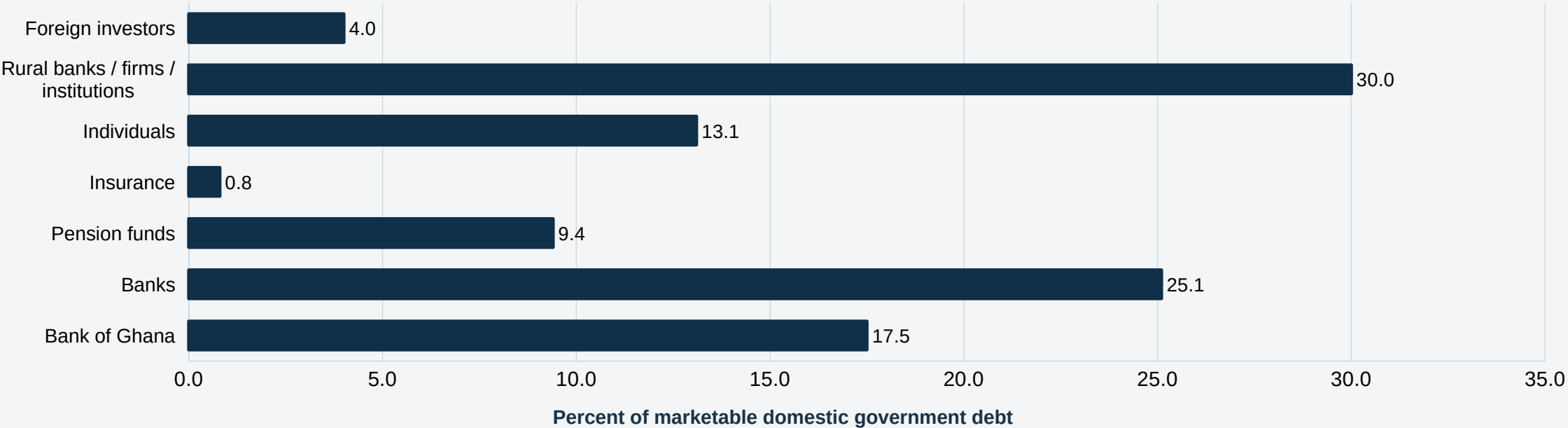
Dataset	Window and unit	Verification / restriction
Bank financial soundness	Six December points, 2020–2025; eight quarters in 2024–2025	FSR Table 3.2 page image checked; no monthly interpolation
Government-debt holders	End-2024 / provisional end-2025; GHS million	MoF Table 8.8 image checked; reported totals retained
DDEP bond records	Twelve instruments; end-2025 prices and annual changes	MoF Table 8.10 image checked; not bank-specific returns
Published liquidity stress	23 banks; alternative bond-liquidity/runoff assumptions	FSR Table 7.1 image checked; not a fresh model replication
Enterprise access	713 firms; February 2023–February 2024 fieldwork	World Bank profile; formal non-agricultural coverage

Later detailed BoG reports were not reliably retrievable in this research session; no numerical 2026 banking update is manufactured.

Banks hold one part of the marketable government-debt stock

End-2025 source-reported shares; denominator is government marketable domestic debt.

Figure 1. Investor shares of marketable domestic government debt

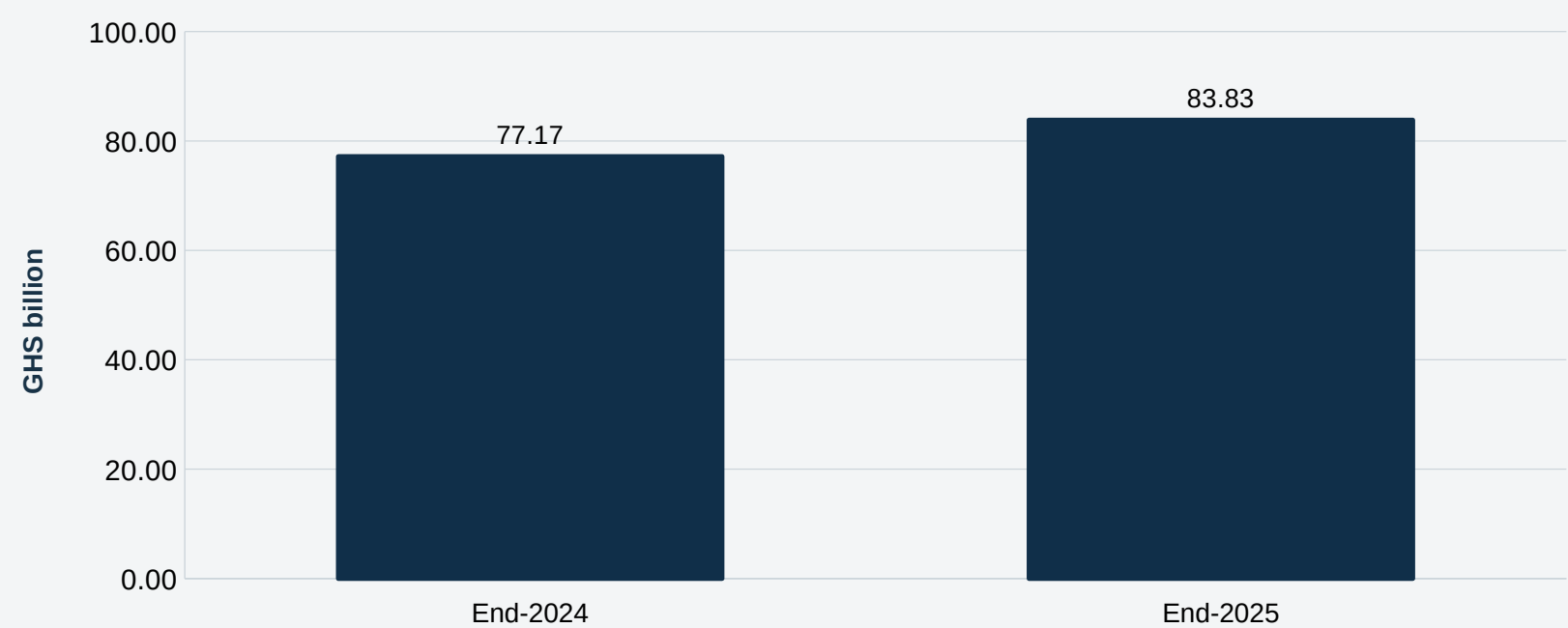


Banks and Bank of Ghana are separate categories. Rounded source shares need not sum to exactly 100.0%.

Nominal bank government-debt holdings increased by 8.6%

Marketable domestic government debt; revised end-2024 and provisional end-2025.

Figure 2. Banks' marketable government-debt holdings



Keep amount and share apart

Holding increase: GHS 6.65 bn.

Published holder share: 25.0%
→ 25.1%.

Neither identifies purchases net of valuation and maturities.

The same 25.1% appears in two different measures

Numerically equal percentages do not make the underlying exposures interchangeable.

Table 4. Government-debt holder shares versus bank-asset exposure

Published statistic	Numerator / denominator	Treatment
MoF: banks' holder share, 2025 = 25.1%	Banks' marketable GoG holdings / marketable GoG debt	Measures the bank part of government's investor base
FSR: government exposure / bank assets = 25.1%	Source-defined sovereign exposure / bank assets	Broader government claims; separate bank denominator
FSR prose comparison "from 49.5%"	A comparable starting date is not clearly established	Do not calculate a 24.4 pp annual fall
FSR BoG exposure chart	Central-bank instruments / bank assets	Not merged with government exposure; no unlabelled values digitised

A scale–mix decomposition explains the stock change exactly

Symmetric two-factor identity; derived from source stocks and total marketable debt.

Table 5. Bank holdings: exact scale–mix decomposition

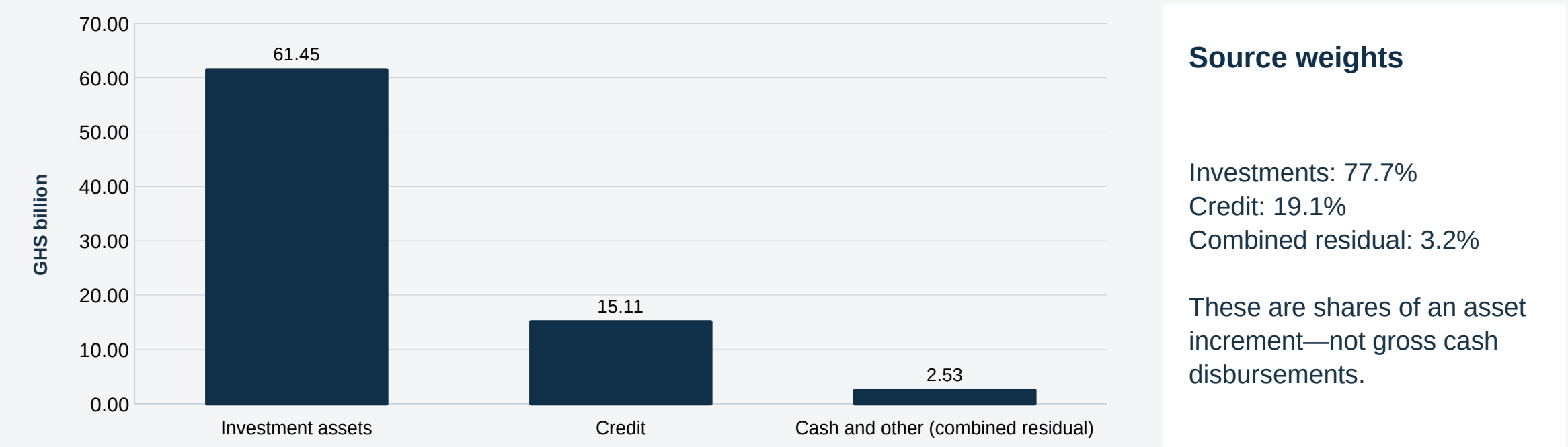
Component	GHS billion	Meaning
Larger government-debt stock	6.150	Total-stock change evaluated at average bank holder share
Change in bank holder share	0.505	Share change evaluated at average government-debt stock
Total bank holding change	6.654	Exact sum before display rounding
What is not identified	Not estimated	Purchases, maturities, revaluation or causal displacement of loans

An accounting decomposition is not a causal decomposition and is not evidence of an optimal investor composition.

Investment assets accounted for most of the reported asset increment

Derived allocation of the GHS 79.09 billion increase in bank assets during 2025.

Figure 3. Derived allocation of the annual bank-asset increment



Derived amounts use rounded source weights. “Investments” includes instruments beyond Government of Ghana securities.

The funding side matters as much as the asset choice

FSR year-2025 flow-allocation and end-2025 deposit-composition measures use different denominators.

Table 6. Funding increments and deposit composition

Measure	Reported value	Denominator / interpretation
Deposits in newly mobilised funds	62.1%	2025 funding increment; not deposits / existing bank assets
Shareholders' funds in the funding increment	23.3%	2025 increment; compared with 11.5% in 2024
Non-financial corporate deposits	62.8%	End-2025 total deposits; not a firm-loan approval rate
Household deposits	29.2%	End-2025 total deposits; concentration within depositors unknown

Ghana’s DDEP demonstrates a balance-sheet loss channel

World Bank’s 2024 account of 2022 banking-sector outcomes; historical evidence, not a new causal estimate.



