

GoldBod and Ghana's Gold Economy

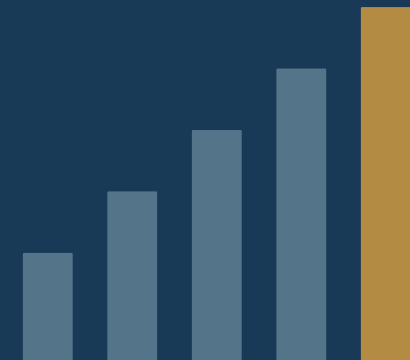
Exports, Foreign Exchange and Public Financial Exposure

Purchases. Exports. Receipts. Financing. Public exposure.

Commissioning institution: Institute of Development and Economic Research (IDER)

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About this publication

Independent research • transparent evidence • reproducible calculations

TITLE AND SERIES

GoldBod and Ghana’s Gold Economy: Exports, Foreign Exchange and Public Financial Exposure

IDER’s Ghana Macroeconomic Policy and Business Intelligence Briefings

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RESPONSIBILITY AND INTERPRETATION

Independent IDER research; citations imply no endorsement. No national causal production effect, consolidated public profit or investment return is estimated. A source discrepancy is not proof of loss or misconduct.

DATA, CODE AND ENQUIRIES

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Report pages and slide numbers match; entries link to their destinations.

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NAVIGATION Running headers return to Contents. Source IDs link to the register; model headings and equations return to the index.

Follow the metal, the claim and the cash through one chain

Five linked accounts: purchases, exports, receipts, financing and public exposure.

01 PHYSICAL ACCOUNT

Measure gross and fine gold, ownership, inventory, exports and deliveries to BoG. An assay can occur without GoldBod purchasing or exporting the gold.

02 CASH AND INCOME

Match invoices, receipts, fees, loans, grants and operating costs. Financing receipts are not sales; reported exports are not necessarily settled cash.

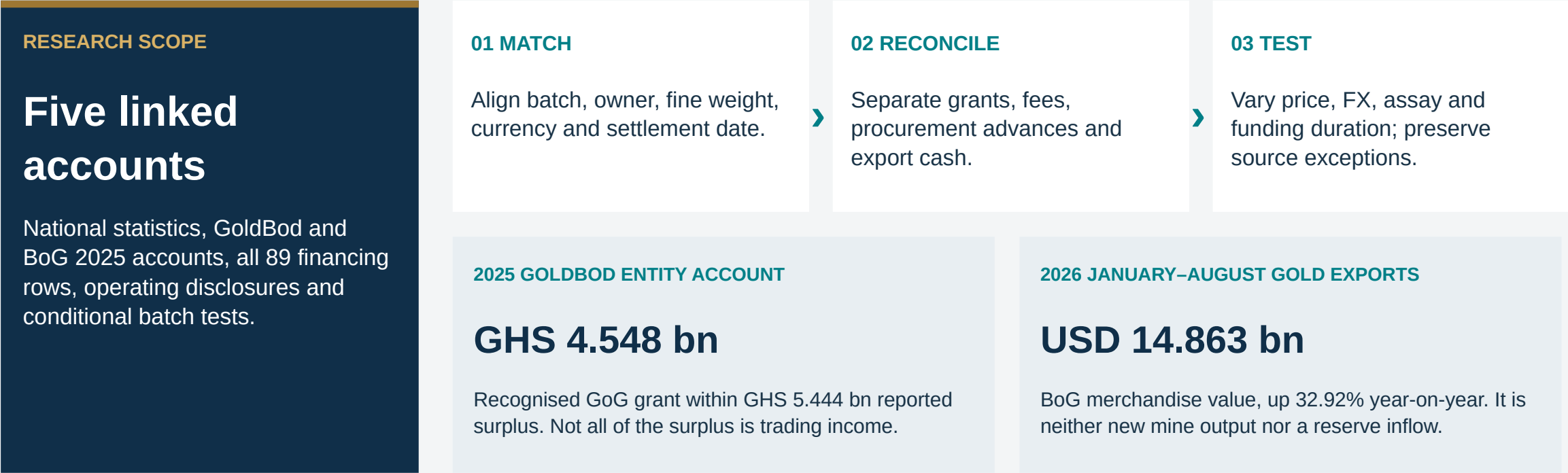
03 PUBLIC ADDITIONALITY

Separate new physical output from capture of existing trade. Consolidate public entities before assessing public costs; keep benefits, risks and attribution distinct.

Sources: IDER calculations [\[S99\]](#).

More recorded gold is not automatically more production or free FX

Research question: what reconciles across the metal, trading, banking and public-finance records?



Sources: BoG September bulletin [\[S01\]](#); GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Source perimeters differ. Accounting and scenarios do not identify a national production effect or consolidated fiscal result.

Do not substitute one gold-economy headline for another

For public finance, banks, miners, exporters, investment teams and evidence users.

OWN-ENTITY SURPLUS

GHS 896.290 m

Reported 2025 surplus less recognised grant. This arithmetic is not consolidated public profit; inter-public fees remain.

MISSING SUPPLY FIELDS

GHS 12.186 bn

Funding on 11 ledger rows without a listed supply. Deleting them changes the comparison denominator; neither missingness nor the ratio measures default.

ASSUMED BATCH ECONOMICS

12.78 days

Zero-margin funding duration in the stated 100 kg case. Price, purity, payability, FX and costs must be replaced with actual contract terms.

Sources: GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Entity accounts, source discrepancies and scenario thresholds are distinct evidence objects.

A 180-day programme can make the five accounts auditable together

Proposed sequence after authorised access, data protection and institutional approval.

DAYS 0–30	DAYS 31–90	DAYS 91–180
PROPOSED OWNER GoldBod / BoG / MoF / GRA Freeze entities, legal versions, batch IDs, reporting currencies and ownership. Record source-date and valuation differences. ACCEPTANCE TEST Every captured record has an owner, period, unit and evidence status.	PROPOSED OWNER Accounts / operations / banks Link purchases, assays, customs, refinery settlements and bank credits. Reconcile balances without deleting missing stages. ACCEPTANCE TEST Report count and value linkage; identify every material residual.	PROPOSED OWNER IDER / independent reviewers Publish scoped consolidated accounts and empirical designs. Separate production from recording and quantify supported uncertainty. ACCEPTANCE TEST Independent replay; unsupported causal and national totals remain unestimated.

Sources: IDER calculations [\[S99\]](#).

Note: Milestones are research and reconciliation deliverables, not institutional commitments or a promise of a positive fiscal result.

Abbreviations and reading terms

The same quantity or currency label does not establish a common ownership or accounting perimeter.

GoldBod	Ghana Gold Board.
BoG / MoF	Bank of Ghana / Ministry of Finance.
GRA / GSS	Ghana Revenue Authority / Ghana Statistical Service.
ASM / LSM	Artisanal and small-scale / large-scale mining.
DGPP	Domestic Gold Purchase Programme.
G4Fx / G4R / G4O	Source trading-ledger programme identifiers; not income categories.
SAC	Adjustment identifier used in the trading ledger; scope requires agreement.
FX / GHS / USD	Foreign exchange / Ghana cedi / US dollar.
kg / t / oz	Kilogram / metric tonne / troy ounce.

XRF	X-ray fluorescence; local assay measurement method.
GIR / NIR	Gross / net international reserves; source definitions govern.
CFO / CFI / CFF	Cash flows from operations / investing / financing.
IPSAS	International Public Sector Accounting Standards.
MoU / DSA	Memorandum of understanding / debt sustainability analysis.
VA / GDP	Value added / gross domestic product; not export turnover.
DiD / ATT	Difference-in-differences / average treatment effect on the treated.
MAR / MNAR	Missing at random / missing not at random.
pp / %; m / bn	Percentage points / percent; million / billion.

How to interpret the evidence

Read the source, time basis and ownership boundary before using a number.

AUDITED ENTITY ACCOUNT

Financial statements and notes for GoldBod as an entity. The audit opinion does not automatically cover directors' operating claims or all public-sector gold costs.

PUBLISHED ADMINISTRATIVE RECORD

National trade tables, mine-size records and funding schedules retain their source definitions. Publication does not establish batch-to-bank reconciliation.

ATTRIBUTED INSTITUTIONAL ASSESSMENT

IMF staff assessments and authority statements are identified as such. A target or expected audit date is not a verified achieved outcome.

ORIGINAL ACCOUNTING CALCULATION

Ratios, residuals and value decompositions follow disclosed source inputs. Arithmetic closure does not prove legal ownership, cash recovery or causality.

CONDITIONAL BATCH SCENARIO

Price, purity, payability, FX, charges and dates are imposed. Ranges are not confidence intervals, forecasts or quoted transaction terms.

PROSPECTIVE CAUSAL RESEARCH

Mine, dealer and banking panels and a credible treatment comparison are still required. No national causal production or public-profit coefficient is fitted.

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Physical gold and ownership

Definitions of key technical terminology — meaning, measurement and interpretation.

Doré and fine gold

Doré is an unrefined alloy. Fine gold is the contained pure-gold mass. A 100 kg bar lot at 92% gold contains 92 fine kg before refining losses.

Troy ounce

A gold-market mass unit equal to 31.1034768 grams. Ordinary ounces and an unexplained “pound” price cannot be substituted in the conversion.

Assay and payability

Assay measures purity. Payability is the contract fraction paid for after specified deductions or recovery terms. The two adjustments must not be counted twice.

Ownership and custody

The owner bears the asset claim; a custodian physically holds it. Assayed or vaulted gold is not automatically GoldBod-owned inventory.

Fine-gold inventory balance

Opening owned fine gold plus acquisitions equals exports, deliveries, documented losses and closing stock on a matched ownership basis.

Batch lineage

A stable identifier links mine or seller, purchase, assay, split/merge, export and refinery receipt. One parcel may otherwise appear repeatedly as throughput.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Production, recording and trade

Definitions of key technical terminology — meaning, measurement and interpretation.

Mine production

Gold physically extracted during a stated period. Formal exports can include older stock, redirected trade or non-domestic origin and cannot substitute for a production census.

Formal capture

The share of underlying activity that enters a defined reporting channel. A higher recorded quantity can occur with unchanged physical production.

Export value and unit value

Export value divided by compatible export mass gives an implicit unit value. It combines price, purity, product mix, timing and measurement—not only world price.

Price–quantity decomposition

An exact accounting split of value growth into quantity and unit-value contributions, averaging both update orders. It does not establish the causal origin of either change.

Source perimeter

The entities, gold types, periods and transactions included. GoldBod assay, GoldBod-owned sales and national merchandise exports can have different boundaries.

Domestic value added

The value of production less intermediate goods and services. Trading turnover and export proceeds are not automatically GDP or new national income.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Receipts, financing and reserves

Definitions of key technical terminology — meaning, measurement and interpretation.

Invoice versus bank receipt

An export invoice creates a claim; a bank value date records cash received. Advance funding, deductions and unpaid balances must be traced separately.

Offtaker pre-financing

Money advanced against future deliveries. It creates a delivery or repayment obligation and is not earned export revenue simply because cash arrives.

Gross and uncommitted FX

Gross receipts can fund loan repayments, external fees and restricted obligations. The remainder is not automatically added to central-bank reserves.

Gross and net reserves

Reserve definitions differ by eligibility and liabilities. BoG's programme gross measure excludes specified assets; NIR is not identical to headline GIR.

Valuation gain

A stock's value changes with gold price or exchange rate even without cash receipt. Unrealised revaluation must not be described as export earnings.

Settlement and currency mismatch

Purchase and sale cash may be fixed in different currencies on different dates. A cedi appreciation after purchase can reduce cedi proceeds from the same dollar receipt.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Accounts and public exposure

Definitions of key technical terminology — meaning, measurement and interpretation.

Grant-inclusive surplus

An entity's reported surplus can include a government grant. Removing it is an arithmetic sensitivity, not a complete measure of commercial or public-sector profitability.

Inter-public transfer

A grant or fee between public entities is income for one and cost for another. Consolidation removes matched internal flows without erasing external resource costs.

Procurement advance

Funding for future gold acquisition or supply. Its outstanding balance is a receivable/payable, not automatically a realised loss or freely spendable revenue.

Operating cash flow

The reported operating cash movement can include grants, prepayments and creditor changes. It must not be equated to a sustainable trading margin.

Contingent exposure

A possible future public payment under a guarantee, contract or support commitment. Report terms and triggers; a nominal ceiling is not an expected loss.

Source residual

The remaining difference after a stated reconciliation. Record its amount and likely scope issues without forcing zero or labelling it misconduct.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Batch economics and controls

Definitions of key technical terminology — meaning, measurement and interpretation.

Locked purchase cost

The cedi amount already committed at purchase. Later price or purity shocks should not retroactively reduce this cost in a downside test unless the contract permits adjustment.

Purchase discount and sale deduction

A discount reduces the purchase benchmark; a sale deduction reduces realised proceeds. Different bases mean their percentages cannot simply be subtracted.

Financing duration

The time funded principal remains outstanding. A partial receipt lowers later principal exposure; financing costs must follow event dates.

Break-even price or FX

The settlement price or exchange rate that makes the specified batch margin zero. It is conditional on cost, purity, delay and contract assumptions.

Liquidity versus profitability

A positive accounting margin can coexist with a cash shortfall before receipts arrive. Conversely, an advance produces liquidity before profit is earned.

Responsible sourcing

Evidence links a seller and mine to legal and environmental requirements and supply-chain risk checks. Purity testing alone does not establish lawful or responsible origin.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Identification and selection

Definitions of key technical terminology — meaning, measurement and interpretation.

Counterfactual

The outcome that would have occurred without the intervention. A before–after increase also contains world-price, exchange-rate, stock and recording changes.

Endogeneity

Policy exposure, compliance and trading participation may respond to the same factors as recorded exports. A fitted correlation can therefore misstate a causal policy effect.

Difference-in-differences

A comparison of outcome changes between supported treatment and comparison groups. Timing, parallel trends, overlap and spillovers must be justified before causal language.

Mediation

A mechanism through which an intervention acts, such as a reporting-channel change. Controlling for it can remove part of the total effect being studied.

Selection and survivorship

Observed licensed, financed or surviving operators may exclude informal sellers, failed buyers and unpaid claims. Start from a documented eligible roster.

Missing-outcome bounds

A range consistent with observed response and defensible limits on missing outcomes. Such a range is not a confidence interval and does not itself solve treatment assignment.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Measurement and inference

Definitions of key technical terminology — meaning, measurement and interpretation.

Cumulative versus monthly flow

A year-to-date total contains earlier months. Derive a quarter by differencing comparable cumulative releases; do not add overlapping totals.

Stock versus flow

Inventory, cash and outstanding finance are measured at a date. Purchases, receipts and costs cover periods; stock/flow ratios need matched interpretation.

Rounding versus material difference

Small residuals may reflect printed precision. A larger ledger-to-note discrepancy still needs an explicit bridge; “rounding” is not a universal explanation.

Confidence versus scenario range

A confidence interval concerns sampling uncertainty under a statistical model. A grid of assumed price and FX shocks is a conditional sensitivity, not a probability distribution.

Clustering and common shocks

Outcomes within a mine, buyer network or price period can share shocks. Repeating a national intervention value across many rows does not create independent treatment variation.

Double robustness

Under a valid difference-in-differences design, one of two nuisance models may be sufficient for consistency. It does not eliminate unmeasured confounding or repair absent comparison data.

Sources: IDER calculations [\[S99\]](#).

Note: Reading definitions do not establish transaction-specific legal status, certification, causal effects or investment suitability.

Five accounts answer five different questions

The unit, owner, period and currency are fixed before any totals are compared.

Table 1. Five accounts answer five different questions

Account	Measure	Needed reconciliation
Purchases	Owned fine gold and acquisition cost	Seller, batch, assay, title and payment.
Exports	Shipped mass, compatible value and receivable	Customs, logistics, owner, refinery and invoice.
Receipts	Bank-confirmed cash by value date	Invoice balance, advances, deductions and currency.
Financing	Outstanding principal, interest and obligations	Lender, maturity, collateral and repayment.
Public exposure	External costs and risks across public entities	Inter-entity elimination and contingent commitments.

Sources: IDER calculations [\[S99\]](#).

Assaying, purchasing and exporting are not interchangeable roles

Official operational descriptions do not substitute for transaction-level ownership records.

Table 2. Assaying, purchasing and exporting are not interchangeable roles

Role	Evidence that establishes it	What must not be inferred
National assayer	Batch assay certificate and scope	All gold assayed was owned or funded by GoldBod.
Buyer / principal	Purchase agreement, payment and title	Gross facilitated exports are its sales revenue.
Agent / service provider	Fee agreement and client identification	The client’s gold value is agency income.
Exporter / offtaker	Export declaration and sale contract	The entire invoice was received as usable cash.
Reserve owner / custodian	BoG title, eligibility and custody record	Physical gold in custody is freely available reserves.

Sources: GoldBod official mandate [\[S09\]](#); GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Convert mass only after purity and unit conventions are fixed

One metric tonne = 1,000 kg; one troy ounce = 0.0311034768 kg.

Table 3. Convert mass only after purity and unit conventions are fixed

Example or concept	Correct treatment	Interpretation
100 kg at 92% gold	92 fine kg; 2,957.8687 fine troy oz	A declared illustration, not an observed GoldBod batch.
Gross doré versus fine gold	Keep both and the assay method	Do not subtract gross from fine mass as unexplained loss.
USD/oz versus GHS/kg	Convert purity, ounces and FX separately	Use purchase and sale fixing dates, not one annual rate.
Tonnes supplied to BoG	A delivery measure, not necessarily customs export	Do not add it to facilitated exports without batch deduplication.

Sources: IDER calculations [\[S99\]](#).

A gold transaction can appear in different periods in five systems

Link dates rather than forcing every stage into the purchase month.

Table 4. A gold transaction can appear in different periods in five systems

Event	Date to retain	Balance generated
Advance received	Bank value date	Funding liability or delivery obligation.
Gold purchased	Title / payment date	Owned inventory and supplier settlement.
Shipment	Customs / departure date	Goods in transit or export receivable.
Refinery settlement	Final assay / fixing date	Final payable value and adjustments.
Receipt and repayment	Bank value date and creditor settlement	Cash and remaining obligation.

Sources: IDER calculations [\[S99\]](#).

Recorded small-scale production rose before GoldBod’s first year

Minerals Commission annual rows; source-labelled troy ounces, 2023–2024.

Table 5. Recorded small-scale production rose before GoldBod's first year

Source scope	2023 production oz	2024 production oz	Change
Large scale	2,900,269.57	2,891,070.24	−0.32%
Small scale	1,204,175.00	2,200,143.00	82.71%
Published ALL	4,107,932.57	5,091,213.24	23.94%

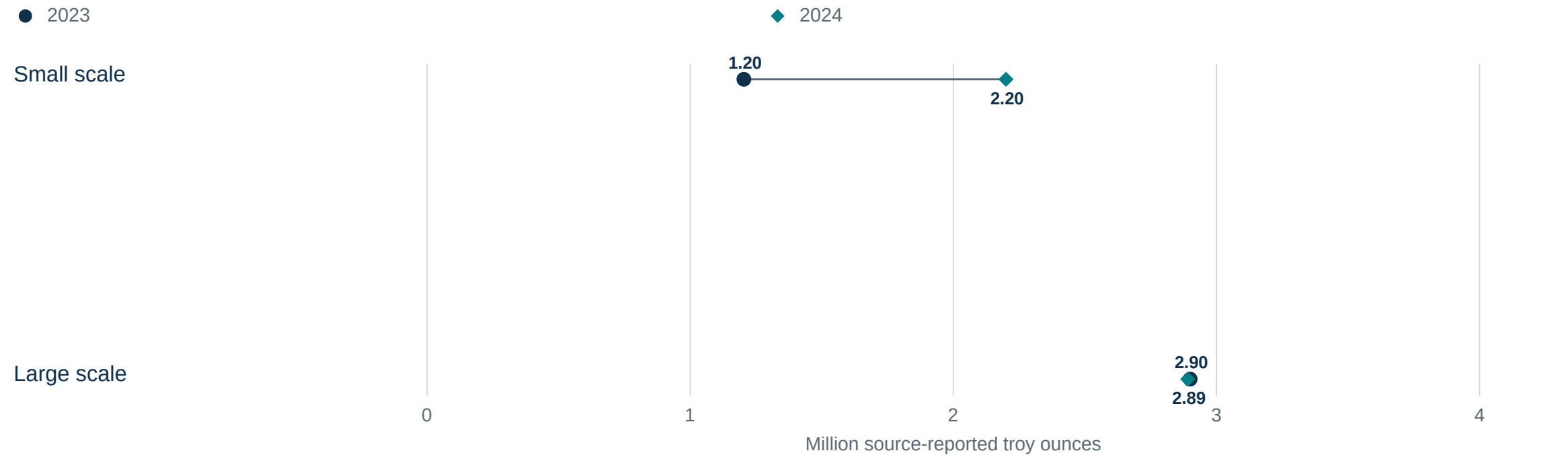
Sources: Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: Recorded output is not independently verified physical extraction; the source's 2023 component sum differs from ALL.

The recorded ASM and LSM paths were different in 2023–2024

Source-labelled production, million troy ounces; not a causal GoldBod comparison.

Figure 1. The recorded ASM and LSM paths were different in 2023–2024



Sources: Minerals Commission database [\[S08\]](#).

Note: Two pre-period observations cannot establish parallel trends or distinguish physical output from better capture.

Published national exports do not fully equal the mine-size rows

Minerals Commission 2024; retain the ALL total and its component residual.

Table 6. Published national exports do not fully equal the mine-size rows

Measure	Published ALL	Large + small scale	Residual
Production (oz)	5,091,213.24	5,091,213.24	0.00
Export quantity (oz)	5,099,947.31	4,553,410.19	546,537.12
Export value (USD)	11,641,292,582.25	9,594,649,176.00	2,046,643,406.25

Sources: Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: The export-value residual is USD 2.047 bn; no allocation to a mine, origin or illegal trade is invented.

Value, quantity and implicit unit value must be read together

Minerals Commission ALL rows; a source comparison with unresolved component coverage.

Table 7. Value, quantity and implicit unit value must be read together

Year	Export mass, million oz	Export value, USD bn	Implicit USD/oz
2023	3.9543	7.3828	1,867.02
2024	5.0999	11.6413	2,282.63

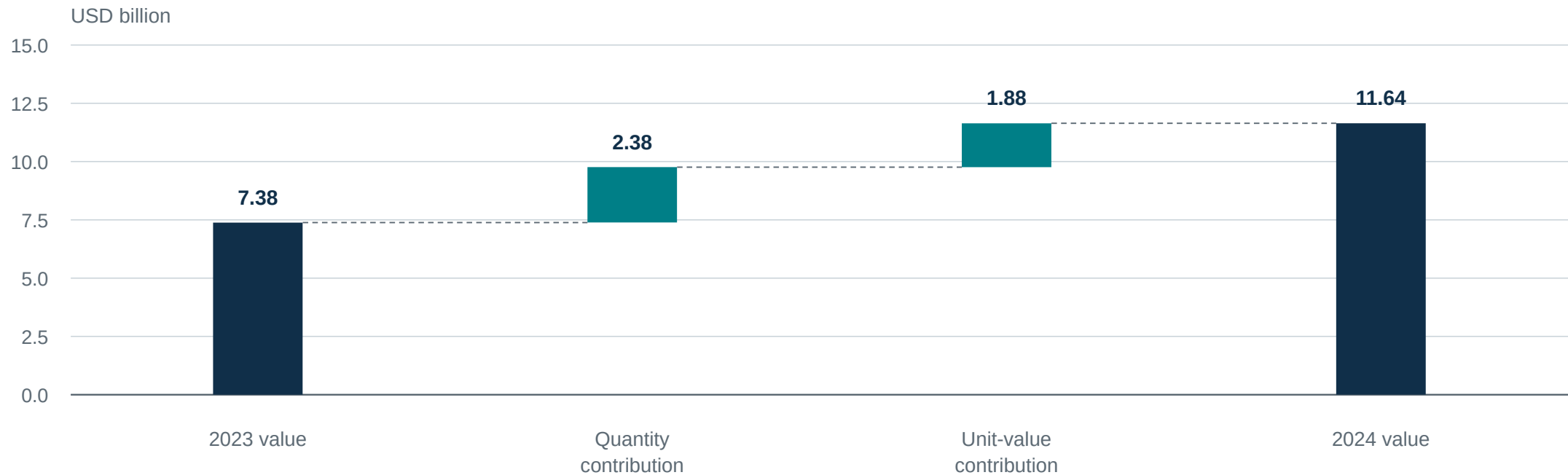
Sources: Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: The implicit value combines purity, mix, timing, pricing and source coverage. It is not an international-price observation.

Recorded export growth contains both quantity and unit-value changes

Exact symmetric decomposition of the ALL-row 2023–2024 value change.

Figure 2. Recorded export growth contains both quantity and unit-value changes



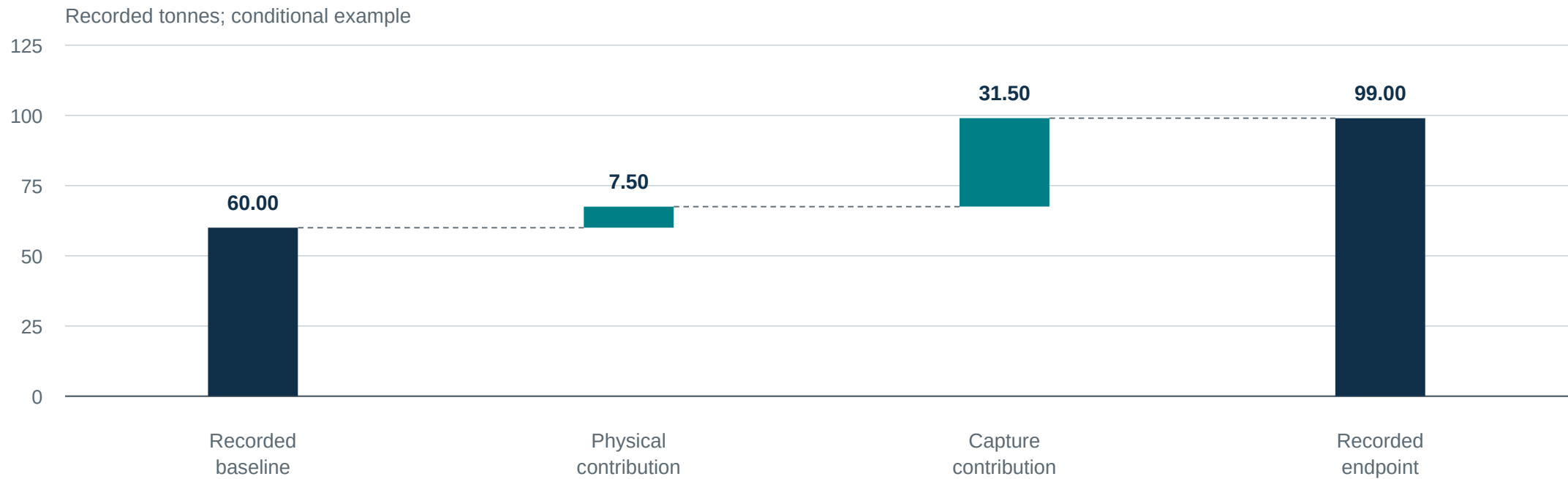
Sources: Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: Accounting attribution, not a production effect. Component-scope exceptions remain unresolved.

A large formal-recording gain can mostly reflect channel capture

Assumed physical production 100 → 110 tonnes; capture share 60% → 90%.

Figure 3. A large formal-recording gain can mostly reflect channel capture



Sources: IDER calculations [\[S99\]](#).

Note: No parameter is calibrated to Ghana. Production and recording contributions are symmetric accounting allocations.

A recorded increase has several observationally similar explanations

Separate these mechanisms before attributing a change to an institution.

PHYSICAL ADDITION

More mined gold requires mine-level tonnes, grade, recovery and production-period evidence. Price incentives, technology and other shocks remain alternative causes.

REDIRECTED RECORDING

A licensed channel can capture trade formerly recorded elsewhere or not recorded. A new invoice or buyer relationship need not mean new extraction.

STOCK AND ORIGIN

Inventory liquidation, transit, re-exports and changes in assay coverage alter exports. Match mine origin, stocks and customs procedures before claiming domestic addition.

Sources: Minerals Commission database [\[S08\]](#); GoldBod official mandate [\[S09\]](#); IDER calculations [\[S99\]](#).

Gold accounts for two-thirds of reported merchandise exports

BoG September 2026 vintage; January–August comparisons.

JAN–AUG 2025 USD 11.182 bn National merchandise gold exports for the corresponding eight-month period.	JAN–AUG 2026 USD 14.863 bn A 32.92% increase in recorded dollar value, not an identified change in mine production.	SHARE OF EXPORTS 66.23% Gold value divided by total merchandise exports of USD 22.440 bn, for the same period.
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Sources: BoG September bulletin [\[S01\]](#); IDER calculations [\[S99\]](#).
Note: Exports are period flows. Reserve stocks and recipient FX announcements have different definitions.

Quarterly and two-month flows are differences—not sums of cumulative totals

BoG 2026 gold exports, same release vintage.

Table 8. Quarterly and two-month flows are differences—not sums of cumulative totals

Window	Months	Export value, USD m	Arithmetic
Jan–Mar	3	5,255.5	5,255.5
Apr–Jun	3	7,243.8	12,499.3 – 5,255.5
Jul–Aug	2	2,363.9	14,863.2 – 12,499.3

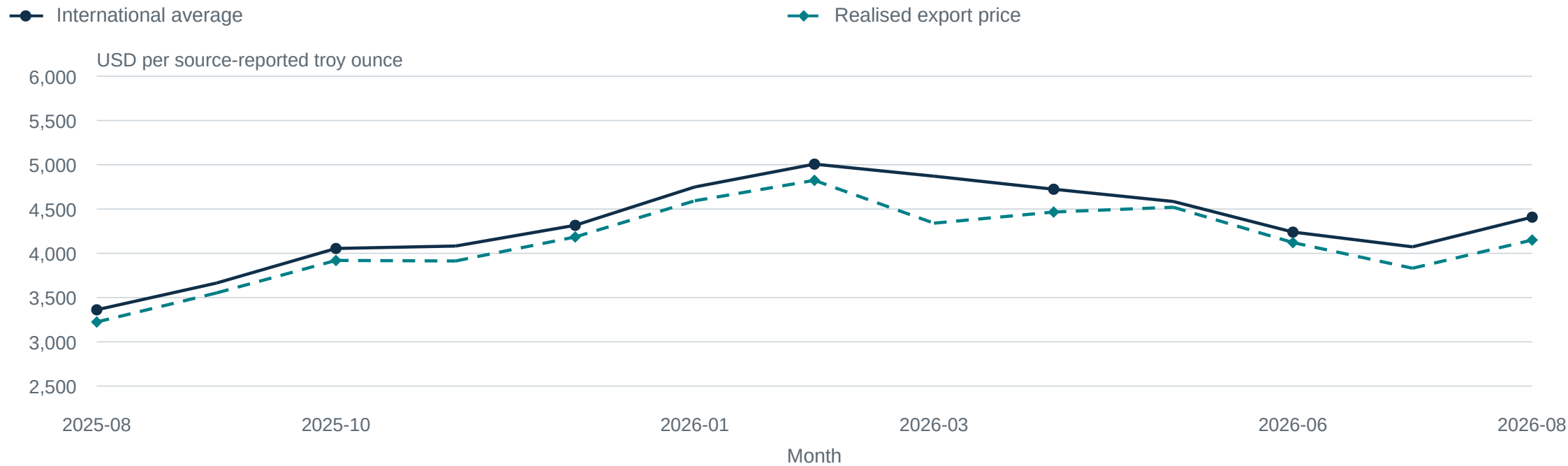
Sources: BoG September bulletin [\[S01\]](#); IDER calculations [\[S99\]](#).

Note: The final window contains two months; do not rank it against a quarter without a duration adjustment.

Published realised prices and international averages do not share one fixing

August 2025–August 2026; BoG monthly series.

Figure 4. Published realised prices and international averages do not share one fixing



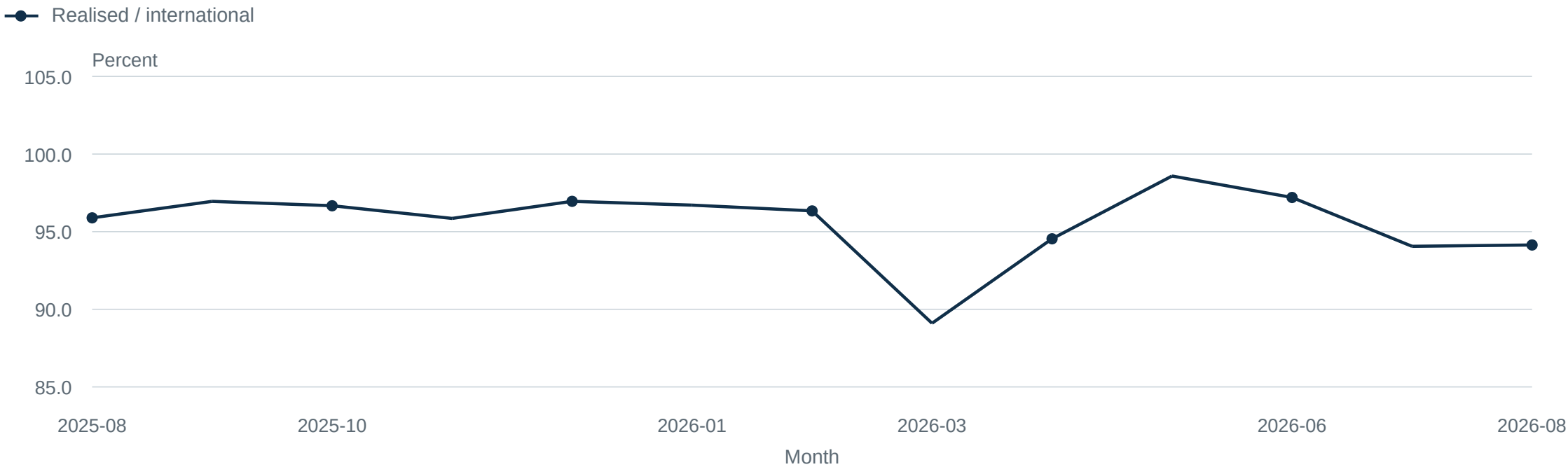
Sources: BoG September bulletin [\[S01\]](#).

Note: The gap is not a matched GoldBod sale discount or measured trading loss; volumes, contracts and fixing dates differ.

A monthly realisation ratio is a pricing diagnostic, not a loss rate

Realised export price divided by international average in the same source month.

Figure 5. A monthly realisation ratio is a pricing diagnostic, not a loss rate



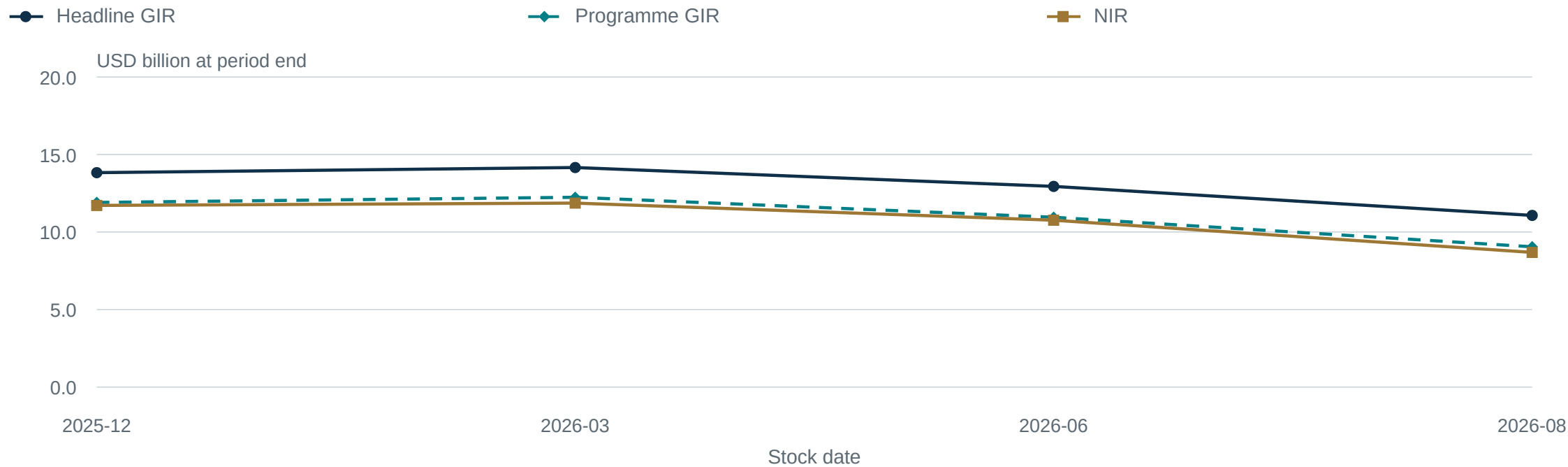
Sources: BoG September bulletin [\[S01\]](#); IDER calculations [\[S99\]](#).

Note: No premium, contract loss or causal policy effect is inferred without matched batches and quotation periods.

Gold export flows and reserve stocks can move in different directions

Selected dated BoG stocks; flows are not plotted on a second axis.

Figure 6. Gold export flows and reserve stocks can move in different directions



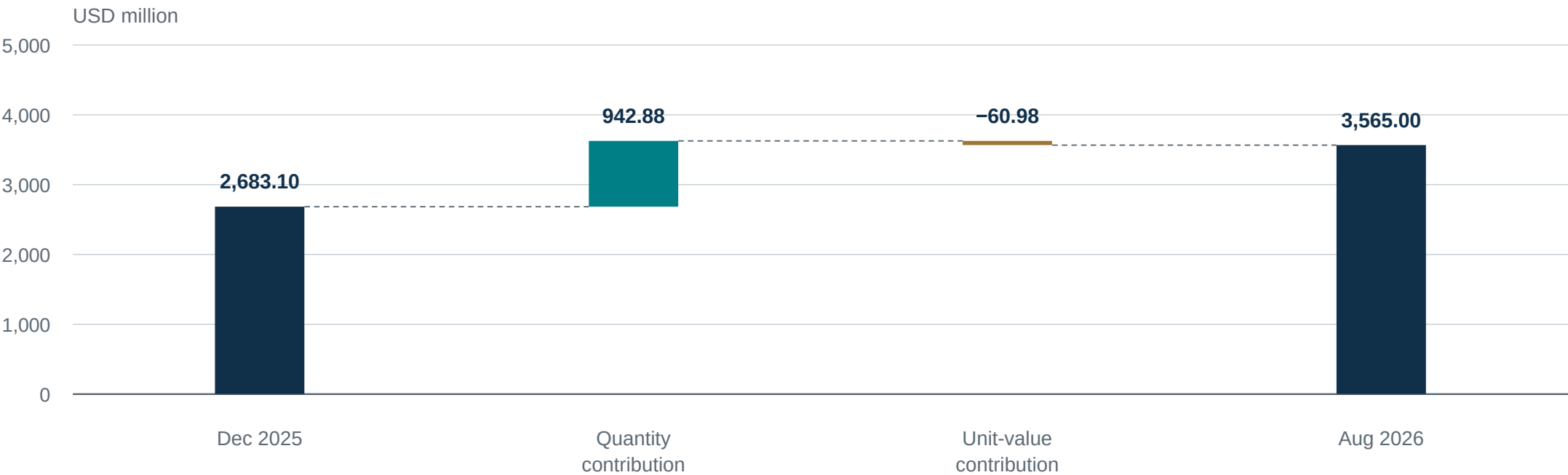
Sources: BoG September bulletin [\[S01\]](#).