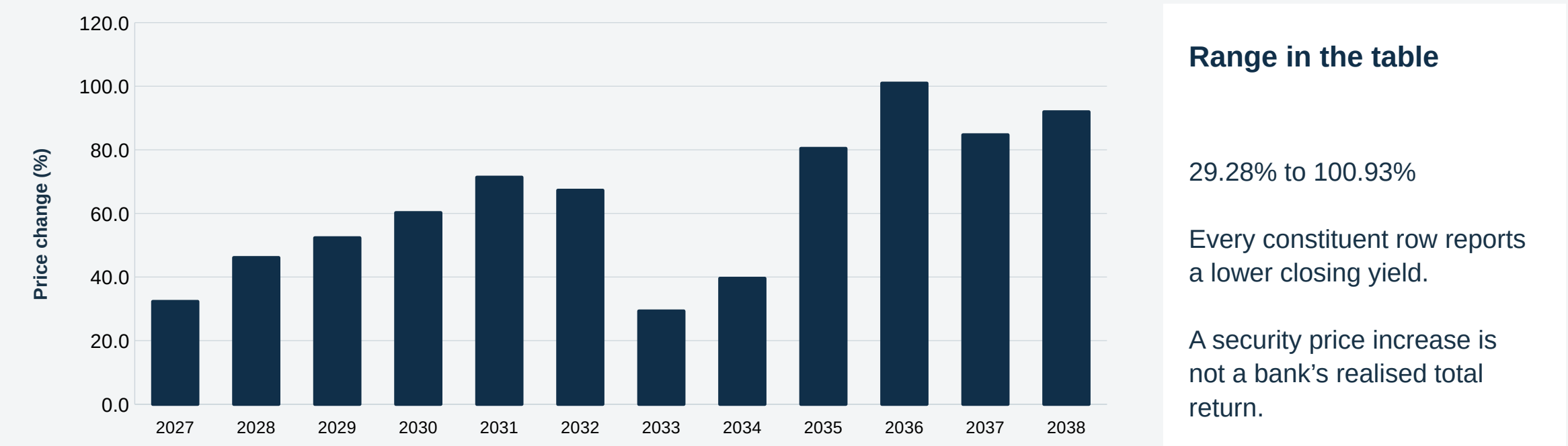
The World Bank links the impairment to the debt exchange. This is evidence of a recorded loss mechanism—not a measure of the private investment that would have occurred without the restructuring.

The historical source’s capital and profitability conventions are not spliced into the current FSR series.

Reported bond-price changes varied markedly across maturities

Twelve DDEP instruments, year-to-end-2025 price changes; coupon receipts and bank holding weights are excluded.

Figure 4. DDEP instrument price changes during 2025



Maturity-year labels identify instruments, not a matched-duration comparison. No missing trading path is interpolated.

Economic loss, accounting recognition and regulatory capital differ

Classification and measurement must be reconciled instrument by instrument.

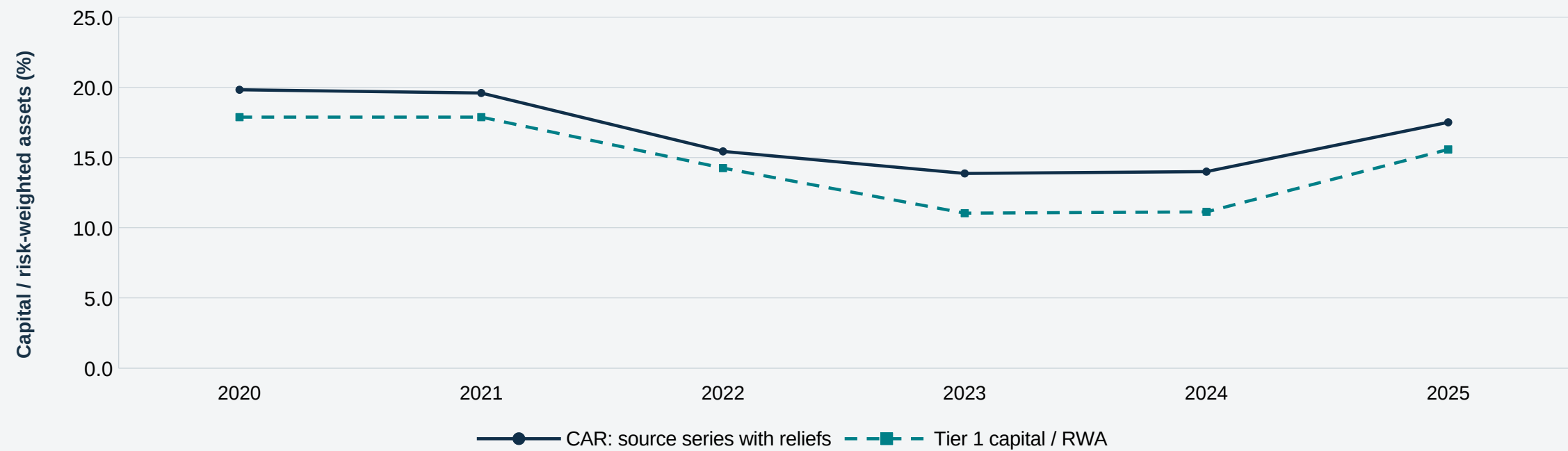
Table 7. Economic, accounting, capital and cash measures

Layer	What to measure	Why the distinction matters
Economic exposure	Change in expected cash-flow value and recoverability	Holding to maturity does not remove default or funding risk
Accounting result	Applicable IFRS 9 category, impairment and valuation movements	A market-price change need not enter profit in the same way
Regulatory capital	Recognised capital after deductions, filters and transitional treatment	Book equity is not automatically eligible regulatory capital
Cash liquidity	Coupon, maturity, sale or collateral proceeds on actual dates	An accounting gain does not pay an immediate withdrawal

Capital ratios improved after the post-DDEP trough

Comparable end-December snapshots from the FSR 2025 vintage; annual percentages.

Figure 5. Capital adequacy and Tier 1 ratios, 2020–2025

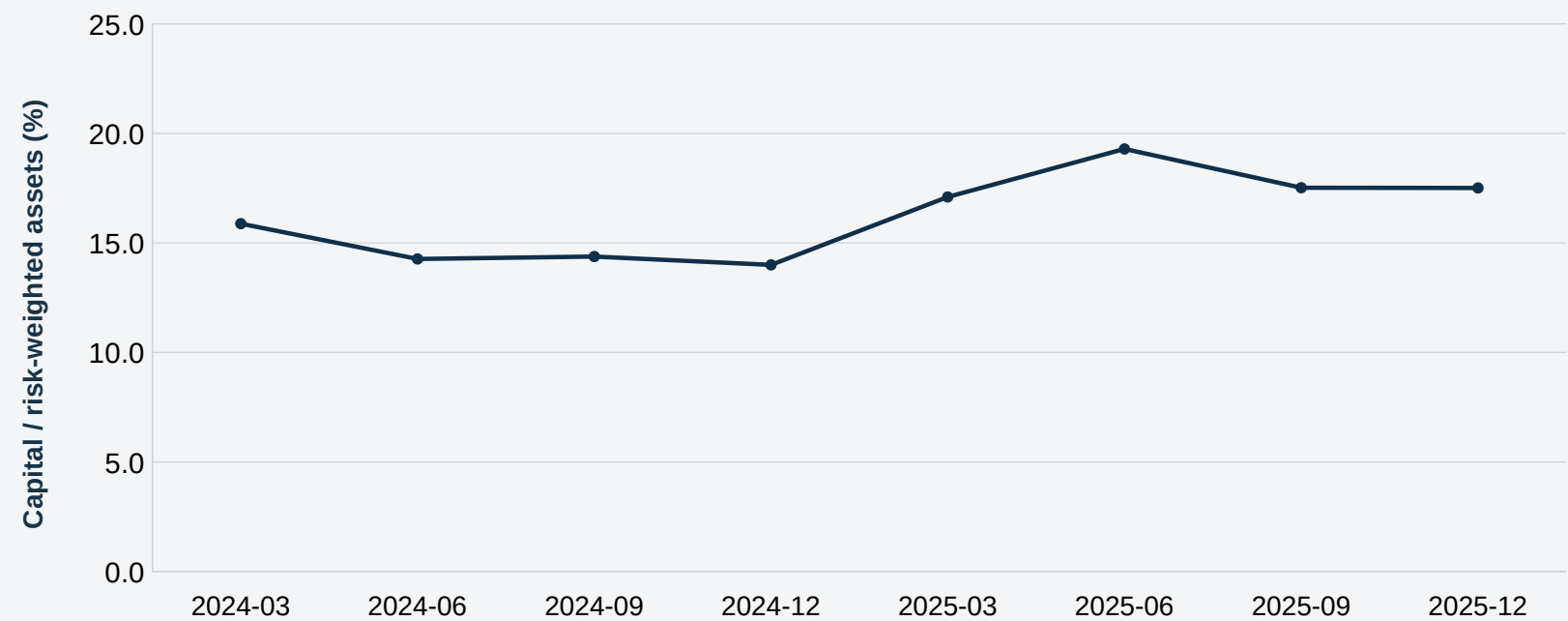


The CAR source row is explicitly labelled “with reliefs”. No bank-specific or fully loaded compliance conclusion follows.

The 2025 quarterly path was not a monotonic rise

Eight consecutive quarterly observations, March 2024–December 2025.

Figure 6. Quarterly capital adequacy, 2024–2025



Timing matters

June 2025: 19.29%
December 2025: 17.51%

This movement does not identify a capital outflow or lending contraction.

A headline CAR needs a usable-capital reconciliation

Capital ratio = eligible capital / RWA; the available loan buffer is not the same quantity.

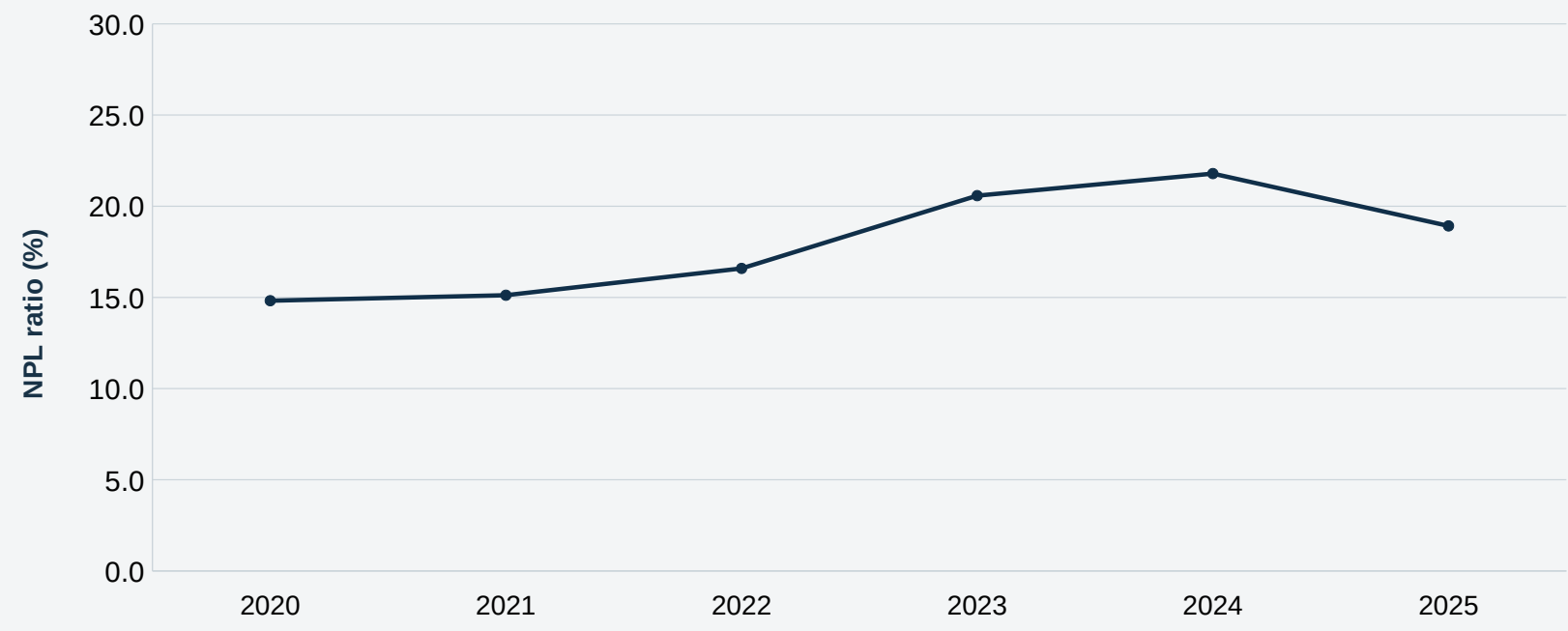
Table 8. Usable-capital reconciliation requirements

Required bridge	Record before interpreting capacity	Avoid
Eligible capital	Tier 1, Tier 2, deductions and relevant loss absorption	Equating all book equity with lendable cash
Relief and transition	With- and without-relief capital and RWA on the same date	Calling a source-labelled relief ratio fully loaded
Capital requirement	Applicable minima, buffers and institution constraints	Applying a universal assumed target as current law
Risk-weighted assets	Credit, market, operational risk and currency changes	Treating total assets as the RWA denominator
Distribution and forward loss	Planned dividends, asset-quality adjustments and pipeline costs	Using gross profit as free capital

The NPL ratio declined in 2025 but exceeded its 2020 level

NPLs divided by gross loans; end-December source-consistent observations.