Note: Differences reflect the source eligibility/liability definitions. This figure does not estimate the effect of gold flows on reserves.

The reported gold-value increase separates quantity from unit value

BoG December 2025 to August 2026: 18.6 → 25.2 tonnes; source includes refined and in-transit gold.

Figure 7. The reported gold-value increase separates quantity from unit value



Sources: BoG September bulletin [\[S01\]](#); IDER calculations [\[S99\]](#).

Note: This source-stock valuation bridge is not cash earned. Unit value also reflects the source asset composition.

The detailed 2025 ledger follows funding and supplies—not final export cash

Published totals, GHS billion except mass.

Table 9. The detailed 2025 ledger follows funding and supplies—not final export cash

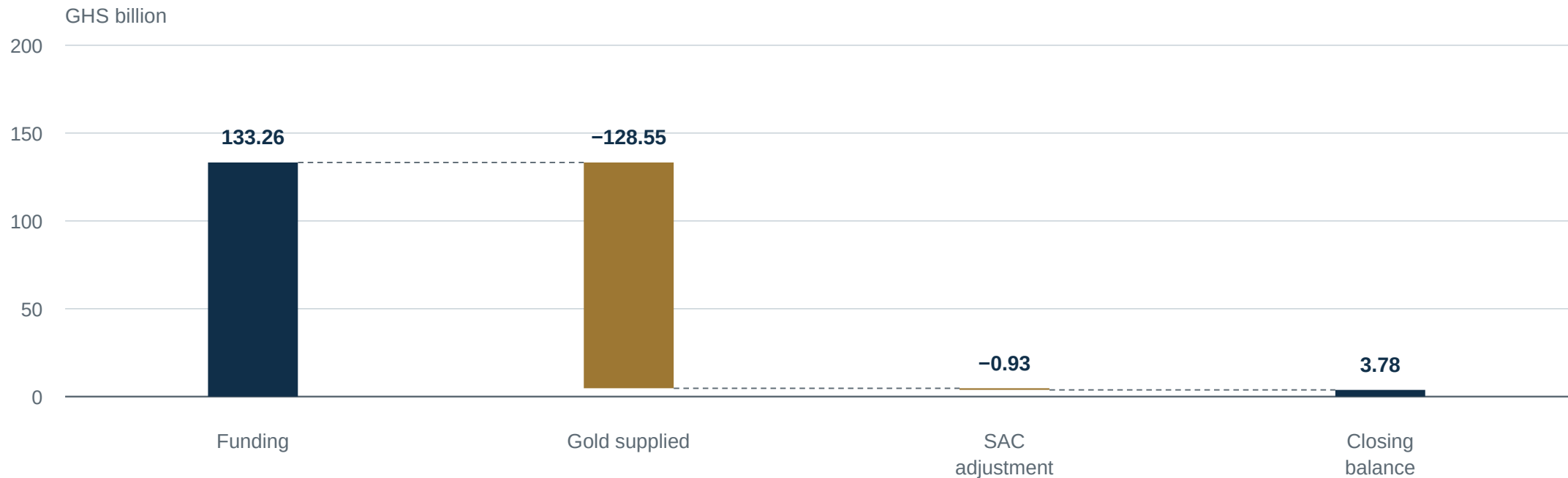
Field	Published amount	Meaning
BoG funding inflow	133.257808	Financing / procurement flow, not GoldBod sales revenue.
Expected cedi supply	132.292977	Source expectation; not a realised cost or fee by itself.
Actual cedi-valued supply	128.546046	Gold supplied to BoG under source valuation.
Mass supplied	80.76255 tonnes	Source mass; final export and fine-content mapping absent.
SAC adjustment	0.931322	Adjustment preserved as labelled in the source.
Closing balance	3.780439	Includes undisbursed funds; not automatically overdue.

Sources: GoldBod–BoG trade ledger [\[S03\]](#).

The published funding-to-supply bridge closes to GHS 3.780 billion

The SAC adjustment is deducted once; no invented balancing transaction.

Figure 8. The published funding-to-supply bridge closes to GHS 3.780 billion



Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Closure establishes source arithmetic, not bank confirmation, purchase profitability or maturity of outstanding obligations.

Three programme identifiers share the published financing ledger

Grouped from the 89 funding rows; dashes retained as missing supply records.

Table 10. Three programme identifiers share the published financing ledger

Programme	Rows	Funding, GHS bn	Listed supplies, GHS bn	Rows with no supply
G4Fx	78	120.4578	119.0517	6
G4O	2	2.8000	1.8456	1
G4R	9	10.0000	7.6487	4

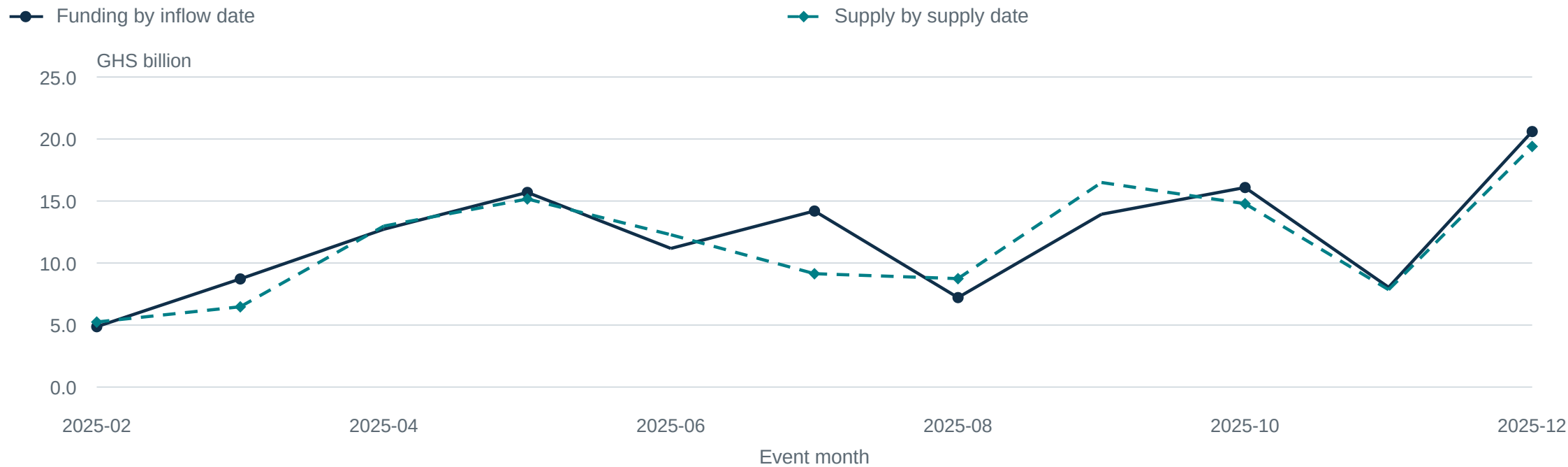
Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Grouping is by invoice prefix, not causal treatment. Do not infer final repayment or zero production from a blank supply field.

Funding months and supply months should be aggregated separately

2025 ledger; amounts follow their own event dates.

Figure 9. Funding months and supply months should be aggregated separately



Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Same-month gaps are not monthly profit or loan arrears. Opening positions, allocations and contract due dates are not recovered.

The transcribed rows retain the source’s small aggregation differences

All 89 funding rows; SAC applied once to the balance sum.

Table 11. The transcribed rows retain the source’s small aggregation differences

Field	Row sum	Published total	Difference
Funding inflow (GHS)	133,257,807,565.69	133,257,807,565.69	0.00
Expected supply (GHS)	132,292,977,097.86	132,292,977,097.86	0.00
Listed supply (GHS)	128,546,046,228.79	128,546,046,228.76	0.03
Listed mass (kg)	80,762.59	80,762.55	0.04
Balance after SAC (GHS)	3,780,439,313.01	3,780,439,313.03	−0.02

Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Mass rows sum to 80,762.59 kg versus the printed 80,762.55 kg. Small printed residuals are not forced to zero.

The ledger and audited DGPP payable are close—but not identical

2025 closing records, GHS; same named counterparty, not a completed instrument-level bridge.

TRADE REPORT	AUDITED NOTE	UNRESOLVED DIFFERENCE
3,780,439,313.03 Funding less valued supplies and the stated SAC adjustment.	3,780,727,736 DGPP-related BoG payable in the audited trade-payables note.	288,422.97 Requires posting-date, classification or adjustment evidence. It is too large to dismiss as nearest-cedi rounding.

Sources: GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: The discrepancy is not an allegation of missing funds, overstatement, default or misconduct.

Neither a supply surplus nor a blank field is a measured trading return

The published schedule does not link each financing tranche to one closed batch.

POOLED ALLOCATION

Some listed supplies exceed the associated inflow. Opening inventory, pooled procurement and later allocation can matter; do not compute a tranche return from these ratios.

MISSING STAGES

Eleven funding rows show no supply entry. Keep them in the population and request the delivery, offset or outstanding status rather than silently dropping them.

ALLOWANCE VERSUS COST

The published inflow–expected gap is GHS 964.830 m, while SAC is GHS 931.322 m. Without the agreement, neither becomes an assumed operating-expense line.

Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

A government grant dominates the 2025 revenue presentation

GHS million; source amounts preserved, 2024 restated comparison.

Table 12. A government grant dominates the 2025 revenue presentation

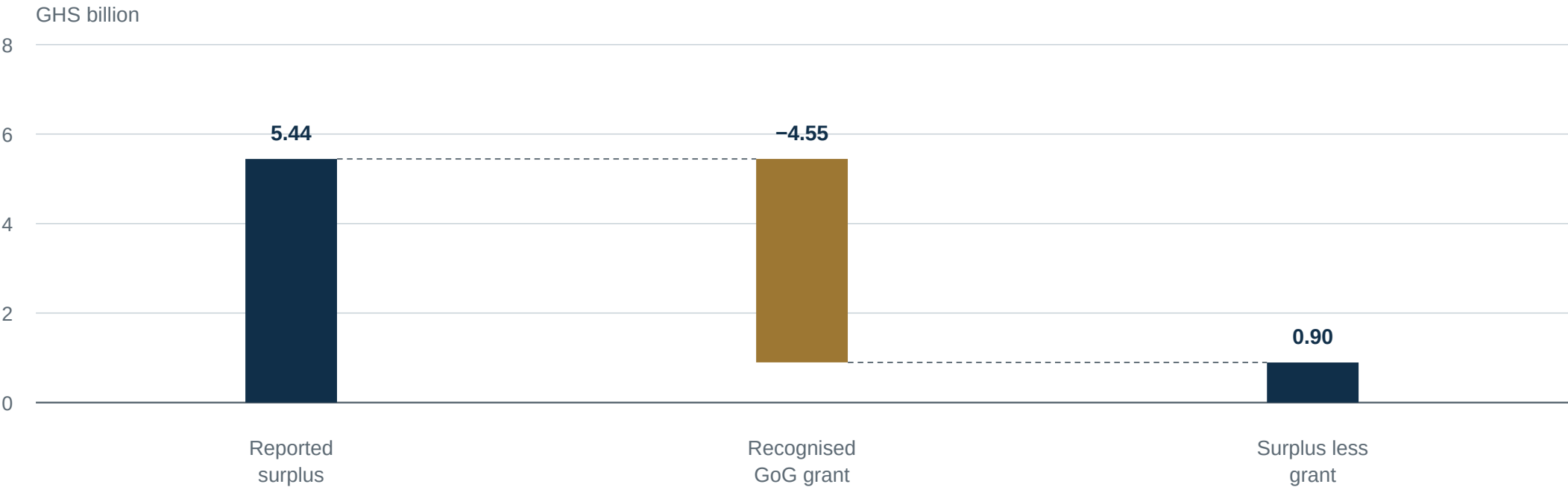
Item	2024 restated	2025	Accounting distinction
Non-tax revenue	307.787	970.765	Assay, service and other entity revenue.
GoG grant	Source dash	4,547.700	Public transfer recorded as revenue.
Finance income	0.357	35.337	Separate from gold sale proceeds.
Total revenue	308.144	5,553.803	81.88% derives from the 2025 grant.
Total expenditure	129.664	109.585	Entity costs, not all DGPP costs.
Reported surplus	185.342	5,443.990	Includes grant and later valuation/associate items.

Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Removing the recognised grant changes the surplus interpretation

Exact subtraction from the audited 2025 entity surplus.

Figure 10. Removing the recognised grant changes the surplus interpretation



Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Note: GHS 896.290 m remains an entity-account residual, not net public profit: public-paid fees and wider costs are not eliminated.

BoG service fees are income to GoldBod and an expense elsewhere

Selected 2025 revenue-note components, GHS million.

Table 13. BoG service fees are income to GoldBod and an expense elsewhere

Component	Amount	Consolidation implication
Assay revenue	337.426	Fee base and customers differ from owned gold sales.
BoG service charges	558.145	Internal public-sector transaction if both entities are consolidated.
Registration	30.771	Regulatory / administrative revenue, not a gold margin.
LSM inspection	41.854	Inspection service is separate from mine production.
Other note components	See source ledger	All source components retained; no presumed net gold-sales line.

Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

The entity’s cost statement does not cover every public gold-programme cost

2025 GoldBod expenditure, GHS million.

Table 14. The entity’s cost statement does not cover every public gold-programme cost

Category	Source amount	Interpretation
Compensation	37.381	Entity employees and related costs.
Goods and services	28.339	Reported operating inputs.
Specialised services	38.915	Source category; not all gold acquisition cost.
Depreciation	4.950	Non-cash expense, distinct from capital outlay.
Total expenditure	109.585	Do not divide into national export value and call the result programme profitability.

Sources: GoldBod audited accounts [\[S02\]](#).

Large cash holdings coexist with procurement and other obligations

2025 audited balances, GHS billion.

Table 15. Large cash holdings coexist with procurement and other obligations

Asset / claim	Amount	Liability / equity	Amount
Cash	8.770555	Trade payables	3.884003
Prepayments	0.444043	Current liabilities	3.931613
Inventory	0.054617	Loans	0.017000
Total assets	9.550171	Total liabilities	3.948613
Current assets	9.468222	Net assets	5.601558

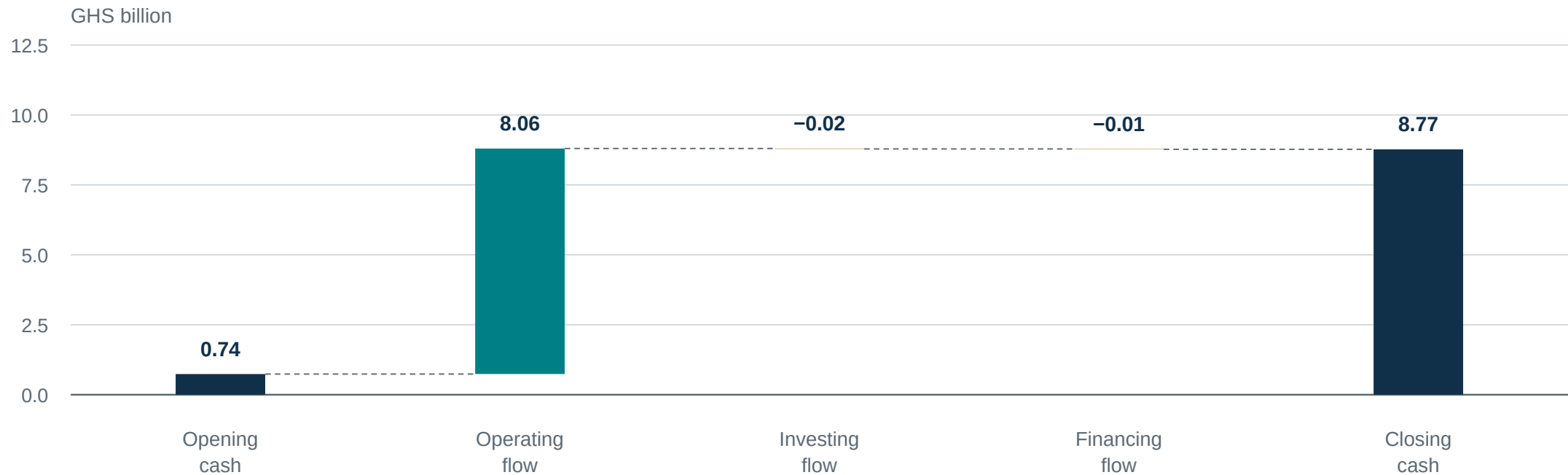
Sources: GoldBod audited accounts [\[S02\]](#).

Note: Cash is not classified as unrestricted here. The BoG cash line includes GHS 4.548 bn matching the recognised grant amount.

The reported cash increase follows operating, investing and financing flows

GoldBod 2025, GHS billion; cash-flow classifications preserved.

Figure 11. The reported cash increase follows operating, investing and financing flows



Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Note: Operating cash includes the effect of grants and working-capital movements; it is not a cash trading-margin estimate.

Creditor financing and prepayment releases affect operating cash

Selected 2025 cash-flow movements and balance-sheet amounts.

Table 16. Creditor financing and prepayment releases affect operating cash

Item	GHS million	Why it matters
Cash-flow increase in payables	2,414.263	Suppliers or principals can fund cash accumulation.
Cash-flow reduction in prepayments	319.333	A release of an existing asset is not new fee income.
Closing supplier prepayments	442.613	Request aging, batch status and recoverability evidence.
Closing inventory	54.617	Book value is not fine mass; valuation and title require separate records.

Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Arithmetic agreement and source discrepancies are both reported

Selected exact checks; no source amounts overwritten.

Table 17. Arithmetic agreement and source discrepancies are both reported

Check	Residual, GHS	Treatment
Revenue components less stated total	1.00	Display precision
Revenue less expense less stated pre-change surplus	−1.00	Display precision
Inventory additions less consumption less closing	1.00	Display precision
DGPP note payable less trade-report balance	288,422.97	Not resolved by published records
Assets less liabilities less net assets	0.00	Balance-sheet identity
Cash flow movement less balance-sheet movement	0.00	Cash identity

Sources: GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: A successful identity is not an audit of the originating banking, inventory or procurement systems.

An audited financial statement does not certify every operational claim

Keep financial-statement assurance and operational reporting separate.

FINANCIAL STATEMENTS The Auditor-General’s opinion concerns the financial statements under their stated framework. The report preserves their classifications and restated comparatives.	DIRECTORS’ NARRATIVE The 2025 ASM and LSM export/facilitation narrative is a different evidence layer. Do not treat facilitated tonnage as independently verified owned exports or mine output.	RECONCILIATION STILL NEEDED A batch-to-customs-to-bank match, inter-public elimination and current operating-model bridge are not supplied by the audit opinion alone.
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Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

The Q1 financial result is an entity flow—not the value of gold handled

GoldBod January–March 2026 source report; GHS million.

Table 18. The Q1 financial result is an entity flow—not the value of gold handled

Measure	Reported amount	Scope
Revenue	187.324496	Quarterly entity revenue.
Expense	72.035932	Quarterly entity expenditure.
Comprehensive income	115.288564	Revenue less expense in the source table.
Closing cash	4,242.901653	Stock at quarter end; not quarterly revenue.

Sources: GoldBod Q1 report [\[S04\]](#); IDER calculations [\[S99\]](#).

Note: The quarterly report is not presented here as independently audited. The post-April operating transition changes comparability.

Q1 assay masses, export masses and purchase quantities have different scope

Published operational measures; no unmatched fine/gross conversion imposed.

Table 19. Q1 assay masses, export masses and purchase quantities have different scope

Measure	Quantity / value	Interpretation
ASM gross assay	23,017.5235 kg	Assay throughput; title and shipment cohort not established.
ASM net assay	21,493.792 kg	Source net assay basis.
ASM exports	12,732.240 kg / USD 2.019462 bn	Source export mass and estimated value.
LSM exports	26,091.09 gross kg / USD 3.567030 bn	Gross mass cannot be equated to the source ounces without purity.
CEO purchase figure	867,678.23 grams	867.67823 kg, not the total assay universe.

Sources: GoldBod Q1 report [\[S04\]](#); IDER calculations [\[S99\]](#).

Two Q1 export presentations differ by USD 330.992 million

Comparable calendar quarter and currency do not establish the same valuation and coverage.

Table 20. Two Q1 export presentations differ by USD 330.992 million

Concept	USD million	Use
GoldBod ASM estimated export value	2,019.462	Source estimate.
GoldBod LSM estimated export value	3,567.030	Source estimate.
Sum of the two estimates	5,586.492	Arithmetic sum, not reconciled national total.
BoG Q1 merchandise gold exports	5,255.500	National merchandise measure.
Unreconciled cross-source difference	330.992	Request scope, valuation and revision bridge.

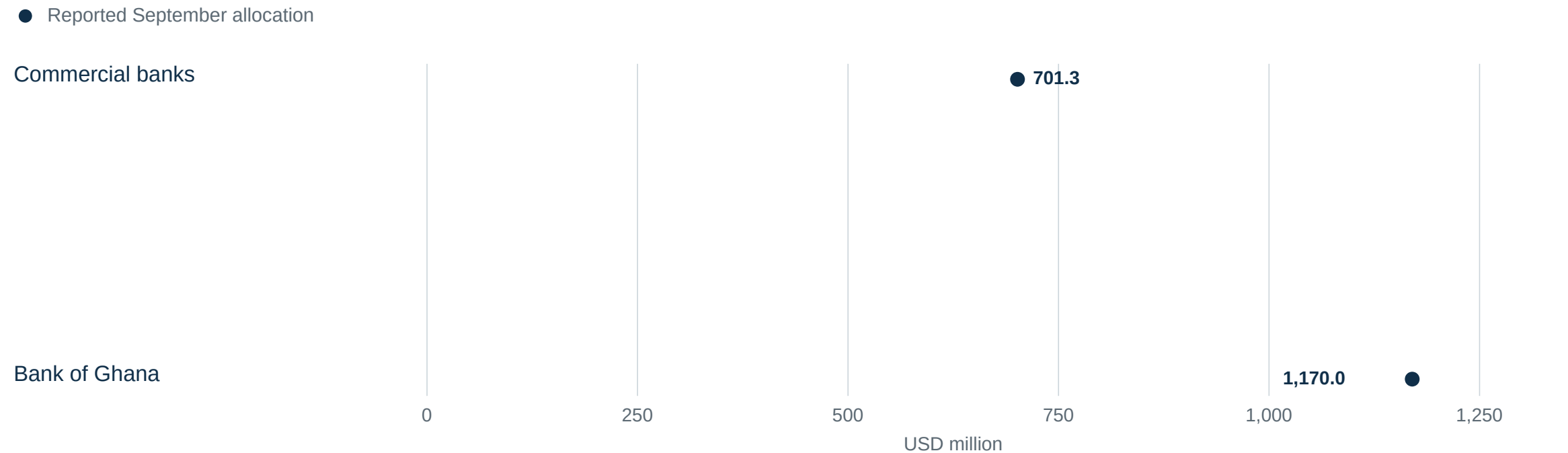
Sources: BoG September bulletin [\[S01\]](#); GoldBod Q1 report [\[S04\]](#); IDER calculations [\[S99\]](#).

Note: The difference is not cash missing from a bank account and not a measured loss.

The reported September FX allocation has two recipients

GoldBod signed release, 30 September 2026.

Figure 12. The reported September FX allocation has two recipients



Sources: GoldBod September release [\[S05\]](#).

Note: Components total USD 1,871.3 m versus the rounded USD 1.871 bn headline. Recipient allocation is not a reserve-addition identity.

An October plan is not an additional September receipt

Signed release controls where a webpage title uses a different target.

Table 21. An October plan is not an additional September receipt

Period / recipient	USD million	Evidence status
September reported total	1,871.0	Rounded reported generation.
September recipient sum	1,871.3	Sum of stated bank and BoG amounts.
September original target	1,400.0	Target, not verified cash receipt.
October total target	1,400.0	Forward plan.
October commercial-bank target	1,000.0	Forward recipient allocation.
October BoG allocation	Up to 400.0	Ceiling, not realised stock addition.

Sources: GoldBod September release [\[S05\]](#); IDER calculations [\[S99\]](#).

Note: The news-page title says USD 1.5 bn for October; the signed release states USD 1.4 bn. The signed figure is used, with the difference disclosed.

The October assay notice changes the local verification workflow

GoldBod notice dated 28 September, effective 1 October 2026.

LOCAL PAYMENT BASIS

The notice assigns XRF a definitive local purity/payment role and water-density testing an indicative role. This is not a refinery payability agreement.

DOCUMENTED EXCEPTIONS

The notice specifies a 0.7% purity discount for stated water-density cases and $\pm 0.1\%$ successive-XRF tolerance. Its exact contractual arithmetic must be confirmed.

NO FALSE CERTIFICATION

Retain instrument, calibration, sampling, retest and dispute records. A purity certificate does not establish mine origin, environmental compliance or lawful title.

Sources: GoldBod assay notice [\[S07\]](#); OECD due diligence guidance [\[S10\]](#); IDER calculations [\[S99\]](#).

Note: The scenario's purity shocks are independent assumptions, not an interpretation of the notice's percentage arithmetic.

DGPP losses, cost-sharing and targets are different fiscal objects

IMF Country Report 26/212; source assessment, not a new transaction audit.

Table 22. DGPP losses, cost-sharing and targets are different fiscal objects

Measure	Source figure	Period / status
BoG DGPP loss	GHS 22 bn	2025 annual amount reported by IMF staff.
Government cost-sharing bonds	GHS 5 bn at par	Transferred March 2026; receivable recorded at end-2025.
Loss / gross gold purchases	15.3%	2025 source ratio.
Loss / gross gold purchases	11.7%	2026 Q1 source ratio.
MoU operating-cost objective	5% of purchase costs	Agreed target, not a verified achieved loss rate.

Sources: IMF Country Report 26/212 [\[S06\]](#).

Note: Do not subtract GoldBod’s grant-inclusive entity surplus from the BoG loss to fabricate a consolidated net result.

Moving a programme can move the location of risk rather than eliminate it

The IMF report describes the 2026 transition and related authority commitments.

EARLIER FEE ROLE

Before the later trading transition, GoldBod's service fees and BoG-funded gold flows occupied different accounts. Reusing a fee-era margin for principal trading is unsafe.

FINANCING AND TRADING

The reported model moves purchase/export financing to GoldBod, with BoG acting in an FX-agency role. Price, settlement and credit risks require a new contractual ledger.

PUBLIC COST ALLOCATION

Budget cost support and cost-sharing can reduce one institution's expense while increasing another's obligation. The agreed public boundary must be consolidated.

Sources: IMF Country Report 26/212 [\[S06\]](#); IDER calculations [\[S99\]](#).

Internal public flows cancel only when both sides and periods match

Illustrative accounting classification; no consolidated monetary total is produced.

Table 23. Internal public flows cancel only when both sides and periods match

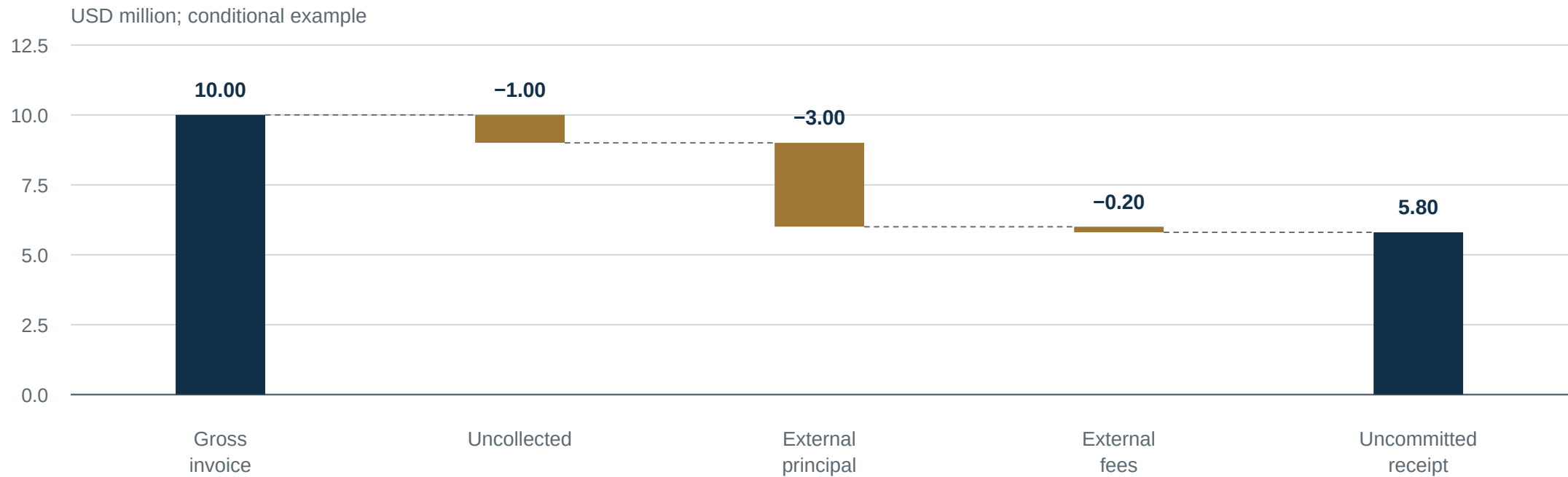
Transaction	Entity account	Public-boundary treatment
MoF grant to GoldBod	GoldBod grant income; government payment	Eliminate matched internal transfer; retain external use.
GoldBod fee billed to BoG	GoldBod revenue; BoG cost	Eliminate matched internal fee, not external operating inputs.
BoG advance to GoldBod	Receivable and payable / delivery obligation	Match stock and flows; financing is not earned revenue.
External offtaker loan	Cash plus external obligation	Liability persists after public-entity consolidation.
External freight, refining, funding	Resource or finance cost	Retain expense on matching accrual/cash basis.
Guarantee or support undertaking	Potential payment under conditions	Disclose trigger, ceiling and risk; do not book an invented expected loss.

Sources: IDER calculations [\[S99\]](#).

A USD 10 million invoice need not release USD 10 million of usable FX

Assumed invoice cohort; outstanding balance and external obligations are explicit.

Figure 13. A USD 10 million invoice need not release USD 10 million of usable FX



Sources: IDER calculations [\[S99\]](#).

Note: The USD 5.8 m remainder is not automatically reserve accumulation. Earlier advance receipts must not be counted a second time.

Public exposure needs amount, horizon and an evidence-backed trigger

Required records for treasury and oversight; no risk probability is assigned.

Table 24. Public exposure needs amount, horizon and an evidence-backed trigger

Exposure	Measurement	Control evidence
Price / assay / FX	Unhedged quantity and fixing mismatch	Batch settlement terms and verified hedge records.
Counterparty / concentration	Outstanding by offtaker, lender and buyer	Aging, collateral, disputes and related parties.
Rollover / liquidity	Dated cash gaps and maturity ladder	13-week forecast; committed versus assumed finance.
Public support	Appropriation, bond, guarantee and obligation	Authorisation, beneficiary, ceiling and payment trigger.
Environmental / sourcing	Unresolved origin and remediation exposure	Mine licence, custody chain, screening and risk review.

Sources: IMF Country Report 26/212 [\[S06\]](#); OECD due diligence guidance [\[S10\]](#); IDER calculations [\[S99\]](#).

Macroeconomic benefits and financial costs require separate evidence

The IMF report records different emphases by staff and Ghanaian authorities.

AUTHORITIES’ INTERPRETATION

The source records the authorities’ view that formalisation and external-liquidity benefits support the programme rationale. This is an attributed assessment, not IDER’s causal estimate.

STAFF RISK ASSESSMENT

IMF staff identify programme losses, quasi-fiscal costs and wider sourcing/environmental risks. The report preserves the amounts, dates and target status rather than treating these as equivalent to an entity audit.

TESTABLE COMPARISON

Compare additional domestic value added and usable FX against external resource costs, financing and risk. Neither export turnover nor a transfer-funded surplus answers that net question alone.

Sources: IMF Country Report 26/212 [\[S06\]](#); IDER calculations [\[S99\]](#).

Announced safeguards must be distinguished from verified completion

The evidence cut-off is 2 October 2026; completion is not inferred from a planned date.

SPECIAL AUDIT

The IMF report expected a DGPP external audit in 2026 Q3. A completed instrument-level report was not recovered; no result is invented because that quarter has ended.

LEGAL DOCUMENTS

This publication uses official operational descriptions and the current assay notice. Full Act 1140 and every specialist agreement were not reconstructed; transaction advice needs primary legal review.

CONSOLIDATED RESULT

BoG’s audited notes add gold-result and stock evidence in the validation chapter. A matched ledger across public grants, fees, loans, hedges and external costs remains unavailable; no consolidated public result is estimated.

Sources: IMF Country Report 26/212 [\[S06\]](#); GoldBod assay notice [\[S07\]](#); GoldBod official mandate [\[S09\]](#); IDER calculations [\[S99\]](#).

B01 is a fully specified 100 kg illustration—not a GoldBod contract

Amounts, rates and timing are imposed solely for sensitivity analysis.

Table 25. B01 is a fully specified 100 kg illustration—not a GoldBod contract

Parameter	Assumption	Boundary
Gross mass / purity	100 kg / 92%	Purchase assay; sale purity varied separately.
Reference price / purchase FX	USD 4,000/oz / GHS 12 per USD	No live quote or market forecast.
Purchase discount	2% of reference cedi value	Locked cost at the purchase event.
Payability / sale deduction	99.5% / 0.5%	Distinct contract adjustments.
Operating costs	0.3% of reference + GHS 20,000	Taxes and unlisted charges excluded.
Finance	20% annually; 14 days	Simple interest on purchase plus operating cash.

Sources: IDER calculations [\[S99\]](#).

A two-percent purchase discount does not guarantee a positive margin

B01; sale price and FX unchanged, all stated costs included.

Table 26. A two-percent purchase discount does not guarantee a positive margin

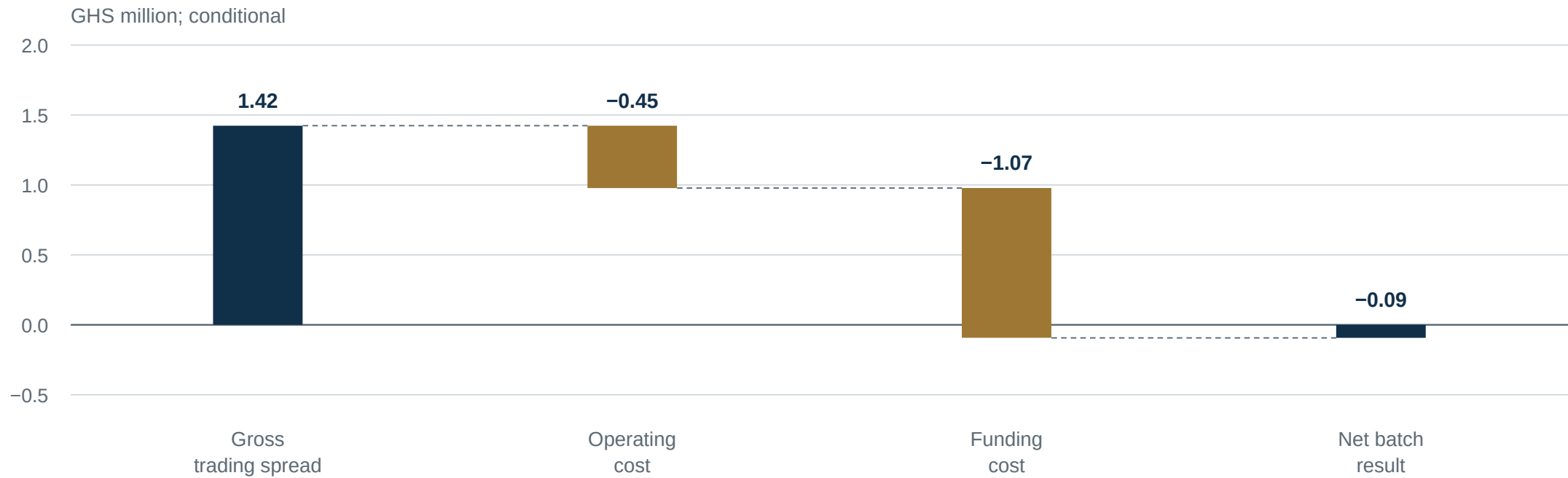
Component	Calculated value	Unit
Fine gold at purchase	2,957.8687	Troy ounces
Locked purchase cost	139,138,142.91	GHS
Sale receipt	11,713,455.78	USD
Translated sale receipt	140,561,469.32	GHS
Operating / financing cost	445,933.09 / 1,070,781.95	GHS
Net batch result	-93,388.63	GHS before tax and unmodelled charges

Sources: IDER calculations [\[S99\]](#).

Operating and funding costs can absorb the apparent trading spread

B01 begins with sale proceeds less locked purchase cost, not gross export value.

Figure 14. Operating and funding costs can absorb the apparent trading spread



Sources: IDER calculations [\[S99\]](#).

Note: Gross spread already reflects payability and sale deduction. It must not be called profit before deducting the specified costs.

Price and cedi settlement changes interact on locked purchase costs

B01; 21-day financing, 92% sale assay. Positive FX change means cedi depreciation.

Figure 15. Price and cedi settlement changes interact on locked purchase costs

	FX -10%	FX -5%	FX +0%	FX +5%	FX +10%
Gold price -10%	-27.34	-21.01	-14.68	-8.36	-2.03
Gold price -5%	-21.01	-14.33	-7.66	-0.98	5.70
Gold price +0%	-14.68	-7.66	-0.63	6.40	13.43
Gold price +5%	-8.36	-0.98	6.40	13.78	21.16
Gold price +10%	-2.03	5.70	13.43	21.16	28.89

Net batch result, GHS million; conditional sensitivity

Sources: IDER calculations [\[S99\]](#).

Note: The full grid contains 225 price, FX, duration and assay combinations. They carry no assigned probabilities.

Post-purchase assay differences affect proceeds, not the locked price

B01; USD 4,000/oz and GHS 12/USD held fixed.

Figure 16. Post-purchase assay differences affect proceeds, not the locked price

	7 days	21 days	45 days
Sale purity 91%	-1.09	-2.16	-3.99
Sale purity 92%	0.44	-0.63	-2.46
Sale purity 93%	1.97	0.90	-0.94

Net batch result, GHS million

Sources: IDER calculations [\[S99\]](#).

Note: The 91–93% cases are imposed purity levels, not statutory discount rates or an allegation of assay error.

Three thresholds expose how thin the base spread is

B01 conditions: all non-varied terms held at their declared values.

Table 27. Three thresholds expose how thin the base spread is

Threshold	Calculated value	Interpretation
Sale gold price	4,002.66 USD/oz	At 14 days and GHS 12/USD, before tax.
Settlement FX	12.0080 GHS/USD	At USD 4,000/oz and 14 days.
Funding duration	12.78 days	At the unchanged base price and FX.

Sources: IDER calculations [\[S99\]](#).

Note: Thresholds are not price targets, lending advice, hedge recommendations or contract guarantees.

A partial receipt reduces later financing exposure

B01 funded principal; 25%, 25% and 50% recovered on days 7, 14 and 28.