Figure 7. Nonperforming loans as a share of gross loans



End-year comparison

2024: 21.79%
2025: 18.92%
Change: -2.87 pp

A ratio decline is not necessarily a decline in new defaults.

Lower NPLs and provision coverage are distinct dimensions

Source values and an explicitly derived accounting proxy; end-2024 versus end-2025.

Table 9. Asset-quality and provision-coverage diagnostics

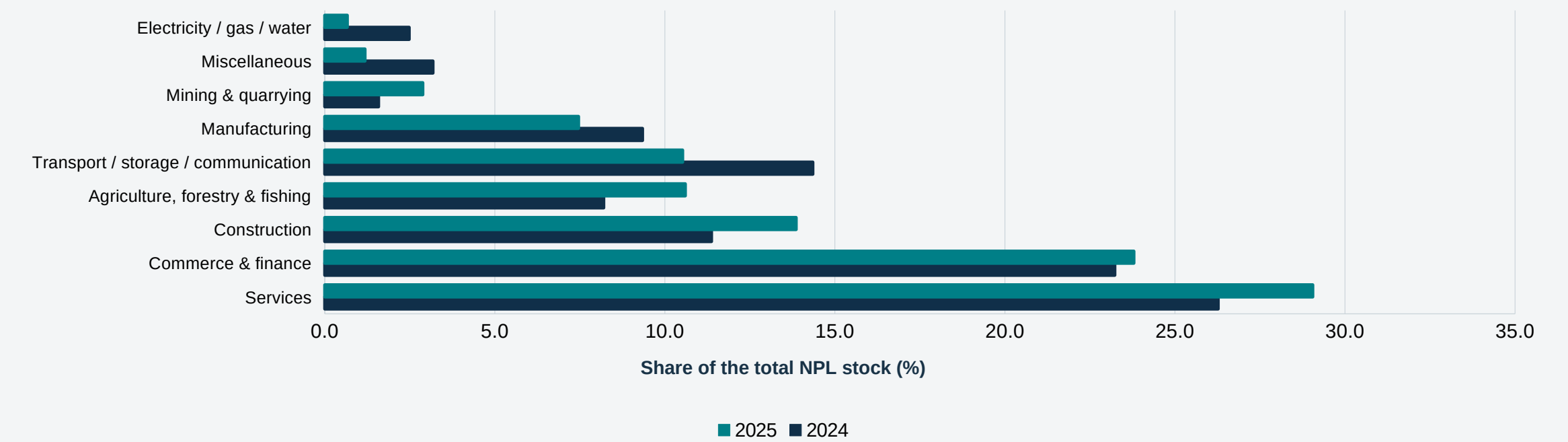
Measure	2024	2025	Interpretation
NPLs / gross loans	21.79%	18.92%	Gross impaired-loan ratio
Loan-loss provisions / NPLs	78.74%	78.82%	Coverage changed little
Net NPLs / capital	11.10%	7.62%	Uncovered problem-loan exposure relative to capital
Derived uncovered share / gross loans	4.63%	4.01%	$\text{NPL ratio} \times (1 - \text{coverage})$; not an ECL estimate

The derived proxy assumes internally aligned numerator definitions. It does not replace audited ECL or a loan-level recovery model.

Three sectors contributed 66.7% of reported NPLs in 2025

Sector contributions to the NPL stock—not each sector’s own NPL ratio.

Figure 8. Activity contributions to the total NPL stock



Services, commerce & finance, and construction sum to 66.7%. A sector’s large share can reflect a large loan book.

A lower NPL ratio can arise without new recoveries

Hypothetical units; each alternative starts from the same opening book.

Table 10. NPL-ratio mechanics: hypothetical examples

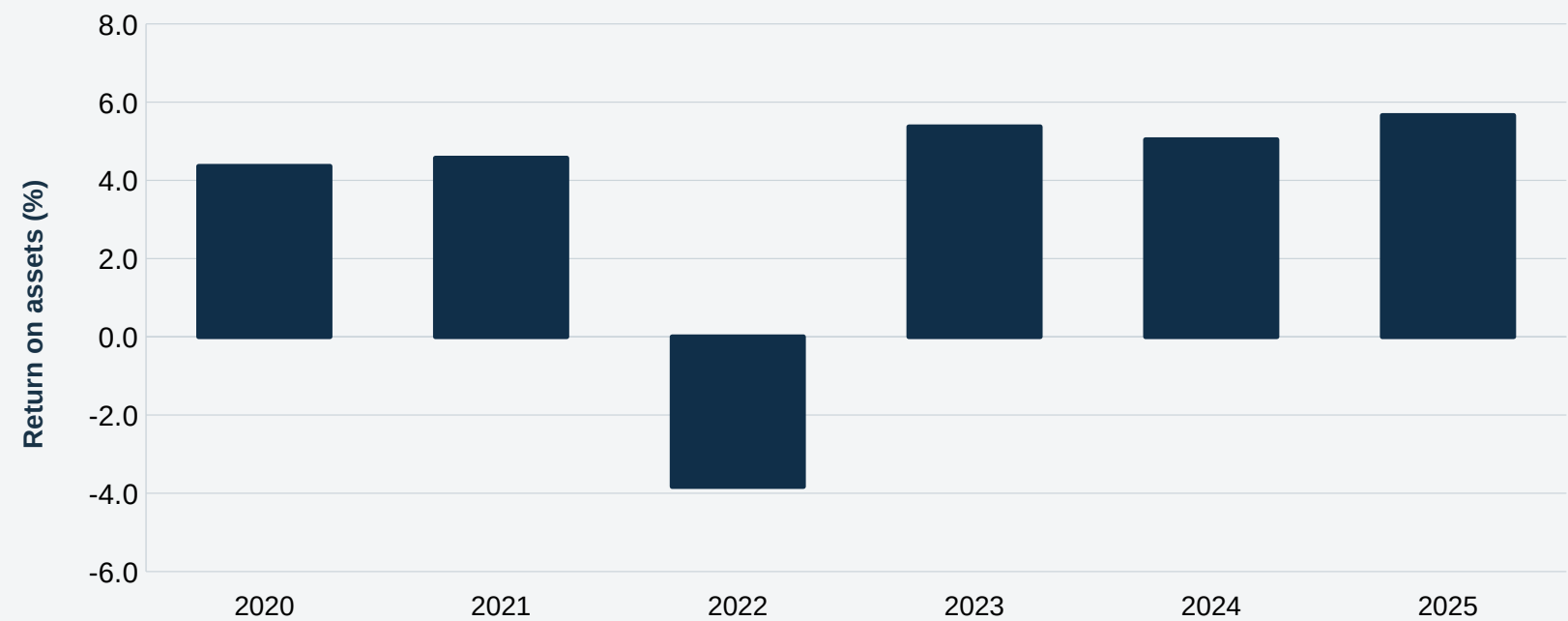
Case	Gross loans	NPLs	Provisions	NPL ratio	Net NPLs
Opening	100	20	15	20.00%	5
Loan growth only	125	20	15	16.00%	5
Fully provided write-off of 5	95	15	10	15.79%	5

A fully provided write-off reduces gross loans and allowances together; it is not itself a new cash recovery.

Return on assets turned positive after the 2022 loss

FSR source-defined annual return on assets; comparable December observations.

Figure 9. Reported return on bank assets, 2020–2025



Not free capital

2025 ROA: 5.66%
2025 ROE: 30.81%

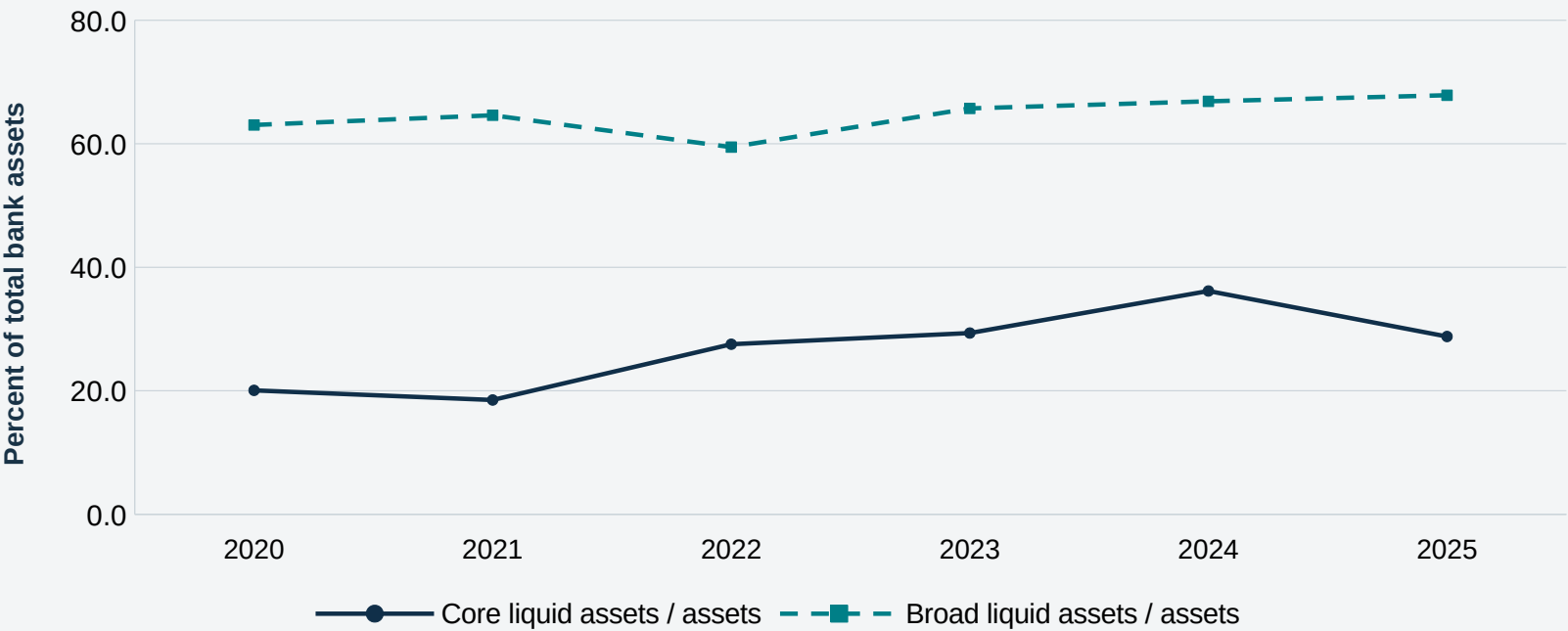
Retentions, distributions, valuation and further impairments determine capital rebuilding.

Profitability ratios have their own source definitions. A negative return is retained on the signed axis.

Core liquidity fell while broad liquidity edged higher in 2025

FSR ratios relative to total assets; annual December observations.

Figure 10. Core and broad liquidity relative to bank assets



Different cash access

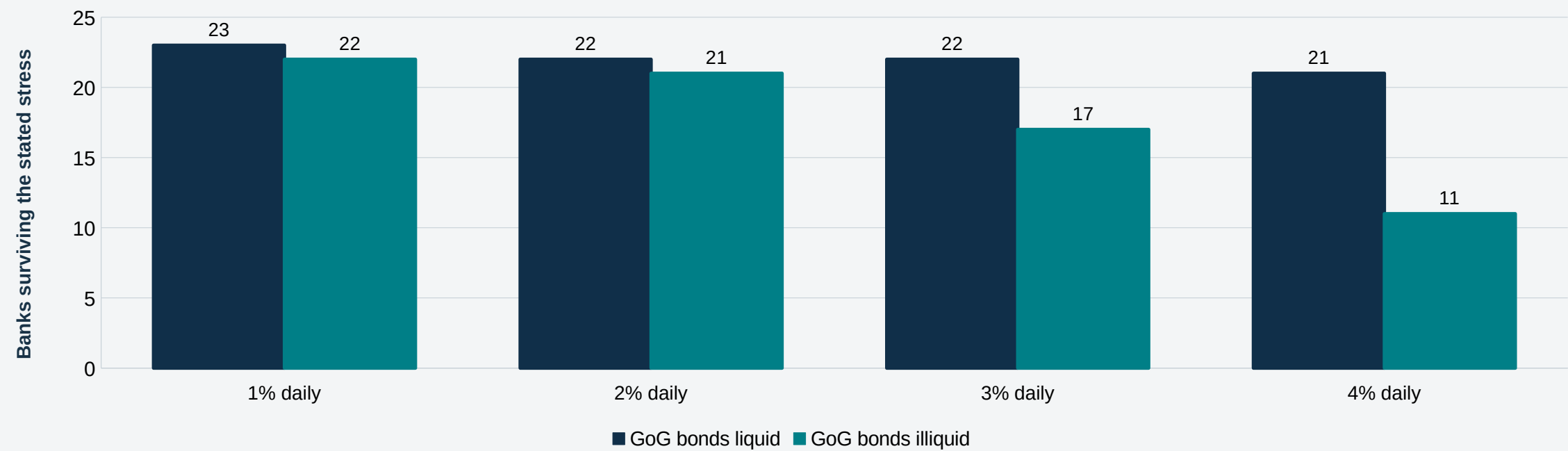
Core: 36.16% → 28.78%
Broad: 66.87% → 67.85%

The difference is not assumed to be entirely GoG securities.