Table 28. A partial receipt reduces later financing exposure

Day interval	Opening principal, GHS m	Principal recovered, GHS m	Interest, GHS
0–7	139.5841	34.8960	535,390.98
7–14	104.6881	34.8960	401,543.23
14–28	69.7920	69.7920	535,390.98

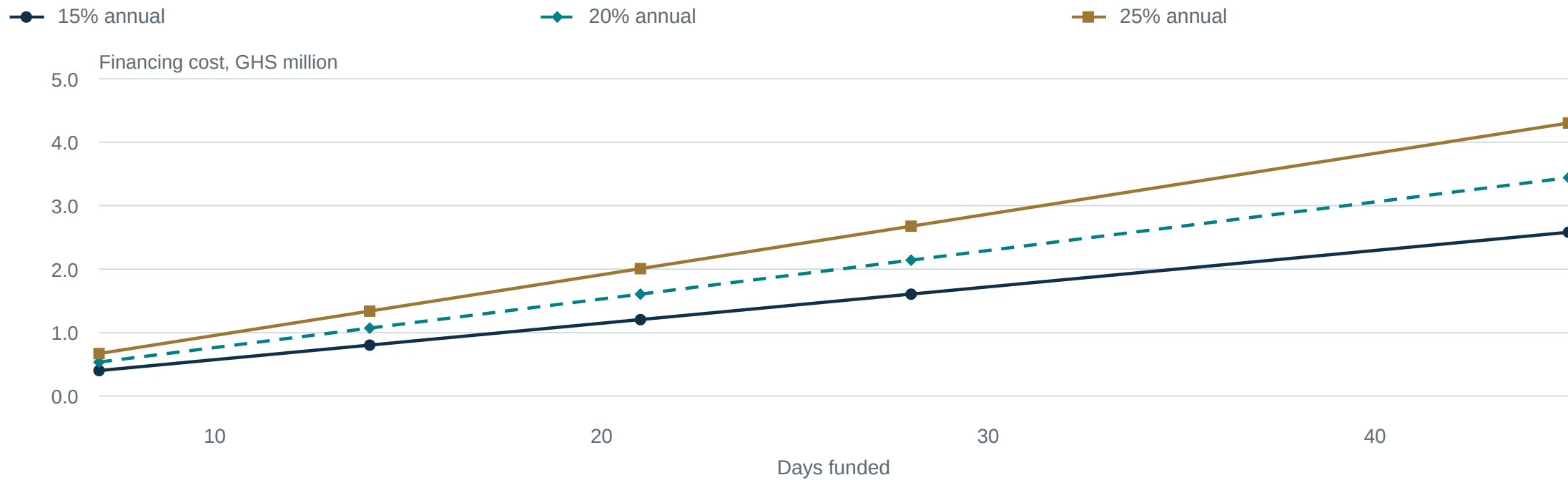
Sources: IDER calculations [\[S99\]](#).

Note: Receipts are applied to funded principal by assumption; realised sale margins and actual loan repayment priority need their own ledger.

Financing costs rise only while the stated principal is outstanding

B01 fully funded amount, no interim repayment in these separate cases.

Figure 17. Financing costs rise only while the stated principal is outstanding



Sources: IDER calculations [\[S99\]](#).

Note: Rates are assumptions, not Ghanaian lending quotations. Discounted valuation is an alternative measure, not an additional cost to add.

A fine-gold inventory identity is separate from the cash ledger

Illustration, fine kg; no third-party custody balances mixed into owned stock.

Table 29. A fine-gold inventory identity is separate from the cash ledger

Movement	Fine kg	Treatment
Opening owned stock	12.0	Matched beginning balance.
New purchased content	92.0	100 gross kg at an assumed 92%.
Exports / BoG delivery	70.0 / 25.0	Distinct outward dispositions, counted once.
Documented refining loss	0.2	Assumed loss; requires actual settlement evidence.
Closing owned inventory	8.8	$12 + 92 - 70 - 25 - 0.2$.

Sources: IDER calculations [\[S99\]](#).

Note: A book-value inventory total cannot validate this mass balance without lot weights and costing.

Replace every illustrative parameter before financing a transaction

For miners, buyers, exporters, logistics firms, banks and corporate finance teams.

COMMERCIAL TERMS

Verify unit, purity, title, benchmark, fixing date, deductions and final payability. Document whose balance sheet bears each assay and price adjustment.

CASH TIMING

Map purchase advances, taxes/fees where applicable, freight, receipts and debt maturity. Keep uncommitted finance outside the assured-liquidity line.

RISK LIMITS

Stress price, FX, delays and counterparty nonpayment jointly. A model loss is not a default probability; a model profit is not an investment recommendation.

Sources: IDER calculations [\[S99\]](#).

The available rows do not identify a national causal production effect

Administrative breadth is not the same as an independent counterfactual.

Table 30. The available rows do not identify a national causal production effect

Available evidence	What it permits	Missing causal component
89 financing rows in 2025	Source arithmetic and timing description	Mine outcomes and independent policy assignment.
2023–2024 production records	Pre-period source comparison	Matched physical production and stable recording.
2025 audit and Q1 report	Entity accounts and scope comparison	Comparable operating model and public consolidation.
2026 national exports / prices	Dated descriptive changes	Credible no-policy path, controls and channel separation.

Sources: IDER calculations [\[S99\]](#).

Note: No regression treats scenarios as observed firms or repeats one national treatment as independent shocks.

The main confounders affect both trade recording and gold outcomes

Required safeguards are specific, not a promise that all bias has been removed.

Table 31. The main confounders affect both trade recording and gold outcomes

Threat	Failure mode	Design response
World gold price / FX	Both participation and gold value respond	Use physical outcomes and pre-specified price/FX exposure.
Selected formal entry	Higher-return mines or buyers join first	Independent eligible roster and pre-treatment history.
Inventory / timing	Stock liquidation looks like new extraction	Mine-stock-production and customs reconciliation.
Policy bundles	Licensing, taxes, financing and assay change together	Define actual intervention and separate mechanisms.
Spillovers / redirection	Comparison outlets receive displaced trade	Measure market networks; model interference.

Sources: Callaway–Sant’Anna [\[S11\]](#); Sant’Anna–Zhao [\[S12\]](#); IDER calculations [\[S99\]](#).

Estimate physical and recording effects as separate outcomes

Prospective design; no treatment coefficient is fitted in this publication.

OUTCOMES

Follow fine kg produced at the mine, fine kg sold formally, domestic value added and bank-confirmed receipts separately. Use time-consistent origin and ownership identifiers.

COMPARISON

Where rollout variation is defensible, estimate cohort-time differences using credible not-yet-treated comparisons. A common national date alone is insufficient.

INFERENCE

Test anticipation, overlap, composition, pre-trends and spillovers. Cluster at the relevant assignment/shared-shock unit. Absence of a pre-trend rejection does not prove identification.

Sources: Callaway–Sant’Anna [\[S11\]](#); Sant’Anna–Zhao [\[S12\]](#); IDER calculations [\[S99\]](#).

Unlicensed, exiting and unpaid units cannot disappear from the frame

Coverage and response are outcomes to document—not nuisances to delete.

Table 32. Unlicensed, exiting and unpaid units cannot disappear from the frame

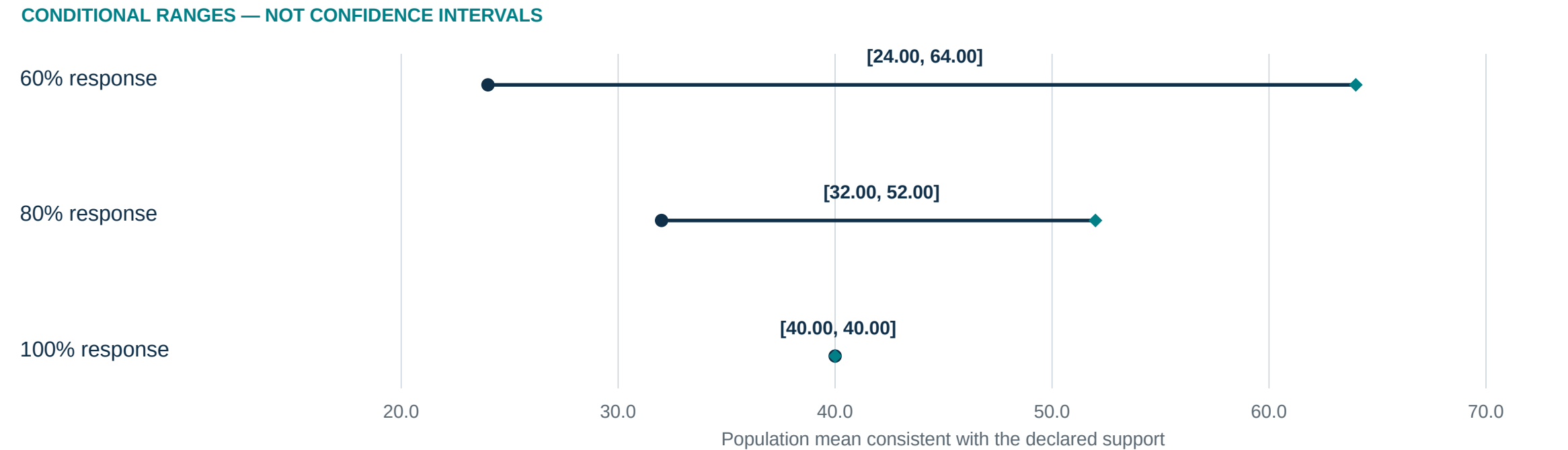
Unit	Records to retain	Interpretation control
Mines / production sites	Eligible roster, closures and output nonresponse	Keep missing extraction distinct from zero output.
Buyers / dealers	Non-takers, lost licences, entry and exit	Do not extrapolate surviving licence holders to all trade.
Batches / invoices	Rejected, disputed and unsettled lots	Use inception cohorts, not receipts-only cohorts.
Banking channels	All relevant accounts and external offsets	Missing bank confirmation is not presumed recovery.

Sources: IDER calculations [\[S99\]](#).

A high observed mean can coexist with a wide population range

Assumed observed mean 40, outcome restricted to 0–100; response rates are imposed.

Figure 18. A high observed mean can coexist with a wide population range



Sources: IDER calculations [\[S99\]](#).

Note: These are mathematical missingness bounds, not estimated Ghanaian production, confidence intervals or causal effects.

More elaborate econometrics cannot repair absent identification

The analysis differentiates descriptive accounting from prospective causal estimation.

DOUBLE ROBUSTNESS

Under the underlying design assumptions, a correct propensity or outcome model can protect a DiD estimator. Neither model repairs a false parallel-trends condition or missing outcome frame.

INSTRUMENTS

A gold-price instrument can directly affect production, income and recording, so exclusion is not automatic. Predetermined prices or licensing intensity do not become valid instruments by label.

RELEASE RULE

Publish assumptions, support, attrition and sensitivity beside each estimate. Where identification fails, release reconciled descriptive results and bounds without causal language.

Sources: Callaway–Sant’Anna [\[S11\]](#); Sant’Anna–Zhao [\[S12\]](#); IDER calculations [\[S99\]](#).

A reproducible next-stage study needs four linked datasets

Templates in the package contain headers only—not invented microdata.

Table 33. A reproducible next-stage study needs four linked datasets

Dataset / grain	Essential fields	Acceptance control
Batch—event	Owner, fine mass, assay, shipment, invoice, bank receipt	Stable lineage through split/merge and final settlement.
Mine—period	Physical output, stocks, formal sales, treatment history	Independent roster, pre-period and nonresponse status.
Public transaction	Entity, counterparty, classification, currency, obligation	Eliminate matched internal flows; retain external costs.
Invoice—cash event	Advance, due date, partial receipt, repayment, dispute	Immutable cohort and remaining balance at each event.

Sources: IDER calculations [\[S99\]](#).

Each decision needs the counterparty’s own exposure—not an export headline

No purchase, sale, lending or asset-allocation recommendation is made.

Table 34. Each decision needs the counterparty’s own exposure—not an export headline

Audience	Decision-grade object	Evidence needed
Miners / buyers / exporters	Realised unit price and payment time	Assay, deductions, title, invoice and bank receipt.
Logistics / contractors	Custody and service receivables	Acceptance, insurance, responsibility and payment date.
Banks / DFIs / funds	Recoverable collateral and financing gap	Batch ownership, perfected security, buyer aging and cash ladder.
Pensions / insurers / asset managers	Issuer-level cash and contingent exposure	Audited note, external funding and concentration—not national FX totals.
MoF / BoG / Parliament	Consolidated costs, liabilities and reserve effects	Dated inter-public elimination and bank/reserve bridge.

Sources: IDER calculations [\[S99\]](#).

A five-account dashboard must publish both coverage and unresolved balances

Proposed frequencies; targets require a measured baseline.

Table 35. A five-account dashboard must publish both coverage and unresolved balances

Indicator	Definition	Frequency / proposed owner
Physical closure	Owned opening fine kg + acquisitions – dispositions – closing	Per batch / operations and independent assay.
Receipt conversion	Settled invoice value / matched invoice cohort value	Weekly / treasury and bank custodian.
Advance exposure	Unsettled principal by date, currency, buyer and title	Weekly / finance and risk.
Net trading result	Same-batch proceeds less costs and finance	Per closed batch / accounts.
Public external cost	External flows after matched internal eliminations	Quarterly / MoF, BoG and GoldBod.
Formal capture versus output	Recorded fine kg with separate physical-production evidence	Monthly/quarterly / statistical and mine-data leads.

Sources: IDER calculations [\[S99\]](#).

Follow the unresolved link—not the largest headline

The extension joins source-account notes, complete ledger coverage and explicit identification tests.

SOURCE-COVERAGE TEST GHS 12.186 bn Funding attached to 11 ledger rows with no listed supply. It is unlinked in this schedule, not proven unpaid or lost.	BOG GOLD HOLDINGS –GHS 10.843 bn 2025 cedi carrying-value change reconciles purchases, disposal, transfer and valuation. It is not a cash-loss estimate.	PHYSICAL ROLL-FORWARD 16,907 fine oz Opening stock plus purchases less sales does not reproduce the disclosed closing doré stock. Other movements require records.
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Sources: GoldBod–BoG trade ledger [\[S03\]](#); BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).
Note: All three are source-specific reconciliations. None establishes misconduct, programme profitability or a causal production effect.

Missing supply fields cover 9.14% of the financing value

2025 financing schedule; all 89 source records remain in the denominator.

Table 36. Missing supply fields cover 9.14% of the financing value

Programme	Rows / blank	Funding, GHS bn	Blank-field funding, GHS bn	Blank value share
All programmes	89 / 11	133.258	12.186	9.14%
G4Fx	78 / 6	120.458	6.186	5.14%
G4O	2 / 1	2.800	1.000	35.71%
G4R	9 / 4	10.000	5.000	50.00%

Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: A blank supply field means not supplied in this schedule. It does not identify the actual delivery, refund, offset or credit status.

Deleting blank rows moves a supply ratio from 96.46% to 106.17%

The same listed supplies are divided by different financing populations.

Table 37. Deleting blank rows moves a supply ratio from 96.46% to 106.17%

Population	Funding, GHS bn	Listed supply, GHS bn	Supply / funding
All funding rows	133.257808	128.546046	96.46%
Rows with a supply entry	121.071788	128.546046	106.17%

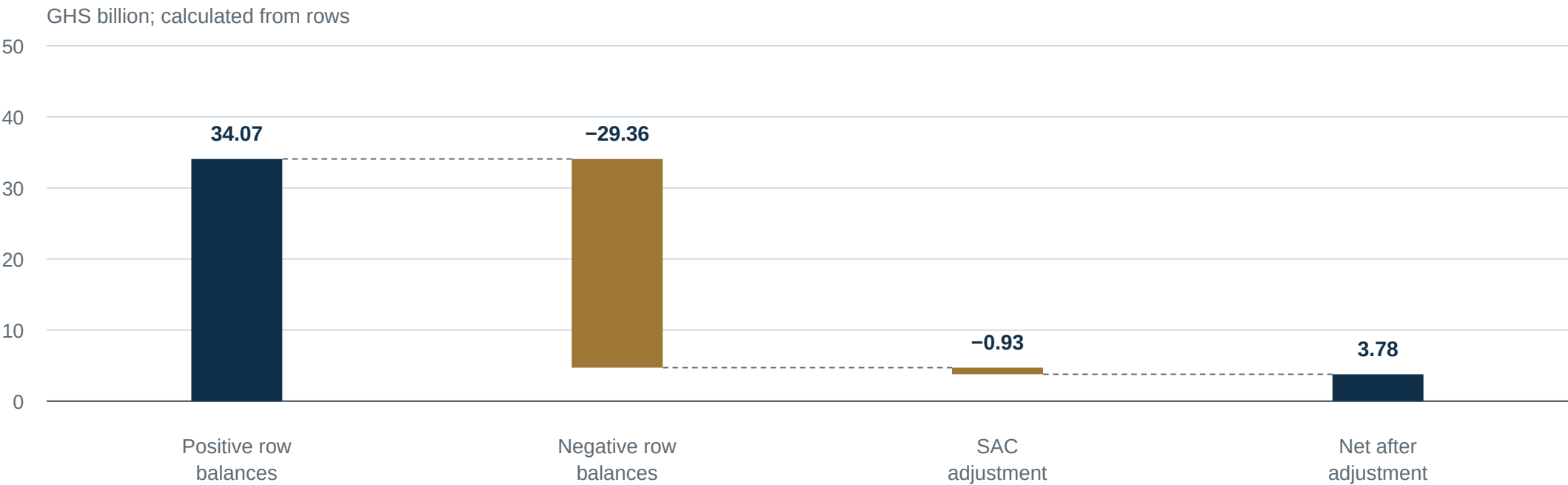
Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Neither ratio is a realised trading return or repayment rate. Pooled batch allocation and the missing rows prevent that interpretation.

Large positive and negative row balances net to a much smaller total

Source invoice balances are accounting allocations, not independently closed loans.

Figure 19. Large positive and negative row balances net to a much smaller total



Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: Gross positive balances cannot be called arrears; negative balances cannot be called profit. The GHS 0.02 row-to-total residual is retained.

Unlinked supply records are not confined to the final days of 2025

Funding dates on rows whose supply amount is blank; no retrospective event date is invented.

Table 38. Unlinked supply records are not confined to the final days of 2025

Funding month	Blank rows	Associated funding, GHS bn	Share of month funding
2025-04	2	1.000000	7.86%
2025-05	4	3.059038	19.49%
2025-07	1	1.976087	13.92%
2025-09	1	1.000000	7.18%
2025-12	3	5.150895	25.00%

Sources: GoldBod–BoG trade ledger [\[S03\]](#); IDER calculations [\[S99\]](#).

Note: The two late-December G4R rows are GHS 4 bn; earlier blank rows remain in the roster. Funding date is not a contractual settlement due date.

BoG reports bullion gains separately from losses on gold deals

Audited 2025 annual report, Notes 9 and 13; GHS billion, signed consistently here.

Table 39. BoG reports bullion gains separately from losses on gold deals

Published line	2024	2025	Interpretation
Refined bullion-sale gain	Source dash	+9.571094	Realised gain over carrying value; not gross sale cash.
G4R net result	−3.839568	−8.849740	Source net line contains realised valuation recycling.
G4O net result	−1.822569	−0.203034	Gold/oil activities combined under the source label.
Note 13 total	−5.662137	−9.052774	Sum of the two preceding loss lines; do not add again.

Sources: BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: The arithmetic of Note 9 less Note 13 is +GHS 0.518320 bn. That partial two-line subtotal is not the programme or consolidated public result.

Three public gold results have three different accounting boundaries

The available source amounts do not form a completed public-sector consolidation.

Table 40. Three public gold results have three different accounting boundaries

Source object	Stated 2025 amount	Required reconciliation
GoldBod entity surplus	GHS 5.443990 bn	Contains grant income and inter-public service charges.
BoG Note 13 net gold-deal loss	GHS 9.052774 bn	Read with Note 9 and Note 13 valuation-recycling disclosure.
IMF staff DGPP assessment	GHS 22 bn loss	Map programme costs, institution coverage and gross/net recognition.
BoG reported recycled gold gains	GHS 7.99 bn (rounded)	Historical OCI moved to profit/loss; not a fresh export receipt.
BoG total open-market cost	GHS 16.730526 bn	No source allocation makes the entire amount a gold-programme cost.

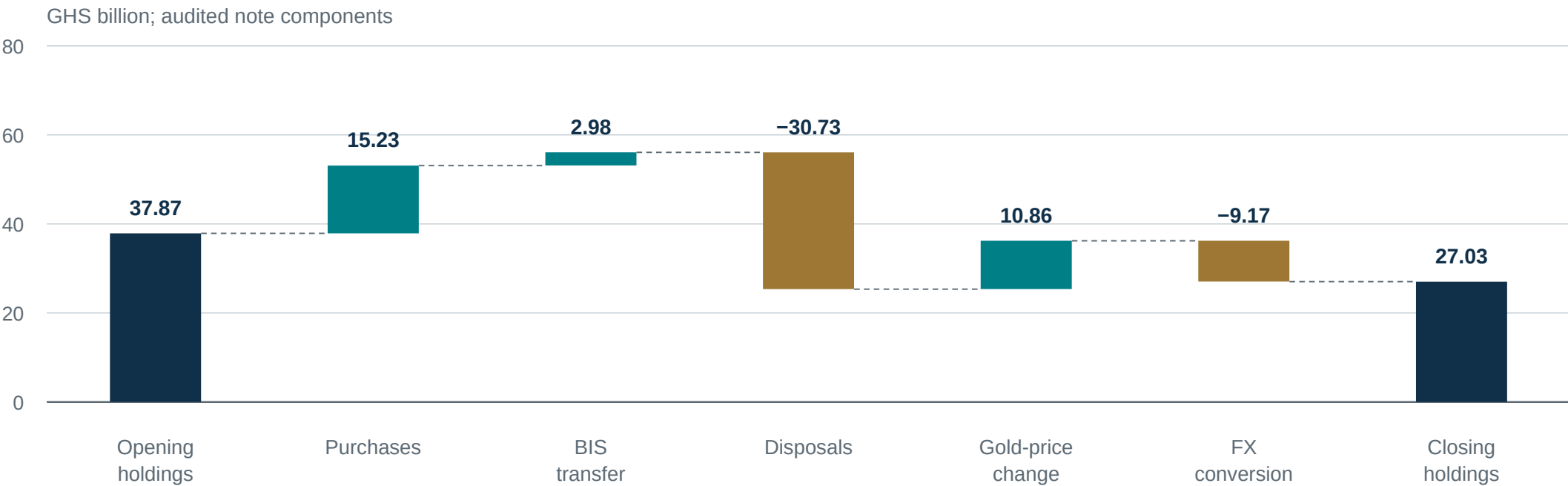
Sources: GoldBod audited accounts [\[S02\]](#); IMF Country Report 26/212 [\[S06\]](#); BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: Do not select a preferred headline, add overlapping loss measures, or subtract unrelated surpluses. A matched counterpart and classification bridge is still needed.

Purchases and higher gold prices did not prevent a lower cedi stock value

BoG Note 21(a), 2025; one source holding perimeter and valuation basis.

Figure 20. Purchases and higher gold prices did not prevent a lower cedi stock value



Sources: BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: The bridge closes exactly at displayed GHS-thousand precision. Disposal and FX movements are not new extraction or an independently measured cash loss.

Gold quantity, valuation and collateral release are different movements

BoG 2025 holdings note: fine ounces are a physical stock; cedi amounts contain prices and conversion.

FINE STOCK

Disclosed holdings decrease from 981,651.86 to 598,199.04 fine ounces. This is one balance-sheet perimeter; doré purchase and sale flows in Note 13 are separate.

VALUATION

The cedi carrying value falls 28.63%. The note separately records +GHS 10.861 bn from gold prices and –GHS 9.175 bn from FX conversion; neither is identified as a bank receipt.

COLLATERAL RETURN

The note describes repayment of the BIS facility and return of pledged gold by year end. A transfer from collateralised holdings is a reclassification, not evidence of newly mined gold.

Sources: BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: No unverified instrument-level link between bullion disposals, doré flows and reserve changes is imposed.

The disclosed doré flows need a 16,907-ounce other-movement bridge

BoG Note 13; opening is the published 2024 closing stock; all units are fine troy ounces.

Table 41. The disclosed doré flows need a 16,907-ounce other-movement bridge

Component	Fine ounces	Interpretation
Opening stock	7,311	Source amount
Purchases	2,914,305	Source amount
Sales	-2,895,426	Source amount
Implied closing before other movements	26,190	IDER arithmetic; not an observed transaction
Reported closing	9,283	Source amount
Unreconciled other-movement requirement	16,907	IDER arithmetic; not an observed transaction

Sources: BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: Equivalent residual: 525.866 fine kg. Transfers, refining, reclassification and perimeter differences remain unobserved. This is not a finding of missing gold.

A programme label and a discontinuation date do not reconcile by themselves

The BoG narrative says G4O ended in March 2025; the GoldBod ledger contains later G4O-labelled funding.

Table 42. A programme label and a discontinuation date do not reconcile by themselves

Ledger identifier	Funding date	Funding, GHS bn	Listed supply date
G4O/2025/001	6-May-25	1.800	19-May-25
G4O/2025/002	29-Sep-25	1.000	Not reported

Sources: GoldBod–BoG trade ledger [\[S03\]](#); BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: Legacy settlement, reclassification or source-label differences could explain timing. The records do not establish an unauthorised transaction or continuing operations.

A gold-related receivable is not unrestricted foreign-exchange cash

BoG Note 26; point-in-time balances, not annual export receipts.

Table 43. A gold-related receivable is not unrestricted foreign-exchange cash

Account line	2024, GHS bn	2025, GHS bn	Scope control
Gold-related FX receivable	2.269817	11.529379	GHS thousand
DGPP within other receivables	5.09	9.67	Source rounded to 0.01 bn

Sources: BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: The source links the FX receivable to dollars sold to commercial banks and a counterpart liability. Do not identify it with GoldBod’s DGPP payable or sum both receivable categories as free FX.

GoldBod’s operating cash closes only after working-capital movements

Audited statement, 2025; GHS million. Source signs are retained, including the fair-value adjustment.

Table 44. GoldBod’s operating cash closes only after working-capital movements

Cash-flow component	GHS m	Basis
Reported surplus	5,443.990347	Grant-inclusive entity result.
Non-cash / interest adjustments	−31.548183	Depreciation +4.950; printed fair value −1.161; interest −35.337.
Payable and trust movements	2,442.790458	Funding sources in the cash statement, not trading revenue.
Inventory / receivables / investment	−112.568143	Cash absorbed by specified asset changes.
Prepayment release	319.333239	Existing asset released; not newly earned fees.
Reported operating cash	8,061.997717	Source total; residual at whole-cedi precision retained.

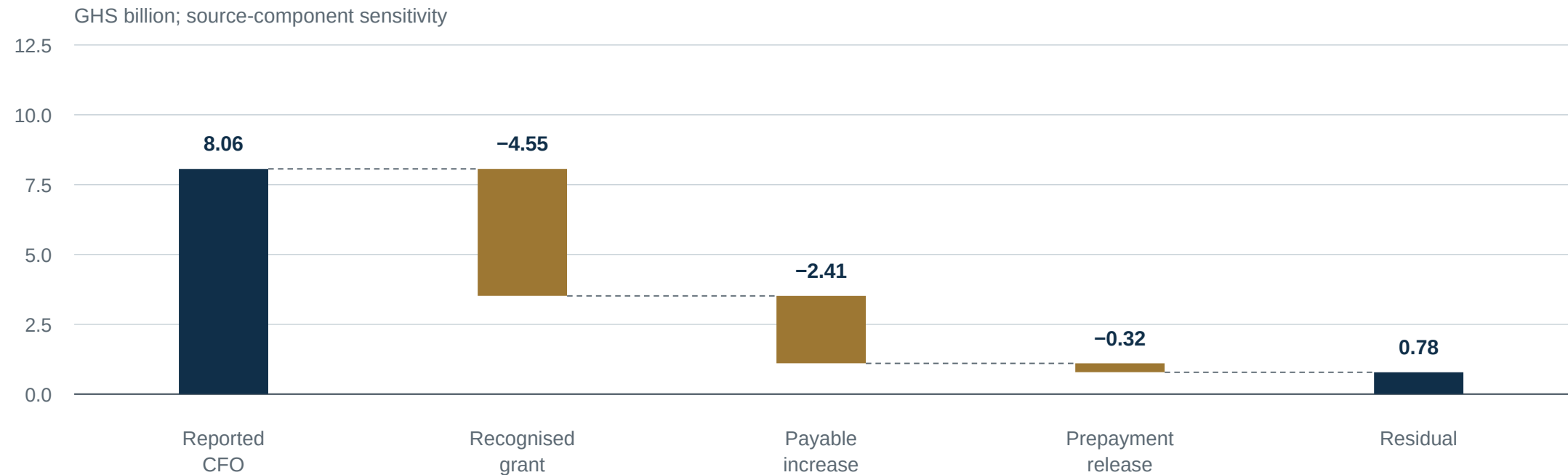
Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Note: A bridge from reported surplus to cash is not a margin calculation and does not classify cash as unrestricted.

Removing selected funding components leaves an accounting residual

Diagnostic subtractions from reported operating cash; no alternative cash-flow statement is asserted.

Figure 21. Removing selected funding components leaves an accounting residual



Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Note: The GHS 780.702 m residual is not free cash or operating profit. Grant recognition is subtracted as a sensitivity; no cash date or restriction is inferred.

A source can close arithmetically while a classification needs clarification

The reported fair-value cash-flow adjustment is preserved—not silently corrected.

OBSERVED SIGN

The income statement reports a GHS 1,160,553 fair-value loss. The cash-flow statement also prints a negative GHS 1,160,553 non-cash adjustment.

WHY IT MATTERS

A simple non-cash-loss reversal would normally add back a loss already deducted from surplus. These published signs therefore need a transaction and classification explanation.

RELEASE TREATMENT

Retain both source amounts and the reported CFO. Do not substitute a revised cash figure without the detailed reconciliation, associate movements and auditor clarification.

Sources: GoldBod audited accounts [\[S02\]](#); IDER calculations [\[S99\]](#).

Note: This is a source-query item, not a restatement, audit qualification or allegation of material misstatement.

Small final-assay differences matter near the zero-margin threshold

B01 purchase purity stays at 92%; sale purity and funded days change only as labelled.

Figure 22. Small final-assay differences matter near the zero-margin threshold

	7 days	14 days	21 days	28 days
Sale purity 91.8%	0.136	−0.399	−0.934	−1.470
Sale purity 92.0%	0.442	−0.093	−0.629	−1.164
Sale purity 92.2%	0.748	0.212	−0.323	−0.859

Net batch result, GHS million; imposed 12-case sensitivity

Sources: IDER calculations [\[S99\]](#).

Note: The ±0.2 percentage-point sale-assay scenarios are not measured assay error, confidence bounds or permitted tolerances.

An accrued batch result and cash repaid by a horizon are different accounts

B01; assume received proceeds repay funded principal first; financing interest is tracked separately.

Table 45. An accrued batch result and cash repaid by a horizon are different accounts

Sale receipt by horizon	Bank cash, GHS m	Unpaid sale, GHS m	Principal remaining, GHS m
0%	0.000	140.561	139.584
50%	70.281	70.281	69.303
90%	126.505	14.056	13.079
100%	140.561	0.000	0.000

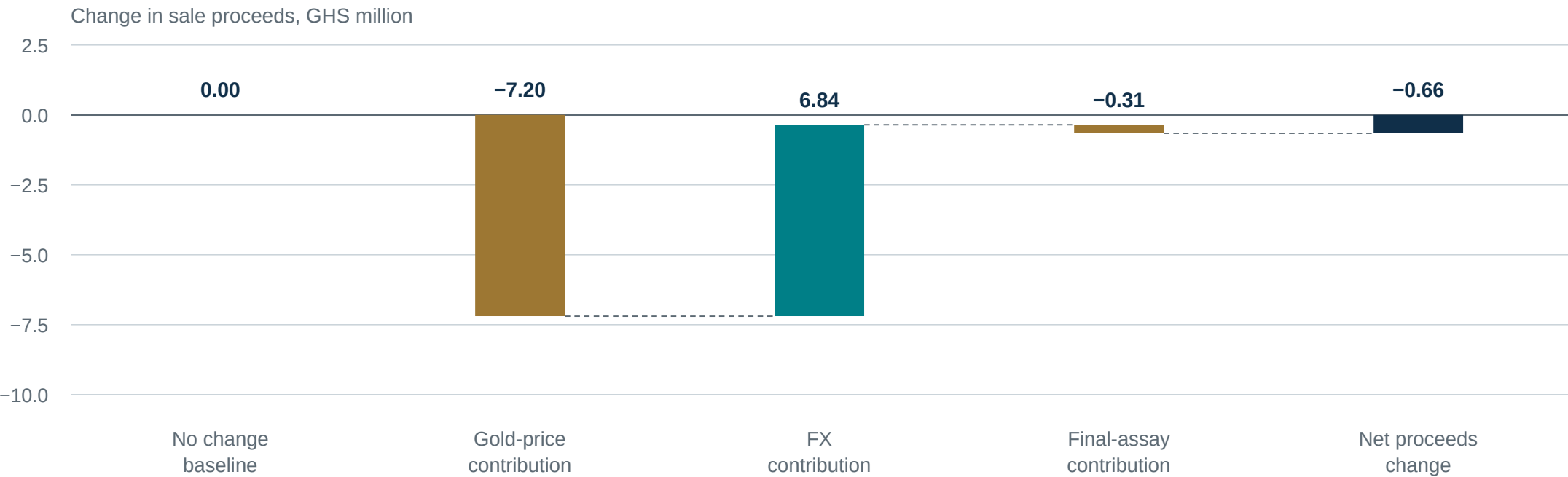
Sources: IDER calculations [\[S99\]](#).

Note: Receipt shares are imposed states, not probabilities. An unpaid invoice is not automatically a loss, but it does not fund a principal payment.

A five-percent FX offset does not exactly cancel a five-percent price fall

B01 sale-side stress; gold price -5%, GHS/USD +5%, final purity 91.8%.

Figure 23. A five-percent FX offset does not exactly cancel a five-percent price fall



Sources: IDER calculations [\[S99\]](#).

Note: Contributions average all six update orders and sum exactly. Purchase cost and financing are held fixed; this is accounting attribution, not an estimated hedge effect.

The historical mine-size table has no post-GoldBod production observation

Executed rank diagnostic for the available 2023–2024 recorded-production table.

Table 46. The historical mine-size table has no post-GoldBod production observation

Diagnostic	Result	Consequence
Recorded mine-size rows	4	Two categories in each of two pre-reform years.
Columns in illustrative design	4	Intercept, mine-size indicator, year indicator and post-2025.
Observed matrix rank	3	The post-reform column is identically zero.
Post-reform physical observations	0	No 2025 production coefficient can be identified from this table.
89 financing records	Different unit	Do not join these as 89 independent mine-policy shocks.

Sources: GoldBod–BoG trade ledger [\[S03\]](#); Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: The records measure reporting categories, not a panel of individual mines. The diagnostic is not a causal regression and no p-value is reported.

Identification requires independent physical outcomes as well as recorded trade

An expanded administrative table does not remove endogenous reporting or market spillovers.

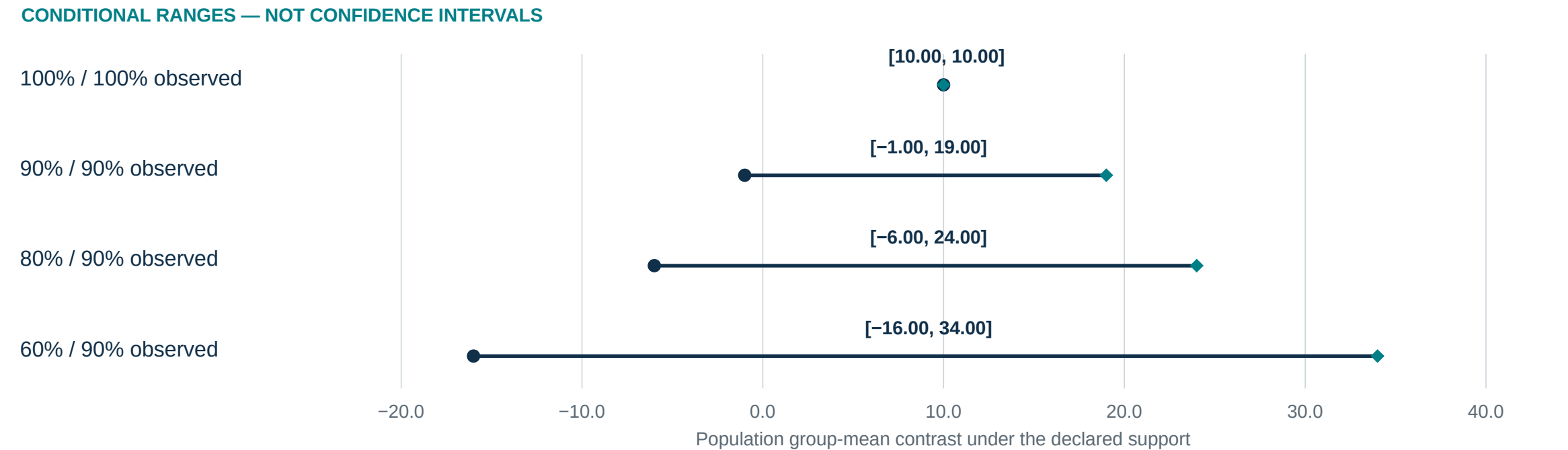
DESIGN AND MEDIATION	COMPARISON AND SELECTION	INFERENCE AND RELEASE
Freeze treatment eligibility and timing before uptake. Estimate mine extraction and formal sale outcomes separately. Do not condition a total-effect model on post-treatment reporting that is part of the mechanism.	Use a documented eligible-mine roster with exits and unlicensed/non-taker status. Pre-treatment price, FX and location exposure may support adjustment; fixed effects do not validate parallel trends or restore absent physical data.	Prespecify assignment-level dependence, anticipation, spillovers and trend sensitivity. A non-significant pre-trend is not proof. Release causal estimates only where the design and observed outcomes support them.

Sources: Callaway–Sant’Anna [\[S11\]](#); Sant’Anna–Zhao [\[S12\]](#); IDER calculations [\[S99\]](#).
Note: No instrument based on world gold prices is assumed valid: prices can directly change both physical production and formal reporting.

An observed advantage can include zero after differential missingness

Assumed observed means 50 and 40; outcomes restricted to 0–100.

Figure 24. An observed advantage can include zero after differential missingness



Sources: IDER calculations [\[S99\]](#).

Note: Response shares and support are assumptions. The ranges are identification bounds, not confidence intervals; causal interpretation requires an additional valid design.

The validation distinguishes completed checks from missing evidence

New source records and original computations support narrower claims than a national causal verdict.

Table 47. The validation distinguishes completed checks from missing evidence

Component	Completed in this edition	Remaining boundary
Source accounting	BoG notes; GoldBod cash flow; 89-row coverage and netting	Underlying contracts, bank confirmations and mass-transfer journals absent.
Empirical extension	2024–2025 BoG comparison and holdings reconciliation	No mine-level national treatment-effect estimate.
Numerical robustness	Assay, repayment states and exact shock attribution	Parameter grids have no fitted probability weights.
Selection control	All blank supply records retained; denominator effect calculated	Actual settlement status and a population response model remain unknown.
Communication	Source differences carried into executive pages and action tests	No assurance conclusion on matters not examined.

Sources: GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); BoG audited annual report [\[S13\]](#); IDER calculations [\[S99\]](#).

Note: Accounting closure, build reproduction and a financial-statement audit are distinct forms of evidence.

A large export number does not measure new gold mined

For miners, businesses, researchers, consumers, media and development partners.

RECORDED NATIONAL TRADE

+32.92%

Gold-export value in Jan–Aug 2026 versus Jan–Aug 2025, from the same BoG release.

WHAT THIS MEANS

The increase can combine more volume, prices, purity, stock movements and formal capture. Mine output needs its own physical records.

DO NOT INFER

A causal national effect, public profit or investment return from one headline.

WITHIN 60 DAYS

GoldBod / Minerals Commission / GRA

Match batch origin, physical production and customs records before attributing a production effect.