Government-bond liquidity changes the published survival count

FSR test: 23 banks; 30 days; counts under 0% versus 100% assumed bond illiquidity.

Figure 11. Published liquidity-stress survival counts



Published model outputs, not actual bank failures or probabilities. The source model was not independently re-estimated.

Published stress outcomes depend on assumptions and starting dates

Source scenarios are evidence about a specified model, not forecasts generated by IDER.

Table 11. Published bank-stress assumptions and results

Published test	FSR result / design	Interpretation control
Single-largest-borrower default	Industry CAR: 17.5% starting point → 15.1% stressed outcome	Source 2026 horizon; not a current observation
Largest-borrower concentration	6.5% of gross loans at industry level; bank range 3.4–19.3%	Aggregate ratio masks institution dispersion
Liquidity runoff	30-day withdrawals; bond-liquidity assumption changed	Market access is part of the result
Macro stress	Satellite NPL / margin models and specified macro paths	No coefficients or shock probabilities independently replicated

Private-investment finance has several simultaneous constraints

A capital ratio is one condition—not a lending forecast.

Loss absorption

Capital after recognised losses and prudential adjustments must support the proposed risk-weighted exposure and origination costs.

Funding and liquidity

Stable funding, payment obligations, eligible collateral and usable cash must support the loan's currency and tenor.

Bankable demand

The firm must apply, qualify, draw the funds and invest. Approved credit, refinancing and actual capital expenditure differ.

The stress bank is explicit and is not calibrated to a Ghanaian institution

All balance-sheet amounts are GHS million; static one-period loss-recognition model.

Table 12. Hypothetical bank: opening model assumptions

Input	Assumption	Role
Assets / liabilities / eligible capital	100 / 90 / 10	Opening accounting identity; no hidden recapitalisation
Government claims / private loans	30 / 40	Risk-exposure bases; not observed portfolio weights
Cash / other assets	20 / 10	Completes the asset side
Opening RWA / capital hurdle	60 / 13%	Hurdle is assumed, not a current legal opinion
New-loan risk weight / origination loss	100% / 1%	Risk-weight and day-one net loss per unit of new credit
Funding / bankable-demand ceilings	10 / 12	Independent illustrative upper limits

No tax offset, earnings retention, default recovery, balance-sheet optimisation or endogenous bank response is included.

Recognised losses reduce headroom before new lending is considered

The same capital unit cannot absorb a sovereign loss and support a new loan at the same time.

$$C' = C - \alpha q S - \ell P \quad H = C' - k(RWA + \Delta RWA)$$

C: opening eligible capital; S: sovereign exposure; q: sovereign loss rate; α : immediate capital-recognition fraction.
P: private-loan exposure; ℓ : additional net private loss rate; k: assumed capital hurdle; H: residual headroom.

Economic versus recognised loss

α changes immediate capital recognition, not the economic exposure.

No double counting

ℓ applies only to additional losses beyond existing allowances.

Separate RWA stress

ΔRWA captures a stated additional denominator shock.

Joint sovereign and private-loan losses reduce the buffer quickly

Hypothetical GHS 100 million bank; capital hurdle 13%; no new lending yet.

Table 13. Joint loss scenarios and capital headroom

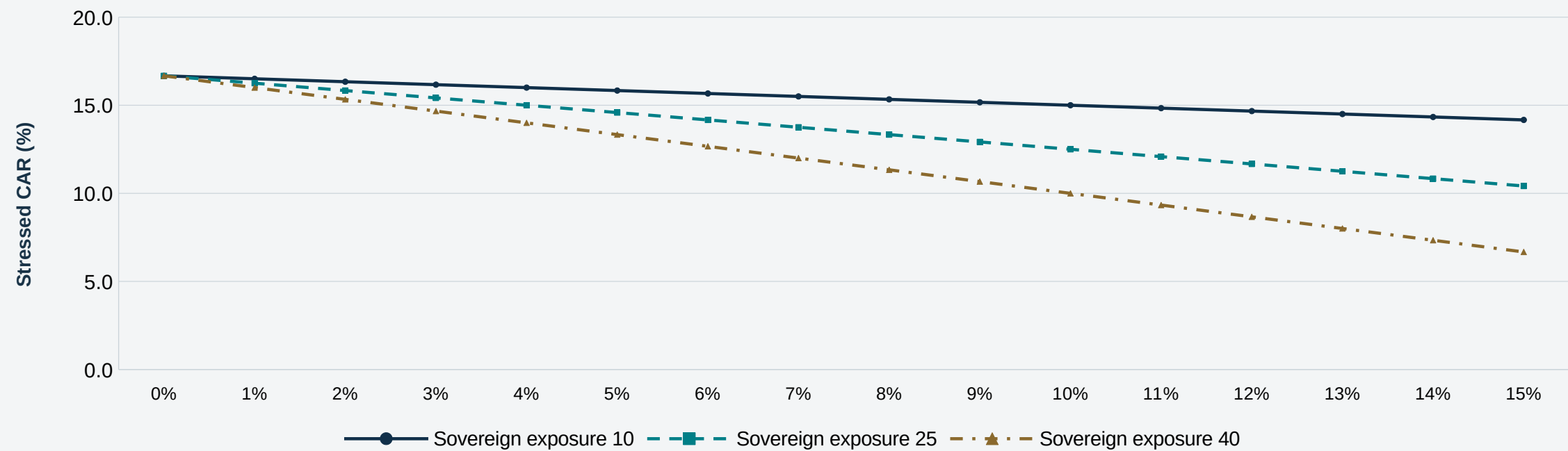
Declared scenario	Capital	RWA	CAR	Headroom
Base	10.00	60.00	16.67%	+2.20
Sovereign loss 2%	9.40	60.00	15.67%	+1.60
Sovereign loss 5%	8.50	60.00	14.17%	+0.70
5% sovereign + 1% private	8.10	60.00	13.50%	+0.30
5% sovereign + 1% private + RWA 5	8.10	65.00	12.46%	-0.35
Sovereign loss 10%	7.00	60.00	11.67%	-0.80

RWA is held fixed except in the explicitly labelled +5 scenario. Headroom is capital less the assumed required amount.

The same sovereign loss rate matters more at higher concentration

Hypothetical capital 10 and RWA 60; no additional private losses; full immediate recognition.

Figure 12. Capital sensitivity to sovereign-loss assumptions



Horizontal categories are assumed sovereign loss rates from 0% to 15%. Exposure amounts are GHS million, not observed banks.

A smaller immediate capital hit does not remove the economic loss

Five-percent loss on sovereign exposure 30; model economic loss 1.50 in every row.

Table 14. Loss recognition and the immediate capital effect

Immediate recognition α	Economic loss	Immediate capital loss	Stressed CAR
0%	1.50	0.00	16.67%
50%	1.50	0.75	15.42%
100%	1.50	1.50	14.17%

$\alpha=0$ is an illustrative recognition/timing case—not evidence of zero risk or an actual relief arrangement.

New lending uses capital through risk weights and initial losses

The ceiling is conditional; a negative starting buffer means no expansion and an unresolved initial breach.

$$\Delta L(\text{capital}) = \max\{0, H / (k \times w + p)\}$$

w: marginal gross risk weight; p: assumed immediate net loss per unit of new lending.

Feasible lending = minimum of capital, funding, liquidity, concentration and bankable-demand ceilings.

Base model

H=2.20; k=13%; w=100%; p=1% → capital-only ceiling 15.71.

After joint losses

H=0.30 → capital-only ceiling 2.14.

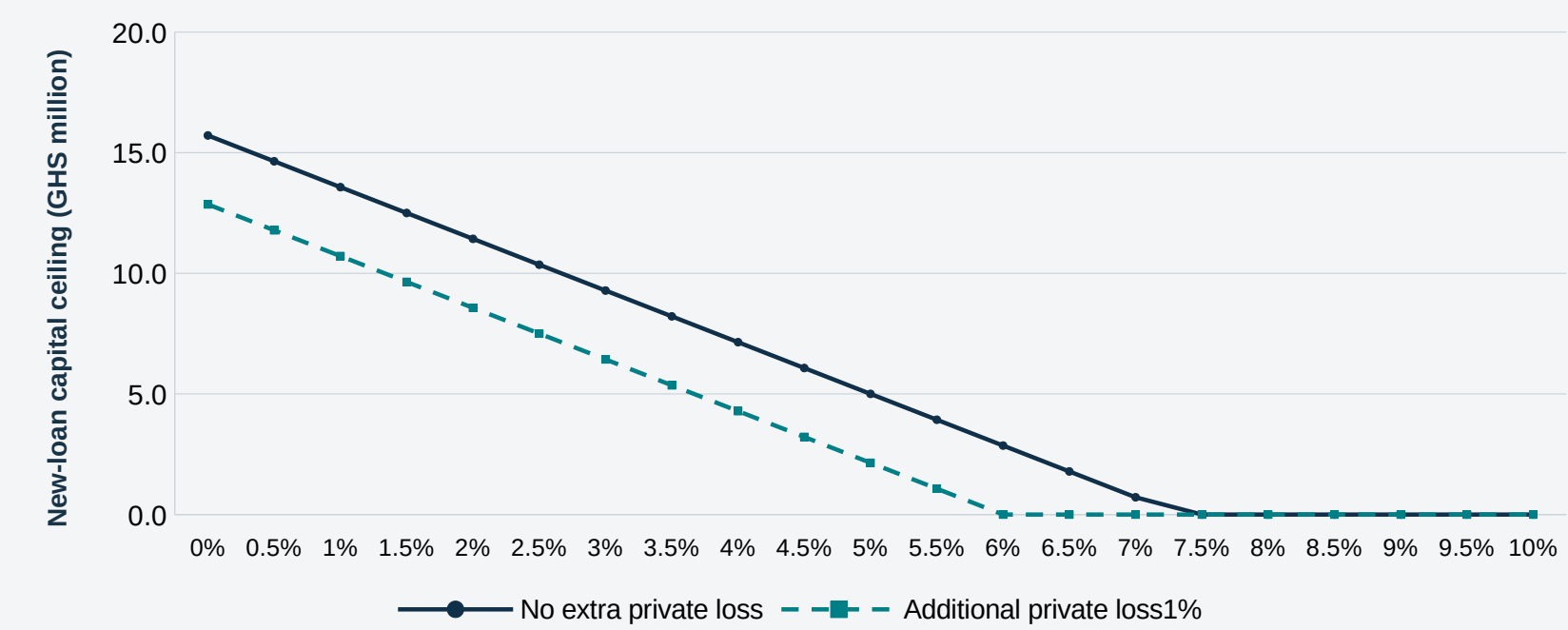
Independent constraints

Base funding ceiling 10 limits lending below 15.71.

Capital-only loan headroom contracts before a large loss is reached

Model sovereign exposure 30; capital 10; RWA 60; hurdle 13%; new-loan loss 1%.

Figure 13. Capital-only new-lending ceilings under joint losses



Joint-stress example

At 5% sovereign loss plus 1% additional private loss:

Capital ceiling=2.14m

No national lending multiplier is inferred.

The x-axis is an assumed sovereign loss rate, not a yield change or default probability. Actual credit is capped by other constraints.

The capital-only ceiling depends on the hurdle and marginal risk weight

Base model; GHS million; 1% initial net loss per unit of new credit.

Table 15. Capital-only lending under alternative assumed hurdles

Assumed capital hurdle	50% risk weight	100% risk weight	150% risk weight
10%	66.67	36.36	25.00
13%	29.33	15.71	10.73
16%	4.44	2.35	1.60

All hurdles and weights are assumptions. The table is not a current Ghana regulatory schedule or a recommendation to lower capital.

Solve the loss that exhausts the assumed capital headroom

Sovereign exposure 30; full immediate recognition; zero remaining headroom under the 13% model hurdle.

Table 16. Reverse-stress boundaries for capital headroom

Additional private-loan loss		RWA addition	Sovereign loss boundary
	0%	0	7.33%
	1%	0	6.00%
	1%	5	3.83%

Numerically verified conditional boundaries—not expected haircuts, policy targets, forecasts or insolvency probabilities.

A positive capital ratio does not ensure payment liquidity

Separate illustrative cash stress; amounts in GHS million; sale discount specified explicitly.

Table 17. Illustrative liquidity shortfall and security sale

Cash item	Amount	Treatment
Opening available cash	2.00	Already unencumbered and accessible
Cash maturities in the stress window	1.00	Exclude uncertain or delayed receipts
Withdrawals and other payments due	10.00	Creates a 7.00 cash need before sales
Available securities at book value	8.00	20% sale discount gives cash proceeds 6.40
Residual cash shortfall	0.60	Sale loss 1.60 is not counted twice in capital

Cash and bond recapitalisation have different liquidity effects

Conceptual comparison; recognition depends on actual valuation and eligible-capital treatment.

Table 18. Recapitalisation instruments and liquidity effects

Support form	Potential bank balance-sheet effect	Question that remains
Cash equity injection	Adds cash and may add eligible capital	Source, cost, conditions and fiscal burden
Government bond injection	Adds a sovereign claim and may add eligible capital	Monetisation, market value, coupons and concentration
Guarantee or contingent support	May alter loss-sharing or funding confidence	Enforceability, trigger, fee and contingent fiscal cost
Restructuring / resolution	Changes claims, ownership or operating perimeter	Treatment of creditors, liquidity and viable future lending

A lower domestic debt cost coexisted with shorter maturity

Ministry of Finance existing-portfolio indicators; 2024 versus provisional 2025.

Table 19. Domestic debt cost and refinancing indicators

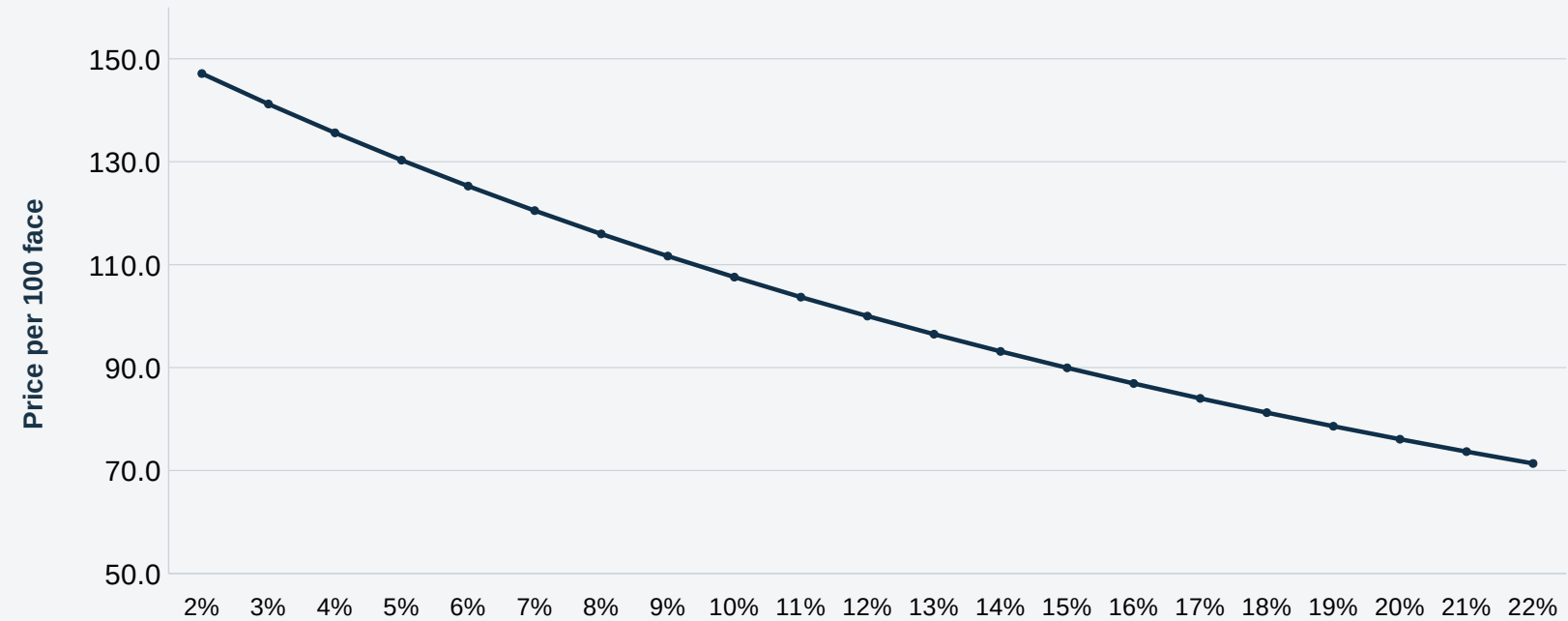
Domestic debt indicator	2024	2025	Change
Weighted average interest rate	16.2%	12.8%	−3.4 pp
Average time to maturity	4.8 years	4.1 years	−0.7 years
Debt maturing within one year	38.0%	39.6%	+1.6 pp

These are existing-debt portfolio measures, not bank return forecasts, auction-level yields or optimal maturity recommendations.

Interest-rate sensitivity depends on contractual cash flows

Assumed five-year annual 12% coupon bond; face 100; exact repricing; no default, options or costs.

Figure 14. Exact price–yield curve of the illustrative bond



Conditional repricing

Base yield 12%: price 100
Yield 17%: price 84.00

This regular-coupon bond is not a reconstructed DDEP instrument.

Quoted yields are assumed annual-effective discount rates. Price sensitivity is not a fitted bank-return or lending equation.

Falling yields can raise prices while lowering future income

The direction of one measure does not establish the direction of total lending capacity.

Existing fixed cash flows

A lower discount rate can raise market value. Capital effects depend on recognition, prior impairment and prudential treatment.

Maturing securities

Replacement investments may earn lower yields. Income pressure depends on repricing dates, funding costs and portfolio changes.

Private credit decision

Relative net returns include losses, capital, liquidity, operating costs and borrower demand—not merely coupon minus bill yield.

Loan balances do not reveal fresh investment financing

The accounting boundary must be defined before interpreting a change in bank credit.

Closing loans = opening loans + disbursements – repayments – write-offs + other changes

Other changes include currency valuation, capitalised interest, transfers and reclassification.
Then distinguish new project financing, working capital, refinancing and lending substituted across banks.

Approval

A commitment is not cash received.

Disbursement

A drawdown can refinance an old loan.

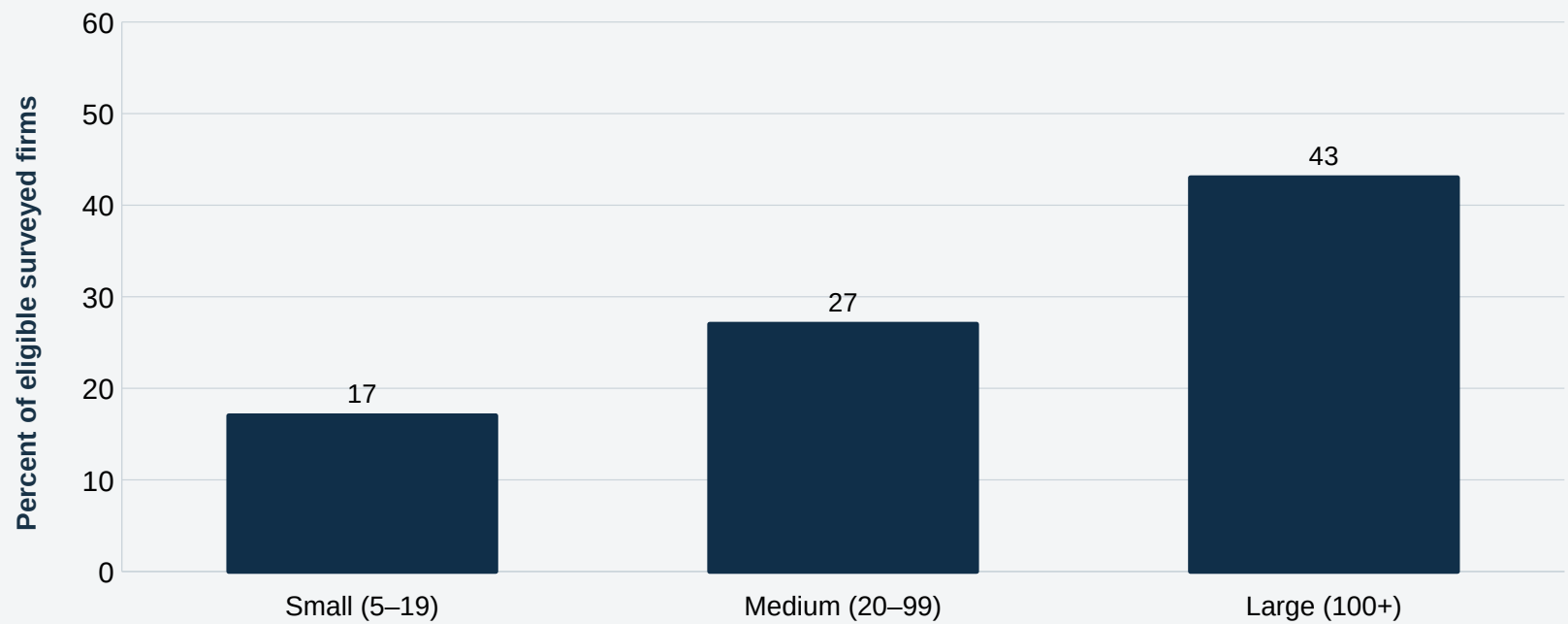
Investment

Actual capex requires enterprise-use evidence.

Bank-loan participation differs across firm-size groups

World Bank Ghana 2023 profile; published rounded proportions; interviews February 2023–February 2024.

Figure 15. Historical bank-loan participation by firm size



Population boundary

Formal, eligible non-agricultural firms with 5+ workers.

Not current approval rates or a sample of all Ghanaian microenterprises.

The 26 pp small–large difference is descriptive. It is not a causal effect of firm size or sovereign holdings.

Follow the enterprise beyond the bank’s balance sheet

Additional finance and additional investment are separate outcomes.

Table 20. Enterprise financing and investment outcomes

Outcome layer	Measure	Control for interpretation
Loan supply	Offer, approval, limit, pricing and bank-specific disbursement	Separate firm demand and changing applicant composition
Total enterprise finance	All lenders, repayments, refinancing and owner funding	Capture lender substitution and non-bank finance
Investment implementation	Dated capex payments, assets acquired and project progress	Do not equate financing receipt with investment completion
Business performance	Sales, employment, cash flow and investment productivity	Measure baseline and comparable follow-up; avoid selection on survival

The direction of causality cannot be read from holdings alone

Portfolio selection, loan demand and fiscal conditions can move together.

Endogenous holdings

Banks may buy government securities when loan demand or asset quality weakens. Prior exposure is not automatically random.

Common conditions

Inflation, interest rates, exchange rates and government payments can change both sovereign risk and private investment.

Selection into loans

Approved borrowers differ from rejected, discouraged and exiting firms. Observed loan prices exclude many non-borrowers.

Compare the same firm across differently exposed banks

An authorised linked-data design; not estimated from the report’s public aggregates.

$$\Delta Y(f,b,t) = \alpha(f,b) + \delta(f,t) + \beta[\text{Shock}(t) \times \text{Exposure}(b,0)] + u(f,b,t)$$

Firm–time effects absorb common firm demand. Treatment must vary across banks within that comparison. Define Y separately: loan amount, disbursement, price or limit; positive-loan and extensive margins differ.