MEASURABLE ACCEPTANCE

Report scope, time, units and unmatched lots; do not convert export dollars into tonnes using one month’s price.

Sources: BoG September bulletin [\[S01\]](#); Minerals Commission database [\[S08\]](#); IDER calculations [\[S99\]](#).

Note: Observed source records and conditional calculations retain their own populations and interpretation limits.

Entity surplus and public profit are not the same result

For MoF, BoG, Parliament, fund managers, banks and institutional investors.

2025 ACCOUNTING SENSITIVITY

GHS 896.290 m

Reported GoldBod surplus less its recognised GoG grant.

WHAT THIS MEANS

The residual still includes fees paid from elsewhere in the public sector. Other public costs and external obligations require consolidation.

DO NOT INFER

A causal national effect, public profit or investment return from one headline.

WITHIN 90 DAYS

MoF / BoG / GoldBod accounts leads

Create one matched inter-public transaction and obligation schedule.

MEASURABLE ACCEPTANCE

Match both counterparties and note gross/net, valuation recycling and period. BoG's partial gold-result lines do not reconcile the IMF programme assessment by themselves.

Sources: GoldBod audited accounts [\[S02\]](#); IMF Country Report 26/212 [\[S06\]](#); IDER calculations [\[S99\]](#).

Note: Observed source records and conditional calculations retain their own populations and interpretation limits.

A narrow trading spread is vulnerable to settlement delay

For buyers, exporters, lenders, corporate finance teams and logistics providers.

B01 | CONDITIONAL BATCH

12.78 days

Zero-margin funding duration for the stated 100 kg batch at assumed price, FX, purity and costs.

WHAT THIS MEANS

An apparent purchase discount can be consumed by payability deductions, operating charges and financing. A positive export value says nothing about margin.

DO NOT INFER

A causal national effect, public profit or investment return from one headline.

WITHIN 30 DAYS

Treasury / risk / operations

Replace the scenario with signed terms and a 13-week cash and maturity schedule.

MEASURABLE ACCEPTANCE

Match title, assay, fixing, receipt and debt dates; label all uncommitted finance and downside assumptions.

Sources: IDER calculations [\[S99\]](#).

Note: Observed source records and conditional calculations retain their own populations and interpretation limits.

Make the physical and legal gold record traceable

For GoldBod, mine operators, GRA, refineries and custody teams.

A01 Freeze the entity, legal and ownership dictionary

PROPOSED OWNER

GoldBod legal + accounts; BoG / MoF

TIME

Day 30 after approved access

ACTION / DELIVERABLE

Document principal versus agent roles, title transfer, gross/fine units, grant terms and applicable agreements for the agreed study scope. Keep unresolved legal cases on a dated exception list.

MEASURABLE ACCEPTANCE TEST

100% of captured transaction classes have an owner, currency, period, document reference and escalation route.

A02 Link the same batch through purchase, assay and export

PROPOSED OWNER

Operations + GRA customs + refinery liaison

TIME

Day 60 first reconciled sample

ACTION / DELIVERABLE

Assign persistent lot identifiers and preserve split/merge history. Match seller, mine origin, purchase payment, assay, customs entry and final refinery settlement.

MEASURABLE ACCEPTANCE TEST

Every sampled lot has a stage record or explicit missing flag. Publish coverage by fine mass and value; do not count the same lot twice.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Close the financing and bank-receipt account

For GoldBod finance, BoG, banks, oftakers and Treasury.

A03 Close the 2025 funding-to-payable reconciliation

PROPOSED OWNER

GoldBod finance + BoG DGPP accounts

TIME

Day 30 exception log; Day 60 bridge

ACTION / DELIVERABLE

Reconcile the detailed trade-report balance to the audited DGPP payable, including the SAC entry, posting dates and any opening or reclassification adjustments.

MEASURABLE ACCEPTANCE TEST

The GHS 288,422.97 difference is resolved with records or remains separately disclosed; no unsupported balancing entry is inserted.

A04 Confirm export receipts against invoice cohorts

PROPOSED OWNER

Treasury + banks + authorised oftakers

TIME

Day 60 baseline; weekly refresh

ACTION / DELIVERABLE

Link each invoice to advance funding, deductions, partial receipts, debt settlement and the beneficiary bank value date. Separate gross receipt from restricted and uncommitted balances.

MEASURABLE ACCEPTANCE TEST

Show settled, unpaid and disputed amounts for the entire inception cohort. No export declaration is relabelled bank-confirmed cash.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Keep physical assurance and legal origin visible

For miners, licensed buyers, assayers, logistics firms and sourcing teams.

A05 Produce a fine-gold inventory and custody statement

PROPOSED OWNER

Vault / assay / independent custody leads

TIME

Day 30 design; monthly close

ACTION / DELIVERABLE

Reconcile opening stock, purchases, refining, exports, BoG deliveries and closing stock by title and location. Record goods in transit and third-party custody separately.

MEASURABLE ACCEPTANCE TEST

All owned mass movements close within documented measurement tolerances. Unexplained fine-weight differences remain visible.

A06 Maintain an assay and sourcing exception register

PROPOSED OWNER

Assay lead + responsible-sourcing officers

TIME

Day 30; review each disputed lot

ACTION / DELIVERABLE

Record instrument, calibration, samples, retests, counterparty checks and mine-origin documents. Distinguish local XRF results from final refinery settlement conditions.

MEASURABLE ACCEPTANCE TEST

Every in-scope lot has an assay method and source-status record. Purity evidence is never presented as legal-origin certification.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Separate own-entity results from public financial exposure

For MoF, BoG, GoldBod, Parliament and independent reviewers.

A07 Separate grant, fee and trading results

PROPOSED OWNER

GoldBod accounts + independent reviewer

TIME

Next monthly close; first report Day 45

ACTION / DELIVERABLE

Present the entity result with grants, fees, finance income, costs, valuation and principal trading separately. Retain the audited statement and provide a transparent analytical bridge.

MEASURABLE ACCEPTANCE TEST

Each adjusted result reconciles to the source statement and names its numerator. Grant-excluded surplus is not labelled public-sector profit.

A08 Consolidate public flows without hiding external costs

PROPOSED OWNER

MoF fiscal-risk team + BoG + GoldBod

TIME

Day 90 initial public-boundary account

ACTION / DELIVERABLE

Match grants, service fees, procurement advances and support bonds between public entities. Retain external financing, refining, freight and operating costs and disclose contingent commitments.

MEASURABLE ACCEPTANCE TEST

Each material elimination has both counterparties, dates and currency. Unmatched internal records and external liabilities are separately reported.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Translate batch economics into dated cash exposure

For banks, DFIs, businesses, exporters, funds and corporate finance teams.

A09 Run a rolling 13-week gold-trade cash schedule

PROPOSED OWNER

Treasury + procurement + export operations

TIME

Day 30; update weekly

ACTION / DELIVERABLE

Map purchase commitments, assay adjustments, shipment dates, buyer receipts and debt maturities. Distinguish committed facilities from financing that has not been agreed.

MEASURABLE ACCEPTANCE TEST

Base and delayed/partial-settlement cases reconcile cash and principal. No credit is counted simultaneously as unrestricted cash and unpaid receivable.

A10 Stress each material batch before credit approval

PROPOSED OWNER

Lender / DFI credit team + borrower finance

TIME

At review; first portfolio summary Day 60

ACTION / DELIVERABLE

Replace B01 with actual terms; test joint price, FX, assay, duration and nonpayment exposure. Reconcile collateral title and insurance with the proposed funding amount.

MEASURABLE ACCEPTANCE TEST

Every scenario labels assumptions and exclusions. A negative result is not a default probability; approval follows the institution's own authorised limits.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Measure physical additionality before making causal claims

For statistical agencies, mine-data teams, IDER and research partners.

A11 Publish a production-versus-recording bridge

PROPOSED OWNER

Minerals Commission + GRA + GoldBod data teams

TIME

Day 90 pilot; quarterly thereafter

ACTION / DELIVERABLE

Follow physical extraction, mine stocks, formal purchases and exports with consistent origin and fine-mass records. Preserve old-series revisions and new-channel additions.

MEASURABLE ACCEPTANCE TEST

Each claimed production change has physical evidence; changed formal capture and unresolved source residuals are shown separately.

A12 Register the causal design before estimating effects

PROPOSED OWNER

IDER methods lead + authorised data custodians

TIME

Day 90 design review; Day 180 feasibility

ACTION / DELIVERABLE

Define intervention, timing, eligible mines/buyers, comparison groups, outcomes and market spillovers. Test overlap, anticipation, pre-trends and response before causal estimation.

MEASURABLE ACCEPTANCE TEST

A signed design and coverage checklist accompanies results. Failed identification yields descriptive or bounded evidence, not an invented national coefficient.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Report FX and public commitments on the correct boundary

For BoG, MoF, Treasury, Parliament, investors and development agencies.

A13 Reconcile reported FX with the reserve-accounting boundary

PROPOSED OWNER

BoG external-sector and reserve-data teams

TIME

Day 60 prototype; monthly refresh

ACTION / DELIVERABLE

Present national exports, bank receipts, recipient allocations, debt payments and reserve valuation as separate objects.
Document restrictions and source vintage changes.

MEASURABLE ACCEPTANCE TEST

Every published reserve bridge distinguishes transactions from valuation and liabilities. Recipient FX allocations are not automatically added to GIR.

A14 Disclose public exposure with amount and trigger

PROPOSED OWNER

MoF / Treasury + parliamentary technical staff

TIME

Next scheduled briefing; quarterly

ACTION / DELIVERABLE

Request programme cost, support, guarantees, outstanding advances and contractual risks by entity and counterparty. Keep actual expenditure, ceilings and targets separate.

MEASURABLE ACCEPTANCE TEST

Each material figure has period, perimeter, status and source. No target is used as a realised denominator or unsupported net public-profit total.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Make the evidence reproducible and the assurance scope explicit

For IDER, media, professional associations, consumers and independent auditors.

A15 Attach an evidence label to each public headline

PROPOSED OWNER

Publication lead + media and stakeholder reviewers

TIME

Day 15 template; every release

ACTION / DELIVERABLE

Use visible fields for date, unit, owner, accounting stage and evidence type. Link charts to data and distinguish physical production, recorded exports and realised cash.

MEASURABLE ACCEPTANCE TEST

100% of issued charts have units, sources and replayable values. Assumptions and material source discrepancies remain in short extracts.

A16 Commission a scoped independent reconciliation review

PROPOSED OWNER

Commissioning institution + independent auditors

TIME

Day 180 first review after data access

ACTION / DELIVERABLE

Review batch samples, balance confirmations, public eliminations and source conflicts using an agreed assurance scope. Record evidence not supplied and the effect on conclusions.

MEASURABLE ACCEPTANCE TEST

The report states exactly which assertions were tested. A clean arithmetic check is not marketed as a full transaction, sourcing or public-finance audit.

Sources: IDER calculations [\[S99\]](#).

Note: Proposed owners and targets; the clock starts after authorised access and approval. No institutional mandate, policy endorsement or investment decision is implied.

Every expression inherits its measurement and evidence boundary

E01–E38 are accounting definitions, source transformations or conditional calculations; P01–P04 are prospective.

A1 | MATCH

Use the same fine-gold unit, owner, currency, period and source perimeter. Retain the distinction between gross mass, fine content, invoices and cash.

A2 | RECONCILE

Preserve source values and residuals. Count internal transfers once within the entity and eliminate matched internal flows only in the stated consolidated boundary.

A3 | LIMIT

Scenario parameters are imposed; no national causal effect or consolidated public profit is claimed. Statistical inference requires observed coverage, assignment and outcomes.

Sources: IDER calculations [\[S99\]](#).

Note: Additional conditions: verify legal scope, assay/payability terms, bank confirmation, source precision and selection assumptions.

Gross mass, purity and fine ounces / Owned fine-gold inventory

E01: results pp. 21, 23 | E02: results p. 75

E01 Gross mass, purity and fine ounces

EXECUTED UNIT CONVERSION

$$W_f = W_g a \tag{E01.1}$$

$$O_f = W_g a / 0.0311034768 \tag{E01.2}$$

Wg and Wf: gross and fine kg; a: purity fraction; Of: fine troy ounces.

ASSUMPTIONS / AXIOMS

Assay and unit convention must match. Ounces are troy ounces, not ordinary ounces.

100 gross kg at 92% gives 92 fine kg.

E02 Owned fine-gold inventory

EXECUTED CONDITIONAL IDENTITY

$$I_1 = I_0 + Q_{buy} - Q_{export} - Q_{BoG} - L \tag{E02.1}$$

$$12 + 92 - 70 - 25 - 0.2 = 8.8 \tag{E02.2}$$

All quantities are owned fine kg; L is documented physical loss.

ASSUMPTIONS / AXIOMS

Custody is not ownership. No batch is both an export and a separate BoG delivery in this same inventory account.

The 8.8 kg closing stock is an illustration.

Ownership and scope matching / Matched growth and export share

E03: results pp. 22, 55 | E04: results pp. 25, 32

E03 Ownership and scope matching

IMPLEMENTED MEASUREMENT CONTROL

$$Q_{assayed} \equiv Q_{owned} \equiv Q_{exported} \tag{E03.1}$$

$$Key = (batch, owner, period, unit) \tag{E03.2}$$

Distinct statistical objects can overlap but are not interchangeable totals.

ASSUMPTIONS / AXIOMS

Assay-throughput and export tables require batch and owner links before reconciliation.

No ownership imputed from an assay.

E04 Matched growth and export share

EXECUTED DATED RATIOS

$$g = 100(X_1/X_0 - 1) \tag{E04.1}$$

$$s = 100X_{gold}/X_{total} \tag{E04.2}$$

X: same-scope value; growth uses comparable January–August windows.

ASSUMPTIONS / AXIOMS

Keep source vintage, currency and cumulative duration fixed; growth is not causal attribution.

2026 YTD growth 32.92%; export share 66.23%.

Unit value and price comparator / Symmetric value decomposition

E05: results pp. 28, 35 | E06: results p. 29

E05 Unit value and price comparator

EXECUTED SOURCE DIAGNOSTIC

$$u_t = V_t/Q_t \tag{E05.1}$$

$$R_t = 100p_t^{realised}/p_t^{international} \tag{E05.2}$$

V/Q requires compatible mass and value; R uses published monthly prices.

ASSUMPTIONS / AXIOMS

Unit value combines quality, timing and composition. R is not a same-batch discount.

No loss rate inferred from unmatched prices.

E06 Symmetric value decomposition

EXECUTED ACCOUNTING

$$\Delta V = \bar{u}\Delta Q + \bar{Q}\Delta u \tag{E06.1}$$

$$\bar{x} = (x_0 + x_1)/2 \tag{E06.2}$$

Q: reported export ounces; u: implicit unit value; contributions in USD.

ASSUMPTIONS / AXIOMS

Average both factor-update orders; retain component-scope exceptions.

No production cause is identified.

Non-overlapping cumulative windows / Gold-stock valuation bridge

E07: results p. 33 | E08: results p. 37

E07 Non-overlapping cumulative windows

EXECUTED PERIOD TRANSFORMATION

$$X_{Apr:Jun} = X_{Jan:Jun} - X_{Jan:Mar} \tag{E07.1}$$

$$X_{Jul:Aug} = X_{Jan:Aug} - X_{Jan:Jun} \tag{E07.2}$$

All X are cumulative gold-export values in the same source vintage.

ASSUMPTIONS / AXIOMS

A two-month window differs from a quarter; no missing months are interpolated.

Cumulative values are not summed.

E08 Gold-stock valuation bridge

EXECUTED STOCK ACCOUNTING

$$\Delta V_G = \bar{u}_G \Delta Q_G + \bar{Q}_G \Delta u_G \tag{E08.1}$$

$$u_G = V_G / Q_G \tag{E08.2}$$

VG: source gold value USD m; QG: source tonnes including specified transit assets.

ASSUMPTIONS / AXIOMS

Quantity and unit-value contributions are arithmetic; no transaction/valuation ledger is recovered.

Value gains are not necessarily cash receipts.

Published financing balance / Event-date aggregation

E09: results pp. 38, 39 | E10: results pp. 40, 41

E09 Published financing balance

EXECUTED SOURCE RECONCILIATION

$$B = F - S - A_{SAC} \tag{E09.1}$$

$$133.257808 - 128.546046 - 0.931322 \approx 3.780439 \tag{E09.2}$$

F: BoG funding; S: cedi-valued supplies; ASAC: stated adjustment. Second line GHS bn, rounded.

ASSUMPTIONS / AXIOMS

Use unrounded inputs for tests. No bank-confirmed export receipt is inferred.

Closing balance includes undisbursed funds.

E10 Event-date aggregation

EXECUTED LEDGER GROUPING

$$F_m = \sum_{i: d_i^f \in m} F_i \tag{E10.1}$$

$$S_m = \sum_{i: d_i^s \in m} S_i \tag{E10.2}$$

Funding and supply are assigned to their own dates. Source dashes remain missing.

ASSUMPTIONS / AXIOMS

Monthly gaps are not transaction profits, arrears or overdue borrowing.

89 funding rows, not 89 policy shocks.

Source residual and precision / Grant-inclusive surplus

E11: results pp. 27, 42, 43 | E12: results pp. 45, 46

E11 Source residual and precision

EXECUTED COMPARABILITY CHECK

$$\rho = T_{published} - \sum_j C_j \tag{E11.1}$$

$$\rho_{payable} = B_{note} - B_{trade} \tag{E11.2}$$

Residuals retain source units and precision; different concepts must be labelled.

ASSUMPTIONS / AXIOMS

Small rounding compatibility does not explain every discrepancy. No artificial balancing item.

DGPP payable difference GHS 288,422.97.

E12 Grant-inclusive surplus

EXECUTED ENTITY SENSITIVITY

$$S_{exgrant} = S_{reported} - G \tag{E12.1}$$

$$5,443,990,347 - 4,547,700,000 = 896,290,347 \tag{E12.2}$$

S: GoldBod 2025 surplus; G: recognised GoG grant; amounts GHS.

ASSUMPTIONS / AXIOMS

This subtraction does not eliminate inter-public fees or include other entities' external costs.

Not consolidated public or trading profit.

Expense and revenue scope / Balance-sheet identity

E13: results p. 48 | E14: results p. 49

E13 Expense and revenue scope

EXECUTED ENTITY ACCOUNT

$$R = R_{fees} + G + R_{finance} + \rho_R \tag{E13.1}$$

$$S_{pre} = R - C + \rho_S \tag{E13.2}$$

R and C use audited source presentation; residuals preserve stated totals.

ASSUMPTIONS / AXIOMS

Do not divide these expenses by national exports and call that profitability.

Entity costs are not all DGPP costs.

E14 Balance-sheet identity

EXECUTED SOURCE IDENTITY

$$Assets = Liabilities + NetAssets \tag{E14.1}$$

$$CurrentAssets = Cash + OtherCurrentAssets \tag{E14.2}$$

All amounts refer to the same audited 2025 entity.

ASSUMPTIONS / AXIOMS

Cash eligibility and restrictions require bank and legal evidence beyond balance-sheet labels.

Large cash is not all available surplus.

Cash-flow movement / Cross-source quarterly scope

E15: results pp. 50, 51 | E16: results pp. 54, 55, 56

E15 Cash-flow movement

EXECUTED SOURCE IDENTITY

$$Cash_1 - Cash_0 = CFO + CFI + CFF \tag{E15.1}$$

$$8.770555 - 0.738176 = 8.061998 - 0.016619 - 0.013000 \tag{E15.2}$$

CFO/CFI/CFF: reported operating, investing, financing cash flows; second line GHS bn, rounded.

ASSUMPTIONS / AXIOMS

CFO can reflect grants and working-capital changes, not only recurring trading operations.

Use full precision in computation.

E16 Cross-source quarterly scope

EXECUTED COMPARISON

$$V_{GB} = V_{ASM} + V_{LSM} \tag{E16.1}$$

$$\rho_{Q1} = V_{GB} - V_{BoG} \tag{E16.2}$$

Q1 GoldBod estimated export values versus BoG national merchandise gold value.

ASSUMPTIONS / AXIOMS

Same quarter/currency is necessary, not sufficient; mass, valuation and revision differences remain.

USD 330.992 m is an unreconciled comparator.

Recipient allocation and target / Invoice-to-uncommitted-FX account

E17: results pp. 57, 58 | E18: results p. 63

E17 Recipient allocation and target

EXECUTED SOURCE ARITHMETIC

$$FX_{sum} = FX_{banks} + FX_{BoG} \tag{E17.1}$$

$$701.3 + 1170.0 = 1871.3 \tag{E17.2}$$

September 2026 reported recipient allocations, USD m.

ASSUMPTIONS / AXIOMS

Headline 1,871.0 is rounded. October targets are separate prospective amounts.

Allocation is not a reserve stock identity.

E18 Invoice-to-uncommitted-FX account

EXECUTED CONDITIONAL EXAMPLE

$$FX_{free} = Invoice - Unpaid - Debt - Fees \tag{E18.1}$$

$$10 - 1 - 3 - 0.2 = 5.8 \tag{E18.2}$$

All amounts USD m in one assumed invoice cohort. Debt is external principal settlement.

ASSUMPTIONS / AXIOMS

Avoid double-counting advances and final receipts; other restricted obligations would reduce the remainder.

Not an observed GoldBod receipt cohort.

Public-boundary consolidation / Reserve stock and transaction change

E19: results pp. 21, 47, 60 | E20: results p. 36

E19 Public-boundary consolidation

DEFINED ACCOUNTING CONTROL

$$R_{public} = \sum_i R_i - R_{internal} \tag{E19.1}$$

$$C_{public} = \sum_i C_i - C_{internal} \tag{E19.2}$$

Internal flows require matched counterparties, periods and classification.

ASSUMPTIONS / AXIOMS

External principal is not income; external resource costs and obligations remain after consolidation.

No consolidated monetary total estimated.

E20 Reserve stock and transaction change

DEFINED ACCOUNTING BOUNDARY

$$\Delta Reserves = Transactions + Valuation + Other \tag{E20.1}$$

$$FX_{allocated} \neq \Delta Reserves \tag{E20.2}$$

Reserve definition and eligible assets/liabilities are source-specific.

ASSUMPTIONS / AXIOMS

BoG headline GIR, programme GIR and NIR are distinct; borrowed FX has counterpart obligations.

No reserve increase attributed to one flow.

Locked batch purchase cost / Batch sales and payability

E21: results p. 67 | E22: results p. 67

E21 Locked batch purchase cost

EXECUTED CONDITIONAL COST

$$C_{buy} = O_0 p_0 e_0 (1 - d_b) \quad (E21.1)$$

$$O_0 = W_g a_0 / 0.0311034768 \quad (E21.2)$$

p0: USD/oz; e0: GHS/USD; db: purchase discount; B01 gross mass 100 kg.

ASSUMPTIONS / AXIOMS

Purchase cost stays fixed under ex-post sale price, FX and assay shocks.

No actual GoldBod contract calibration.

E22 Batch sales and payability

EXECUTED CONDITIONAL VALUE

$$R_{USD} = O_1 p_1 \pi (1 - d_s) \quad (E22.1)$$

$$R_{GHS} = e_1 R_{USD} \quad (E22.2)$$

pi: payable fraction .995; ds: sale deduction .005; O1: final assay fine ounces.

ASSUMPTIONS / AXIOMS

Payability and fee bases remain distinct. Final-assay risk does not retroactively alter locked purchase cost.

Sale receipt presumes full buyer settlement.

Operating cost rule / Simple funding cost

E23: results p. 68 | E24: results pp. 68, 74

E23 Operating cost rule

EXECUTED CONDITIONAL COST

$$C_{op} = vO_0p_0e_0 + F \tag{E23.1}$$

$$v = 0.003, \quad F = 20,000 \tag{E23.2}$$

Variable operating rate on reference value plus fixed GHS cost.

ASSUMPTIONS / AXIOMS

Rates are imposed; taxes and unlisted border, legal or hedging charges excluded.

The operating rule is not an observed tariff.

E24 Simple funding cost

EXECUTED CONDITIONAL FINANCE

$$J = (C_{buy} + C_{op})rd/365 \tag{E24.1}$$

$$r = 0.20, \quad d = 14 \tag{E24.2}$$

r annual simple rate; d funded days; no interim recovery in base case.

ASSUMPTIONS / AXIOMS

Finance only outstanding principal; risk premiums and fees need actual lender terms.

Not a current lending quote.

Net batch margin / Break-even price, FX and duration

E25: results pp. 68, 69, 101 | E26: results pp. 72, 101

E25 Net batch margin

EXECUTED CONDITIONAL RESULT

$$M = R_{GHS} - C_{buy} - C_{op} - J \tag{E25.1}$$

$$m = 100M/C_{buy} \tag{E25.2}$$

M is pre-tax batch result; m is margin divided by locked purchase cost.

ASSUMPTIONS / AXIOMS

B01 does not measure a national trading profit or all public-sector costs.

Base result: GHS -93,388.63.

E26 Break-even price, FX and duration

EXECUTED CONDITIONAL THRESHOLDS

$$p^* = \frac{C_{buy} + C_{op} + J}{O_1 \pi (1 - d_s) e_1} \tag{E26.1}$$

$$d^* = \frac{365(R_{GHS} - C_{buy} - C_{op})}{r(C_{buy} + C_{op})} \tag{E26.2}$$

FX threshold is total cedi costs divided by USD sale receipt; d* requires positive gross spread.

ASSUMPTIONS / AXIOMS

Hold non-varied inputs fixed. A threshold is not a forecast, price target or recommended quote.

Base zero-margin duration 12.78 days.

Partial principal recovery / Production and capture decomposition

E27: results p. 73 | E28: results p. 30

E27 Partial principal recovery

EXECUTED CONDITIONAL LEDGER

$$B_k = B_{k-1} - Recovery_k \tag{E27.1}$$

$$J = \sum_k B_{k-1} r(d_k - d_{k-1})/365 \tag{E27.2}$$

B_k: remaining funded principal; assumed receipts apply to principal.

ASSUMPTIONS / AXIOMS

Do not charge interest again on repaid amounts; actual repayment waterfall may differ.

Recovery schedule is explicitly synthetic.

E28 Production and capture decomposition

EXECUTED CONDITIONAL ACCOUNTING

$$E = cP, \quad \Delta E = \bar{c}\Delta P + \bar{P}\Delta c \tag{E28.1}$$

$$99 - 60 = 7.5 + 31.5 \tag{E28.2}$$

P physical tonnes; c formal capture; E recorded tonnes in an imposed example.

ASSUMPTIONS / AXIOMS

No stocks, imports or re-exports in this simple illustration. Actual applications need those additional accounts.

Not calibrated to Ghana's capture rate.

Missing-outcome mean bounds / Inception-cohort settlement exposure

E29: results p. 81 | E30: results pp. 24, 51, 80

E29 Missing-outcome mean bounds

EXECUTED CONDITIONAL SENSITIVITY

$$\mu = r\mu_{obs} + (1 - r)\mu_{miss} \tag{E29.1}$$

$$\mu \in [r\mu_{obs} + (1 - r)L, r\mu_{obs} + (1 - r)U] \tag{E29.2}$$

r response share; assumed observed mean 40, support [0,100].

ASSUMPTIONS / AXIOMS

Support and response must be justified in real data; this does not identify a treatment effect.

80% response gives a mean range 32–52.

E30 Inception-cohort settlement exposure

DEFINED MEASUREMENT

$$Outstanding_t = Invoice - \sum_{k \leq t} Settlement_k \tag{E30.1}$$

$$Age_t = t - Date_{origin} \tag{E30.2}$$

Keep partial receipts, advances, disputes and origin dates; distinguish cash from cedi-valued gold delivery.

ASSUMPTIONS / AXIOMS

Paid-only cohorts select on the outcome. No observed recovery median estimated.

Templates contain no private claim histories.

Event-date cash and financing gap / Evidence release and audit scope

E31: results pp. 64, 85, 102 | E32: results p. 104

E31 Event-date cash and financing gap

DEFINED LIQUIDITY ACCOUNT

$$Cash_t = Cash_0 + \sum_{k \leq t} (In_k - Out_k) \tag{E31.1}$$

$$Gap = \max(0, -\min_t Cash_t) \tag{E31.2}$$

Cash paths require actual dated inflows, outflows and committed credit.

ASSUMPTIONS / AXIOMS

A shortfall is not a default probability; source cash balances are not all unrestricted.

Proposed 13-week monitoring definition.

E32 Evidence release and audit scope

IMPLEMENTED REPORTING CONTROL

$$Observed \neq Assumed \neq Target \tag{E32.1}$$

$$ArithmeticClosure \neq CausalIdentification \tag{E32.2}$$

Evidence type, source, period, perimeter and validation status are recorded.

ASSUMPTIONS / AXIOMS

A financial audit does not automatically certify operational narrative or public consolidation.

All central claims retain explicit scope.

Ledger coverage and gross-net balances / BoG result and stock boundaries

E33: results pp. 87, 88, 89 | E34: results pp. 91, 92, 93

E33 Ledger coverage and gross-net balances

EXECUTED SOURCE DIAGNOSTIC

$$Coverage_v = 1 - \frac{\sum_{i \in missing} F_i}{\sum_i F_i} \tag{E33.1}$$

$$B_{net} = \sum_i \max(B_i, 0) + \sum_i \min(B_i, 0) - SAC \tag{E33.2}$$

F is source funding; missing means no listed supply field; Bi is the signed source row balance.

ASSUMPTIONS / AXIOMS

Do not drop blank rows, infer repayment from a delivery value, or treat a negative balance as trading profit.

Blank-field funding is GHS 12.186 bn; not a measured default.

E34 BoG result and stock boundaries

EXECUTED SOURCE RECONCILIATION

$$S_{partial} = Gain_{bullion} - Loss_{gold\ deals} \tag{E34.1}$$

$$V_1 = V_0 + Purchases + Transfer - Disposals + Price + FX \tag{E34.2}$$

S is a partial two-line subtotal, not programme profit; V is the source gold-holdings carrying value.

ASSUMPTIONS / AXIOMS

Match signs, currency and source scope. Stock changes and valuation recycling are not current export cash.

No matched bridge from these lines to IMF programme costs.

Doré mass residual / Indirect operating-cash reconciliation

E35: results p. 95 | E36: results pp. 98, 99

E35 Doré mass residual

EXECUTED SOURCE DIAGNOSTIC

$$R = I_0 + Purchases - Sales - I_1 \tag{E35.1}$$

$$R = 7,311 + 2,914,305 - 2,895,426 - 9,283 \tag{E35.2}$$

All quantities are the note’s fine troy ounces; R is the unobserved other-movement requirement.

ASSUMPTIONS / AXIOMS

Transfers, refining and scope may explain R. It must not be labelled physical loss without supporting records.

Residual 16,907 fine oz, not a finding of missing gold.

E36 Indirect operating-cash reconciliation

EXECUTED SOURCE ACCOUNTING

$$CFO = Surplus + Adjustments + \Delta WorkingCapital \tag{E36.1}$$

$$Residual = CFO - Grant - \Delta Payables - PrepaymentRelease \tag{E36.2}$$

Signs follow the cash-flow statement, not a generic asset-change formula; grant removal is a sensitivity.

ASSUMPTIONS / AXIOMS

Preserve printed source signs. The selected residual is not unrestricted cash, recurring income or trading profit.

The non-cash fair-value adjustment requires clarification.

Interaction-aware sale-proceeds bridge / Differential-response contrast bounds

E37: results p. 103 | E38: results p. 106

E37 Interaction-aware sale-proceeds bridge

EXECUTED CONDITIONAL ATTRIBUTION

$$R_1 = R_0 f_{price} f_{FX} f_{assay} \tag{E37.1}$$

$$\phi_j = \frac{1}{6} \sum_{orders} (R_{after\ j} - R_{before\ j}) \tag{E37.2}$$

The three imposed factors change sale proceeds; locked purchase and funding costs remain unchanged.

ASSUMPTIONS / AXIOMS

Average all six update orders. Contributions sum to the change but do not identify causal mechanisms.

Shapley attribution is a convention, not an estimated hedge.

E38 Differential-response contrast bounds

EXECUTED CONDITIONAL BOUNDS

$$L_g = r_g \mu_{g, obs} + (1 - r_g)L, \quad U_g = r_g \mu_{g, obs} + (1 - r_g)U \tag{E38.1}$$

$$\mu_T - \mu_C \in [L_T - U_C, \quad U_T - L_C] \tag{E38.2}$$

r is group response; observed means 50 and 40; outcome support [0,100] is assumed.

ASSUMPTIONS / AXIOMS

Real data need defensible support and response. A population contrast is not automatically a treatment effect.

80% / 90% response gives the range -6 to +24.

Cohort-time production effect / Separate physical and recording outcomes

P01: results pp. 77, 78, 79 | P02: results p. 79

P01 Cohort-time production effect

PROSPECTIVE ONLY — NOT ESTIMATED

$$ATT(g, t) = E[Y_t(1) - Y_t(0) \mid G = g] \tag{P01.1}$$

$$ATT_h = \sum_g w_g ATT(g, g + h) \tag{P01.2}$$

Y physical mine output or separately formal recording; G first exposure cohort.

ASSUMPTIONS / AXIOMS

Conditional parallel trends, overlap, no unmodelled anticipation and suitable interference structure.

No causal national coefficient fitted.

P02 Separate physical and recording outcomes

PROSPECTIVE ONLY — NOT ESTIMATED

$$Y_{it}^P = PhysicalGold_{it} \tag{P02.1}$$

$$Y_{it}^R = RecordedGold_{it} \tag{P02.2}$$

Two outcomes measured in compatible fine mass, not substituted for each other.

ASSUMPTIONS / AXIOMS

Stable origin, stock and recording definitions; treatment can act through both channels.

Post-treatment reporting is a possible mediator.

Direct and market-spillover effects / Response weighting and selection

P03: results p. 78 | P04: results pp. 80, 83

P03 Direct and market-spillover effects

PROSPECTIVE ONLY — NOT ESTIMATED

$$DE(e) = E[Y(1, e) - Y(0, e)] \tag{P03.1}$$

$$SE(e, e_0) = E[Y(0, e) - Y(0, e_0)] \tag{P03.2}$$

e: exposure to nearby or network treatment; define dealer and mine-market boundaries.

ASSUMPTIONS / AXIOMS

Require a credible exposure map, assignment support and observed nonparticipant outcomes.

No national multiplier or displacement ratio estimated.

P04 Response weighting and selection

PROSPECTIVE ONLY — NOT ESTIMATED

$$\hat{\mu}_w = \frac{\sum_i R_i w_i Y_i}{\sum_i R_i w_i} \tag{P04.1}$$

$$w_i = d_i / Pr(R_i = 1 \mid X_{i,pre}) \tag{P04.2}$$

Ri response; di design weight; Xpre baseline predictors.

ASSUMPTIONS / AXIOMS

Valid frame, positivity and suitable missingness assumptions; add non-random missingness sensitivity.

No weights invented for publicly reported operators.

The unresolved items remain part of the report

No source balance or statistical observation is overwritten to create apparent agreement.

Table 48. The unresolved items remain part of the report

Issue	Specific limitation	Treatment
Production / source scope	MinCom ALL and mine-size rows do not fully match	Preserve residuals; no physical-production attribution.
Trade / audited payable	GHS 288,422.97 difference between closing records	Request documentary bridge, not a balancing plug.
Q1 export estimates	USD 330.992 m cross-source comparator difference	No claim of missing cash or trading loss.
Public consolidation	Inter-public counterpart ledger not available	No net public-profit total.
Legal / assurance scope	Full Act and contracts; special audit completion not recovered	No transaction-specific legal opinion or completion claim.
Source binaries	External PDF downloads failed in the working runtime	URLs, locators, transcriptions and image-review records retained.

Sources: GoldBod audited accounts [\[S02\]](#); GoldBod–BoG trade ledger [\[S03\]](#); GoldBod Q1 report [\[S04\]](#); Minerals Commission database [\[S08\]](#).

Each numerical exhibit has a source or a declared assumption

Reproduction is distinct from independent verification of the originating systems.

Table 49. Each numerical exhibit has a source or a declared assumption

Layer	Files / procedure	Evidence boundary
Published inputs	inputs/*.csv; sources/source_register.json	Original scopes, dates, dashes and rounding retained.
Accounting and scenarios	code/analyse.py; outputs/*.csv	Deterministic calculations; no fabricated causal model.
Exhibits	outputs/figure_data and table_data	Editable native marks and tables tied to data.
Equations	docs/equation_register.json; assets/equation_*.png	Mathematical sources and assumptions retained.
Publication / replay	code/build.py; code/finalise.py; verification/	Rendered review, internal links and local replay checks.

Sources: IDER calculations [\[S99\]](#).

References and source links — 1 of 5

Titles open the source; exact locators and verification boundaries accompany the data.

S01 Bank of Ghana | 23 September 2026

Summary of Economic and Financial Data — September 2026

PDF pp. 8–9: commodity prices and external sector.

S02 Ghana Gold Board; Auditor-General | Published 29 April 2026

Annual Report and Audited Financial Statements for the Year Ended 31 December 2025

PDF pp. 17–22: statements; pp. 34–44: notes; printed pages are two fewer.

S03 Ghana Gold Board | 2025 ledger; published 2026

GoldBod/BoG Trade Report (Detailed), 31 December 2025

All five pages; 89 financing rows plus SAC adjustment; table totals.

References and source links — 2 of 5

Titles open the source; exact locators and verification boundaries accompany the data.

S04 Ghana Gold Board | January–March 2026

First-Quarter Report 2026

PDF pp. 5–6: financials; pp. 10–11: assay and export tables.

S05 Ghana Gold Board | 30 September 2026

September 2026 Foreign-Exchange Generation and October Target

Signed one-page press release; September allocation and October plan.

S06 International Monetary Fund; Ghanaian authorities | Staff report completed 10 July; Board 27 July 2026

Ghana: 2026 Article IV Consultation and Sixth ECF Review — Country Report 26/212

PDF pp. 31–32, 40–42, 108: DGPP costs, transition and authorities' commitments.

References and source links — 3 of 5

Titles open the source; exact locators and verification boundaries accompany the data.

S07 Ghana Gold Board | 28 September; effective 1 October 2026

Assaying Guidelines for Local Gold Trading

Two-page notice: water-density and XRF procedures and verification.

S08 Minerals Commission, Ghana | Accessed 2 October 2026

Industry Statistics and Data

Annual 2023–2024 rows: Large Scale, Small Scale and ALL; gold production, export quantity and value.

S09 Ghana Gold Board | Accessed 2 October 2026

Official Mandate and Operations

Official site mandate and trading/assaying descriptions.

References and source links — 4 of 5

Titles open the source; exact locators and verification boundaries accompany the data.

S10 OECD | Third edition, 2016

OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas

Responsible supply-chain due-diligence framework and gold supplement.

S11 Brantly Callaway and Pedro H. C. Sant’Anna | 2021; author manuscript revised 2020

Difference-in-Differences with Multiple Time Periods

Author abstract and identification, aggregation and simultaneous-inference framework.

S12 Pedro H. C. Sant’Anna and Jun B. Zhao | 2020

Doubly Robust Difference-in-Differences Estimators

Author abstract; panel/repeated-cross-section ATT and nuisance-model conditions.

References and source links — 5 of 5

Titles open the source; exact locators and verification boundaries accompany the data.

S13 Bank of Ghana | 2026; reviewed 2 October 2026

Annual Report and Financial Statements 2025

PDF pp. 124–125,132,136: Notes 9,13,21(a),26; printed pp. 62–63,70,74.

S99 Institute of Development and Economic Research | 2 October 2026

GoldBod: Reconciliation, Batch Economics and Public-Exposure Protocol

This archive: inputs, analyse.py, results, equation catalogue and verification.

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