Identification

Defensible shock and exposure assignment; not prior holdings alone.

Inference

Bank, event and repeated-firm dependence; effective clusters disclosed.

External validity

Multi-bank firms do not automatically represent single-bank MSMEs.

The equation is a research protocol. No Ghana β , p-value, confidence interval or national crowding-out effect is manufactured.

A government auction design needs the actual allocation rule

Near-cutoff comparisons are candidates for validation—not automatically valid instruments.

Assignment record

Recover original bids, timestamps, cutoffs, partial awards and beneficial ownership. Separate customer orders from bank positions.

Local validity

Test sorting, discretionary allocation, baseline balance and sensitivity to bandwidth and excluded cutoff observations.

Linked outcomes

Follow securities, cash funding, capital and loans after settlement. Report the local award effect before adding IV assumptions.

Controls, mechanisms and sources of selection must be separated

The estimand determines which variables are legitimate controls.

Table 21. Endogeneity threats and identification safeguards

Threat	Required treatment	What would not resolve it
Endogenous fiscal or yield movement	Define an external or assignment-based financing shock	Relabelling an ordinary rate change a surprise
Bank exposure selection	Audit pre-shock holdings, incentives, overlap and balance	Assuming lagged exposure is exogenous
Mediating capital or liquidity	Estimate total and channel-specific effects separately	Controlling mechanically for post-shock capital
Concurrent firm demand	Firm–time comparisons and independently measured demand	Before–after macro regression alone
Instrument weakness / exclusion	Mechanism, first stage, sensitivity and robust inference	A conventional significant first stage alone

Keep non-borrowers, exits and nonreporting banks in the frame

A surviving-loan sample is not the population of firms that sought finance.

Table 22. Sample coverage, entry and exit controls

Selection point	Record / procedure	Interpretation safeguard
Bank reporting and mergers	Complete licensed-bank frame; mergers, exits and return versions	Do not analyse only surviving reporters
Borrowing decision	Eligible enterprises; need, application and discouragement	A non-applicant is not automatically unconstrained
Approval and withdrawal	All decisions, requested and approved amounts	A denied-loan interest rate is missing, not zero
Panel attrition	Defaults, prepayments, lender switches and closures	Separate real exit from loss of observation
Unequal coverage	Design weights or conditional observation weights; overlap tests	Weighting does not remove unmeasured confounding

Disaggregation should follow the transmission mechanism

Pre-specify groups and horizons rather than choosing those with large coefficients.

Table 23. Prespecified heterogeneity dimensions

Dimension	Minimum split	Reason
Sovereign exposure	Issuer, currency, tenor, measurement category and encumbrance	Loss, income and liquidity sensitivities differ
Bank condition	Pre-shock capital quality, funding, NPL coverage and size	Separates initial vulnerability from post-shock response
Enterprise finance	Firm size, sector, formality, risk and lender count	Multi-bank results may miss single-bank MSMEs
Loan purpose	Working capital, investment, refinancing and overdrafts	A credit change need not finance new capital assets
Outcome horizon	Settlement,3/6/12-month credit and later investment	Distinguishes immediate allocation from realised capex

Join holdings, capital, loans and enterprise outcomes

An operational schema is supplied as empty templates; confidential records were not invented.

Table 24. Linked security, bank and enterprise records

Data block	Essential fields	Linkage and control
Security register	Issuer, ISIN, quantity, carrying / market value, coupon, maturity, repo status	Bank–instrument–date; beneficial owner
Capital and risk	Tier 1/2, reliefs, deductions, RWA, ECL and distributions	Bank–date; reconciled reporting perimeter
Funding and liquidity	Deposits, currency, runoff, collateral and cash-flow dates	Bank–counterparty / tenor bucket
Application and loan	Firm ID, request, decision, terms, drawdowns and repayments	Bank–firm–loan; all application outcomes
Enterprise investment	Project cash use, capex, assets, employment and alternative finance	Firm–period; baseline and consent basis

Every metric needs a denominator, time stamp and responsible owner

Proposed research controls—not observed achievements or current regulatory targets.

Table 25. Proposed monitoring indicators and responsibilities

Indicator	Definition	Frequency / proposed owner
Sovereign concentration	GoG exposure / assets and eligible capital; issuer and value basis named	Monthly; treasury + regulatory reporting
Capital usability	With/without-relief CAR; eligible-capital and RWA bridge	Monthly; finance + risk
Asset-quality pressure	NPL inflows, recoveries, write-offs and net provisions; same perimeter	Monthly; credit risk
Liquidity dependency	Stressed cash coverage with stated GoG monetisation and haircuts	Weekly / monthly; ALM
Private investment finance	New cash, refinancing-adjusted finance and linked enterprise capex	Quarterly; bank + enterprise research
Data completeness	≥98% required-field completion; material issuer/date mismatches resolved	Each release; independent checking function

The same evidence supports different decisions

Analytical use does not imply adoption, commissioning or endorsement by any institution.

Table 26. Audience-specific analytical uses

Audience	Decision-relevant question	Boundary
MoF / government	How do financing and support instruments change bank exposure and fiscal contingencies?	No costless recapitalisation assumption
BoG / regulators	Which capital and liquidity constraints bind after aligned loss recognition?	No bank-conduct or compliance verdict from aggregates
Banks / fund and asset managers	How do issuer, duration, funding and private risk combine in stress?	No optimal portfolio allocation estimated
Businesses / MSME associations	Do approvals, terms and net drawdowns change for comparable firms?	Stock growth is not universal access
DFIs / pensions / insurers / investors	Does an instrument match risk, liquidity and financing additionality?	No product suitability or return forecast

Use the link as a set of verifiable questions—not a trading signal

Three checks connect sovereign exposure to the business financing decision.

Exposure and valuation

Which government claims are held, how are they measured, and when can they produce cash? Are unrealised gains being mistaken for income?

Loss and capacity

What capital remains after existing and incremental losses? Which funding, leverage or borrower constraints bind before new lending?

Enterprise additionality

Who receives new cash, on what terms, for which purpose? Does the financing add to total firm investment or replace another source?

A 90-day programme can build a reproducible reporting base

The clock begins after approvals and data-access agreements; causal release is conditional on design validity.

Table 27. Conditional research delivery schedule

Period	Deliverable	Acceptance condition
Days 0–15	Source inventory, definitions, population frame and permissions	Issuer, valuation, capital and privacy rules documented
Days 16–30	Historical holdings / capital / cash-flow intake	Cross-table identities and material exceptions reviewed
Days 31–60	Linked bank–firm panel, stress modules and design assessment	Coverage, assignment and effective sample validated
Days 61–90	Supported estimates, independent replay and publication	Only defensible claims released; limitations retained

Investment outcomes at 6 or 12 months require historical follow-up; they cannot be created by a 90-day reporting timetable.

Primary-table fidelity and causal identification are separate tests

The new analysis retains the original numerical inputs and adds explicitly sourced diagnostics.

Table 28. Retained primary-table comparisons and additions

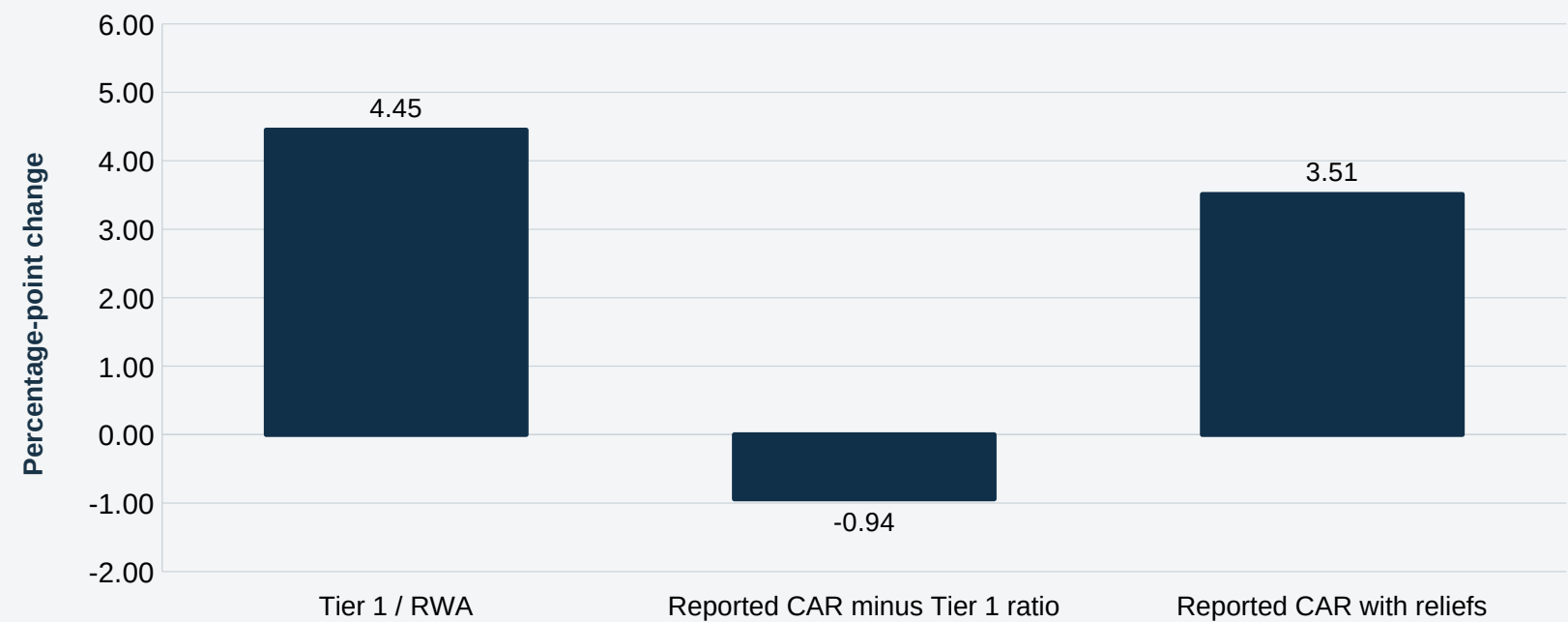
Evidence block	Completed comparison / addition	Interpretation boundary
FSR financial soundness	132 original values matched; 48 additional entries extracted	Reported aggregates; CAR relief label retained
Government holders and bonds	28 holder entries and 72 bond entries matched	Positions and prices are not bank-specific returns
NPL composition / liquidity stress	18 sector-share and 10 stress-count entries matched	Stress counts are published model outputs
External quasi-experiment	Direct and placebo estimates at both bandwidths	Colombia; reconstructed intervals, not Ghana effects
Current Ghana causal effect	Assignment, selection and release protocol strengthened	No linked bank–firm microdata; no causal coefficient

Sources: FSC Ghana, FSR 2025; MoF, 2025 debt report; Önder et al. (2024). [S01](#), [S02](#), [S09](#).

Tier 1 movement exceeds the change in the reported total CAR

December 2024 to December 2025; ratio changes in percentage points.

Figure 16. Decomposition of the reported capital-ratio change



Exact ratio identity

Tier 1: +4.45 pp
Reported residual: -0.94 pp
Total CAR: +3.51 pp

Capital amounts and RWA changes are not separately identified.

CAR minus Tier 1 is a reported-ratio residual; it is not assumed to be fully loaded Tier 2 capital.

A larger broad-liquidity ratio can conceal lower core cash backing

Same FSR reporting universe and December dates; percentage units are explicit.

Table 29. Core and broad liquidity: level and composition measures

Measure	2024	2025	What it describes
Core liquid assets / assets	36.16%	28.78%	Immediate/core component
Broad liquid assets / assets	66.87%	67.85%	Broader source asset category
Broad minus core, per total assets	30.71 pp	39.07 pp	Additional non-core portion; issuer not identified
Core as a share of broad liquidity	54.08%	42.42%	Derived composition ratio
Core liquid assets / short liabilities	43.31%	35.29%	Different denominator: short-term liabilities

These are source-defined ratios—not the Basel Liquidity Coverage Ratio and not a government-only security exposure.

A lower NPL ratio does not determine the NPL stock change

Observed ratios: 21.79% in 2024 and 18.92% in 2025. Loan-stock growth below is assumed.

Table 30. Implied NPL-stock growth under assumed loan growth

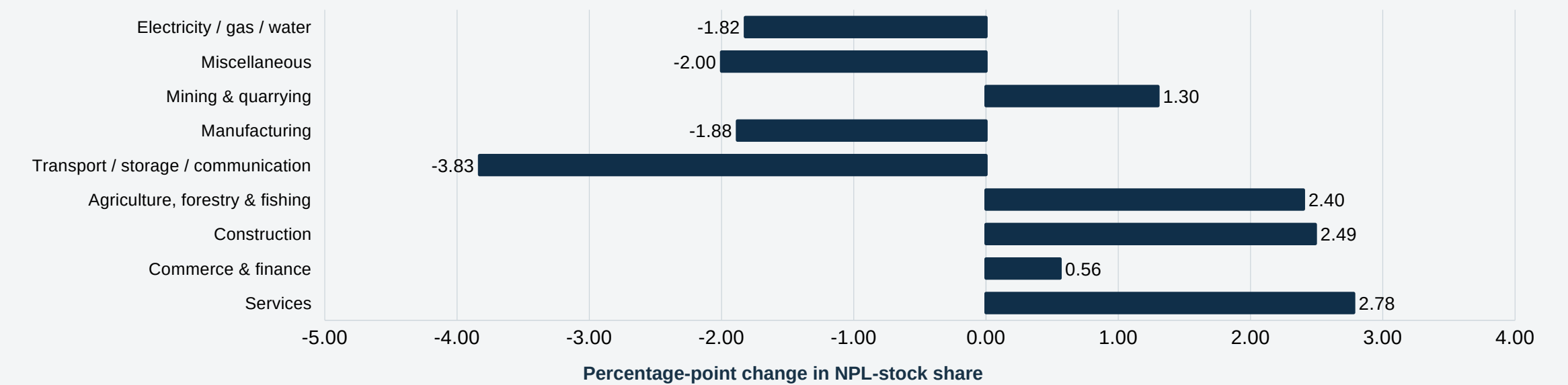
Assumed gross-loan growth	Implied NPL-stock growth	Interpretation under the identity
0.00%	-13.17%	NPL amount declines
5.00%	-8.83%	NPL amount declines
10.00%	-4.49%	NPL amount declines
15.17%	+0.00%	Unchanged NPL amount
20.00%	+4.19%	NPL amount increases
30.00%	+12.88%	NPL amount increases

The 15.17% loan-growth boundary is conditional accounting—not the observed growth of a matched gross-loan denominator.

Sector concentration and sector NPL rates answer different questions

Change in each activity’s share of total NPLs, 2024–2025; percentage points.

Figure 17. Changes in activity shares of the NPL stock



Category HHI: 1,738.2 → 1,890.8 (0–10,000 scale) | Half absolute share movement: 9.53 pp

Nine fixed source categories; concentration across activities is not borrower concentration or bank-market concentration.

All twelve reported prices remained below face value

Closing price per 100 face, end-2025; source instrument order retained.

Figure 18. DDEP closing prices relative to face value



Price recovery $\neq$ par

The 2036 instrument rose 100.93% in price, yet closed at 69.43 per 100 face.

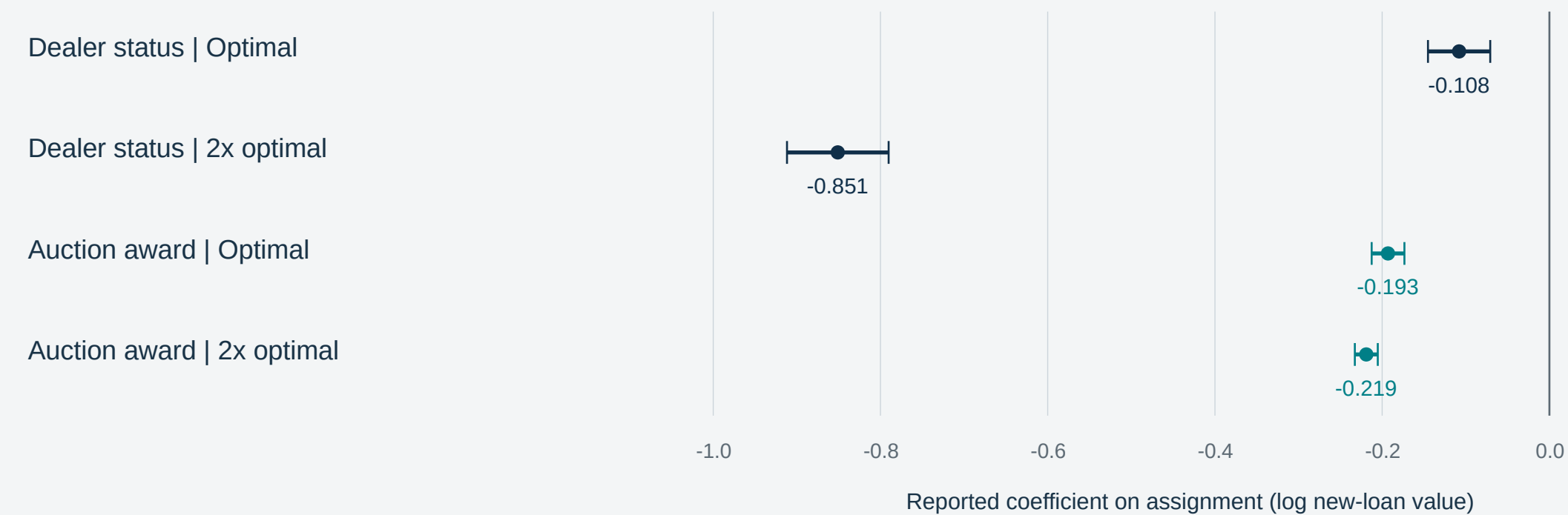
Coupons, cash flows and bank weights are not in that price-change statistic.

Maturity labels identify instruments; cross-instrument price differences are not a matched-duration comparison.

The published local estimates are sensitive to bandwidth

Colombia, 2004–2015; regression-discontinuity estimates from Table 4, columns 1 and 3.

Figure 19. Published Colombian local effects and bandwidth sensitivity



Published coefficients $\pm 1.96 \times$ reported SE; approximate pointwise 95% intervals. Annual and weekly outcomes differ; not Ghana estimates.

Placebo results and outcome definitions remain part of the evidence

Published lagged-loan placebo rows from the same two direct-effect columns; no significance stars.

Table 31. Published placebo estimates and approximate intervals

Design and bandwidth	Coefficient	Reported SE	Approximate 95% interval
Primary-dealer status Optimal	-0.013	0.063	[-0.136, 0.110]
Primary-dealer status 2x optimal	+0.010	0.050	[-0.088, 0.108]
Auction award Optimal	+0.097	0.083	[-0.066, 0.260]
Auction award 2x optimal	+0.083	0.063	[-0.040, 0.206]

The manuscript’s “investment” variable includes financial investments; it is not automatically physical business capex.

A capital-only lending ceiling can exceed the jointly feasible ceiling

Additional assumptions: Tier 1 = 8; gross leverage exposure = 120; leverage hurdle = 6%; GHS million.

Table 32. Joint capital, leverage, funding and demand constraints

Scenario	Capital ceiling	Leverage ceiling	Joint ceiling	Starting test
Base	15.71	11.43	10.00	Meets assumed hurdles
2% sovereign loss	11.43	2.86	2.86	Meets assumed hurdles
5% sovereign + 1% private	2.14	0.00	0.00	Initial breach; not cured
Same losses; +5 RWA	0.00	0.00	0.00	Initial breach; not cured
No loss; funding limited	15.71	11.43	3.00	Meets assumed hurdles

All hurdles are illustrative. Existing RWA/exposure held fixed; new-loan expected loss reduces both capital measures.

System-wide buffers cannot automatically be transferred between banks

Three hypothetical two-bank systems with the same summed capital and funding ceilings; GHS million.

Table 33. Two-bank illustration: aligned and separated resources

Configuration	Capital ceilings A / B	Funding ceilings A / B	Sum of bank-feasible lending	Pooled ceiling
Aligned	5 / 5	5 / 5	10	10
Partly misaligned	8 / 2	3 / 7	5	10
Fully separated	10 / 0	0 / 10	0	10

No interbank transfer, capital injection, borrower substitution or endogenous response is assumed in this illustration.

Predetermined exposure alone does not make the shock exogenous

A Ghana design must separate a common event from differential bank exposure and fiscal spillovers.

Define the intervention

Specify losses from a named instrument or assignment rule, not “high sovereign exposure” as a generic treatment. Freeze the pre-event security register.

Validate the comparison

Compare the same firm across banks; inspect pre-event outcomes and common support. Allow explicit deviations from parallel trends rather than treating a passed pre-test as proof.

Track total firm outcomes

Measure all-lender credit and actual capex. Government arrears, bank selection and borrower switching can alter both treatment and investment outcomes.

Missing access outcomes can change the observed size gap

Historical small/large participation of 17% / 43%; assumed missing mass within the same target domains.

Table 34. Assumption-based access and missingness envelopes

Assumed missing mass	Small-firm envelope	Large-firm envelope	Large – small envelope
0%	[16.5, 17.5]%	[42.5, 43.5]%	[25.0, 27.0] pp
5%	[15.7, 21.6]%	[40.4, 46.3]%	[18.8, 30.6] pp
10%	[14.8, 25.8]%	[38.2, 49.1]%	[12.5, 34.3] pp
20%	[13.2, 34.0]%	[34.0, 54.8]%	[0.0, 41.6] pp
30%	[11.6, 42.2]%	[29.8, 60.5]%	[-12.5, 48.9] pp

These are assumption-based bounds including source rounding—not survey confidence intervals or estimated nonresponse rates.

Payment-backing measures use distinct liability denominators

Fresh FSR Table 3.2 transcription; selected December records. All 12 dated rows are in the companion CSV.

Table 35. Additional liquidity measures by liability denominator

Year	Core / short liabilities	Liquid / deposits	Broad / short liabilities
2020	26.32%	28.85%	82.72%
2021	23.98%	27.48%	83.73%
2022	33.21%	36.47%	71.71%
2023	35.47%	37.61%	79.46%
2024	43.31%	48.16%	80.09%
2025	35.29%	39.54%	83.20%

No interpolation between December points; the 2024–2025 quarterly observations are separately dated in the data.

Cost-to-income improvement need not mean lower personnel costs

December 2024–December 2025; source-defined expenses relative to gross income.

Table 36. Expense-to-income ratios and their arithmetic residual

Measure	2024	2025	Change
Non-interest expenses / gross income	40.83%	35.20%	-5.63 pp
Personnel expenses / gross income	16.45%	17.11%	+0.66 pp
Arithmetic non-personnel residual	24.38%	18.09%	-6.29 pp

Residual interpretation assumes personnel costs are included in non-interest expenses under the same gross-income perimeter.

Uncertainty must match the design—not merely the software

Conditions for future bank–firm causal estimates; none is a completed Ghana correction.

Table 37. Identification and inference release requirements

Issue	Required evidence / procedure	Result when unmet
Assignment and exclusion	Actual award rule; sorting, balance and mechanism checks	Report local association, not an IV effect
Weak first stage	Dependence-appropriate weak-identification inference	Retain wide or unbounded confidence sets
Bank / auction dependence	Correct assignment cluster; effective cluster count; finite-sample sensitivity	Do not count loan rows as independent shocks
Observation and survival	Full roster; defined outcomes; overlap, weight tails and exit linkage	Coverage bounds and narrower population claim
Multiple outcomes and timing	Lock primary outcomes; disclose all horizons and deviations	No selective significance or pooled national effect

Use the additional diagnostics at their supported level of inference

Each finding is linked to a calculation, a decision question and the missing information.

Table 38. Evidence-to-decision register

Evidence	Decision question	Next required record
Tier 1 ratio +4.45 pp; total CAR +3.51 pp	What capital is usable after reliefs and RWA effects?	Capital components, deductions and RWA bridges
Core / broad liquidity 54.1% → 42.4%	How much can be paid without security monetisation?	Encumbrance, haircuts, cash-flow and depositor ladders
NPL-stock boundary at 15.17% loan growth	Did problem balances fall, or only their ratio?	Matched gross loans, NPLs, recoveries and write-offs
Published RD effects depend on design and bandwidth	What variation could identify a Ghana financing effect?	Auction assignment, bank–firm links and actual capex
Joint constraints differ from industry averages	Which banks can fund a viable incremental loan?	Bank-level capital, leverage, funding and demand

Unresolved source differences are kept visible

A reconciliation problem is not repaired by substituting a convenient denominator.

Table 39. Source exceptions: exposure and capital

Issue	Observed source detail	Treatment in this report
Government exposure comparison	FSR endpoint 25.1%; prose “from 49.5%” has an unclear comparison baseline	Use endpoint; do not report a 24.4 pp annual decline
Capital relief label	FSR Table 3.2 says CAR with reliefs	Retain treatment; no fully loaded inference
Government-debt holder subtotal	MoF table 42.6% including BoG; prose 41.6%	Use table and stock arithmetic; banks alone 25.1%
Cross-source holding amounts	Government claims, security-register holdings and bank investments differ	No invented residual or merged valuation universe

Sources: FSC Ghana, FSR 2025; MoF, 2025 debt report. [S01](#), [S02](#).

Source precision is different from statistical uncertainty

Document what was retrieved, what was reconstructed and what remains unavailable.

Table 40. Source exceptions: prices, precision and scope

Issue	Evidence retained	Restriction
DDEP weighted summary	Published yield change is –1,152 bp; all 12 rows negative	Closing instrument weights are not banks’ actual portfolio weights
Rounded holder values	Source amounts to GHS 0.1 million; shares to 0.1 pp	Published total controls shares; rounding residue disclosed
Published bank stress outputs	All Table 7.1 counts checked against original page image	No independent replication of confidential bank model
Later bank data	Detailed 2026 banking reports not reliably retrieved	No fabricated September 2026 observation
Enterprise profile	Historical published rounded participation estimates	No new survey variance or all-MSME generalisation

Definitions reproduce the observed comparisons and decompositions

Reported rate differences are percentage points; monetary tables identify GHS million or billion.

Table 41. Accounting definitions and measurement conventions

Quantity	Formula	Interpretation
Holding growth	$100 \times (H1/H0 - 1)$	Percent change of source stocks
Holder share	$100 \times H/T$	Holder's fraction of the government debt stock
Scale–mix identity	$\Delta H = \text{mean}(s)\Delta T + \text{mean}(T)\Delta s$; $H = sT$	Exact two-factor accounting; not purchases or causation
Capital ratio	$100 \times \text{eligible capital} / \text{RWA}$	Retain source capital treatment
NPL ratio / coverage	NPL/gross loans; provisions/NPL	Different denominators; not a new-borrower PD
Sector NPL HHI	Sum of squared percentage shares	Concentration across source categories, not bank competition

Source: IDER calculations; definitions and assumptions in author's notes.

The annual comparison retains one source vintage

FSR Table 3.2; December observations; percentages.

Table 42. Annual capital and asset-quality inputs

Year	CAR with reliefs	Tier 1 / RWA	NPL / loans	Provisions / NPL	Net NPL / capital
2020	19.83	17.88	14.82	84.28	5.24
2021	19.60	17.88	15.12	81.26	6.16
2022	15.44	14.25	16.59	83.58	10.32
2023	13.87	11.04	20.58	73.19	14.55
2024	14.00	11.13	21.79	78.74	11.10
2025	17.51	15.58	18.92	78.82	7.62

All values are source percentages. The companion CSV also includes eight consecutive 2024–2025 quarterly records.

The same annual records support profitability and liquidity comparisons

FSR Table 3.2; December observations; source-defined percentages.

Table 43. Annual profitability and liquidity inputs

Year	ROA	ROE	Core liquidity / assets	Broad liquidity / assets
2020	4.36	21.40	20.06	63.04
2021	4.57	20.91	18.50	64.61
2022	-3.83	-25.48	27.53	59.45
2023	5.37	34.16	29.34	65.72
2024	5.04	30.84	36.16	66.87
2025	5.66	30.81	28.78	67.85

Government-debt holding stocks remain distinct from bank balance sheets

MoF Table 8.8; GHS million; end-2024 revised / end-2025 provisional.

Table 44. Marketable government-debt holdings by investor

Holder	2024	2025
Bank of Ghana	58,585.5	58,275.8
Banks	77,171.4	83,825.9
Pension funds	24,196.2	31,274.2
Insurance	2,375.7	2,791.1
Individuals	43,108.6	43,568.2
Rural banks / firms / institutions	89,924.4	100,121.0
Foreign investors	13,415.0	13,449.0
TOTAL (reported)	308,776.8	333,305.1

Rounded row sums can differ from published totals by GHS 0.1 million. No balancing item is invented.

DDEP price and yield observations 1 / 2

MoF Table 8.10; end-2025 levels and calendar 2025 changes; source precision retained.

Table 45. DDEP bond observations: maturities 2027–2032

Maturity	Coupon (%)	Closing yield (%)	Price / 100	Price change (%)	Yield change (bp)
2027	8.35	14.94	93.34	+32.28	-1196
2028	8.50	14.48	89.33	+46.08	-1288
2029	8.65	15.00	84.55	+52.31	-1174
2030	8.80	15.19	80.87	+60.23	-1155
2031	8.95	15.39	77.68	+71.36	-1210
2032	9.10	15.47	75.30	+67.26	-1063

Prices and price changes are not total investment returns. The companion file includes each instrument’s outstanding amount.

DDEP price and yield observations 2 / 2

MoF Table 8.10; end-2025 levels and calendar 2025 changes; source precision retained.

Table 46. DDEP bond observations: maturities 2033–2038

Maturity	Coupon (%)	Closing yield (%)	Price / 100	Price change (%)	Yield change (bp)
2033	9.25	15.80	72.44	+29.28	-446
2034	9.40	15.00	74.15	+39.56	-580
2035	9.55	15.11	72.92	+80.41	-1105
2036	9.70	15.84	69.43	+100.93	-1362
2037	9.85	16.10	68.06	+84.70	-1158
2038	10.00	15.70	69.47	+91.93	-1230

Prices and price changes are not total investment returns. The companion file includes each instrument’s outstanding amount.

The model’s conditions are explicit and independently reproducible

The purpose is sensitivity measurement, not an institution-specific capital certification.

Table 47. Conditional bank-stress equations and boundaries

Module	Exact equation or condition	Boundary
Recognised capital	$C'=C-\alpha qS-\ell P$	Losses incremental after opening allowances
Headroom	$H=C'-k(RWA+\Delta RWA)$	Hurdle assumed; not a universal legal threshold
Loan ceiling	$\max[0,H/(kw+p)]$	Gross marginal RWA; 1% origination net loss
Reverse stress	$q^*=[C-\ell P-k(RWA+\Delta RWA)]/(\alpha S)$	Defined only when $\alpha S>0$; negative root means initial shortfall
Bond value	$PV=\sum CF_t/(1+y)^t$	Annual regular cash flows; not actual DDEP pricing
Feasible lending	$\min(\text{capital},\text{funding},\text{liquidity},\text{demand},\text{other limits})$	No guarantee that the ceiling is used

Source: IDER calculations under stated assumptions.

Inputs, calculations and the report’s data can be checked separately

The companion package contains frozen source tables, code, output files and author’s notes.

Table 48. Data, numerical and publication controls

Validation layer	Evidence supplied	What it does not establish
Primary sources	Exact documents, table locators, page-image checks and exception ledger	Independent audit of original bank submissions
Numerical replay	Holdings identities, ratio changes, stress arithmetic and root checks	Behavioural or causal validity of assumed model
Display integrity	Editable chart data, table register and rendered-page review	External institutional certification
Source-date discipline	End-2025 main endpoints; historical access and DDEP evidence labelled	A current September 2026 bank balance-sheet assessment
Next-stage research	Empty linked-data templates and a conditional identification protocol	Access to confidential records or a completed causal study

Use consistent terms for exposure, capital and credit

Definitions apply to figures, tables, data files and author’s notes.

Table 49. Abbreviations and statistical conventions

Term	Meaning	Convention
GoG / BoG / MoF	Government / Bank of Ghana / Ministry of Finance	Different issuer and institutional roles
CAR / RWA	Capital adequacy ratio / risk-weighted assets	Ratio treatment and denominator stated
Tier 1 / NPL / ECL	Core regulatory capital / nonperforming loan / expected credit loss	Not interchangeable measures
pp / bp	Percentage points / basis points	1 pp = 100 bp; not relative percent growth
GHS mn / GHS bn	Ghana cedi million / billion	GHS 1 bn=GHS 1,000 mn
Headroom / capacity	Capital above hurdle / conditional new-loan ceiling	Neither equals cash or realised investment
Causal / descriptive	Identified intervention effect / measured association or identity	Causal label requires defensible counterfactual

Source: IDER analytical framework; definitions and assumptions in author’s notes.

References and source links 1 / 4

Clickable source titles; full source versions and review status are in the companion register.

S01	Financial Stability Council, Ghana 2025 review; accessed 20 September 2026 Financial Stability Review 2025 FSR Table 3.2, PDF p. 31; Table 3.1 and leverage, p. 29; asset/funding pp. 27–28; Table 7.1 p. 50.
S02	Ministry of Finance, Ghana 2025 financial year; published 2026 Annual Public Debt Report for the 2025 Financial Year Tables 5.1 (PDF p. 27), 8.8 (p. 46), 8.10 (p. 48). End-2025 provisional; 2024 revised where marked.
S03	World Bank 2024 8th Ghana Economic Update: Strengthening Domestic Revenue Systems for Fiscal Sustainability Financial-sector fiscal risks, printed p. 18 / PDF p. 29. Historical 2022 DDEP impairment evidence.
S04	International Monetary Fund December 2025 Ghana: Fifth Review under the Extended Credit Facility Country Report 25/343. Financial-sector discussion, printed pp. 23–25; staff report completed 3 December 2025.

References and source links 2 / 4

Clickable source titles; full source versions and review status are in the companion register.

S05	Basel Committee on Banking Supervision December 2017 <u>The Regulatory Treatment of Sovereign Exposures—Discussion Paper</u> Historical discussion paper and accompanying publication record. It did not itself change the Basel treatment.
S06	Basel Committee on Banking Supervision October 2018 <u>Stress Testing Principles</u> Objectives, governance, resources, methodology, documentation and use of stress testing.
S07	IFRS Foundation Official overview accessed September 2026 <u>IFRS 9 Financial Instruments</u> Classification, measurement and expected-credit-loss overview.

References and source links 3 / 4

Clickable source titles; full source versions and review status are in the companion register.

S08	Khwaja, Asim Ijaz, and Atif Mian 2008 Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market American Economic Review 98(4): 1413–1442. DOI 10.1257/aer.98.4.1413.
S09	Önder, Yasin Kürşat; Sara Restrepo-Tamayo; Maria Alejandra Ruiz-Sanchez; Mauricio Villamizar-Villegas 2024 Government Borrowing and Crowding Out American Economic Journal: Macroeconomics 16(1): 286–321; DOI 10.1257/mac.20200273. Accepted manuscript: Table 4, PDF p. 21; design pp. 12–20; investment definition p. 9.
S10	World Bank Enterprise Surveys 2024; survey fieldwork 2023–2024 Ghana 2023 Country Profile Coverage pp. 2–3; Figure 14 p. 7; finance appendix pp. 11–12.

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S12	Cole, Stephen R., and Miguel A. Hernán 2008 <u>Constructing Inverse Probability Weights for Marginal Structural Models</u> American Journal of Epidemiology 168(6): 656–664. DOI 10.1093/aje/kwn164.
S13	Rambachan, Ashesh, and Jonathan Roth 2023 <u>A More Credible Approach to Parallel Trends</u> Review of Economic Studies 90(5): 2555–2591. DOI 10.1093/restud/rdad018. Introduction and identification framework.

Assess private-investment capacity through capital, cash and credit quality

Government holdings are an exposure—not a direct measure of credit displaced or investment financed.

What is measured

Bank government-debt holdings increased; reported CAR and NPLs changed; published stress tests show liquidity sensitivity. Each uses its own source, date and denominator.

What the model shows

Sovereign losses, private-credit losses and rising RWA can jointly reduce headroom. Strong capital alone does not supply funding, liquidity or viable loan demand.

What supports decisions

Link security-level cash flows, usable capital, asset quality and actual firm financing. Test credible shocks and sample coverage before reporting causal effects.



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