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Enterprise Financial Modelling for Mining: From Cost Model to Investment Committee

How MiningIQ builds structured, auditable financial models that generate complete financial statements, model fiscal regimes across jurisdictions, and deliver board-ready investment committee reports with Bayesian risk analysis — all from a single source of truth.

Most mining financial models are spreadsheets. They start simple, grow complex, and eventually become unmaintainable. The formulae are opaque. The assumptions are buried. Version control is non-existent. When the investment committee asks a question, the answer takes days because someone has to manually trace through nested cell references to understand what the model is actually doing.

MiningIQ's enterprise financial model takes a fundamentally different approach. It is built on the same structural principles used by leading management consultancies for corporate financial modelling: a strict separation of inputs, calculations, and outputs; a chart of accounts that maps directly to financial statement line items; and a calculation engine that is deterministic, auditable, and repeatable. The difference is that MiningIQ is purpose-built for mining — it understands fiscal regimes, commodity price decks, mine schedules, and the specific cost structures that make mining economics unique.

Design Philosophy: Inputs, Calculations, Outputs

The architecture of MiningIQ's financial model follows a principle that management consultancies have applied to corporate finance for decades: every model should have a clean, enforced separation between what goes in, what is computed, and what comes out. In practice, most mining spreadsheet models violate this principle within the first month of use. Inputs get hardcoded into formula cells. Calculation logic gets duplicated across tabs. Outputs reference intermediate calculations that nobody documented.

MiningIQ enforces this separation structurally. The model is organised into three distinct layers, and the calculation engine moves data through them in one direction only.

1	**Input Layer** All assumptions, market data, cost inputs, and production profiles enter the model through a structured input interface. Each input is typed, documented, version-controlled, and tagged for sensitivity analysis. Inputs include key parameters (discount rate, tax, dividends), fiscal regime configuration, financing terms, working capital assumptions, depreciation policy, revenue terms, and risk flex definitions. Nothing is hardcoded into the calculation layer.
2	**Calculation Engine** A deterministic engine processes inputs through a defined sequence: revenue from production volumes and price decks, operating costs from MineCost, depreciation from asset schedules, working capital from DSO/DPO/inventory days, financing from debt instruments, and fiscal charges from the configured jurisdiction. Every intermediate result is stored and traceable. The engine runs identically every time for the same inputs — there is no hidden state.
3	**Output Layer** Complete financial statements (income statement, balance sheet, cash flow), key metrics (NPV, IRR, payback, DSCR), sensitivity analysis, Bayesian risk distributions, and an automated investment committee report. All outputs are generated from the calculation results — they are never manually adjusted or overridden.

Entity-Scenario Architecture

The model is structured around two core concepts: entities and scenarios. An entity represents a project or mine. A scenario represents a set of assumptions applied to that entity — a base case, an upside, a downside, or a price sensitivity. This is not a naming convention; it is enforced in the data model. Every input, every calculation, and every output is scoped to a specific entity and scenario.

Why this matters: When the investment committee asks to see the project under three different commodity price assumptions, the answer is three scenarios within the same entity. Each scenario inherits the full model structure — fiscal regime, depreciation policy, financing terms, cost inputs — and differs only in the assumptions being tested. There is no risk of accidentally comparing a base case with one set of tax assumptions against a downside case with different tax assumptions, because the model structure prevents it.

Scenario Decks

Scenarios are grouped into decks for reporting. A deck might contain a base case, a downside, and an upside — or it might contain fifty price-sensitivity runs. The IC report is generated from a deck, which means the investment committee sees a coherent set of scenarios that have all been calculated against the same underlying model, not a collection of independently maintained spreadsheets.

MineCost Integration

Operating and capital costs do not originate in the financial model. They flow in from MineCost through a structured adapter that maps MineCost's WBS cost tree to the financial model's chart of accounts. When MineCost is updated — a new schedule run, revised equipment fleet, updated fuel price — the financial model receives the changes through a controlled sync process. The mapping is configured once and maintained as a permanent link, not a one-time data import.

Complete Financial Statements

MiningIQ generates three complete financial statements for every scenario, calculated period by period across the full life of mine. These are not summary tables or approximations — they are full, interconnected statements where the balance sheet balances, the cash flow reconciles, and every line item traces to a specific calculation in the engine.

Income Statement

Revenue is calculated from production volumes, product specifications, and commodity price decks with exchange rate conversion. Cost of sales breaks down into the categories defined by the MineCost WBS — mining costs, mining fuel, processing costs, processing power, tailings management, processing fuel, G&A, camp and catering, and site fuel. Each is a separate line item that can be traced back to its physical source in the cost model. Gross profit, operating expenses, depreciation, amortisation, and EBIT follow the standard structure.

Balance Sheet

Fixed assets are tracked through a full depreciation schedule with support for multiple methods (straight-line, units of production, diminishing value) and separate book and tax depreciation. Working capital is modelled from DSO, DPO, and inventory day assumptions applied to the revenue and cost profiles. Debt is tracked instrument by instrument with drawdown schedules, repayment profiles, and interest accruals. The balance sheet ties to the income statement through retained earnings and to the cash flow through changes in working capital and financing activities.

Cash Flow Statement

Unlevered free cash flow is the primary valuation metric. The cash flow statement reconciles EBIT to operating cash flow through working capital movements, adds back depreciation, deducts capital expenditure, and applies the fiscal regime. Levered cash flow then layers in financing — debt drawdowns, repayments, interest, and dividends. The cumulative cash position identifies peak funding requirements, and the model tracks when the project transitions from cash-negative to cash-positive.

Period-by-Period Calculation Granularity	**Full Tie-Out** BS ↔ P&L ↔ CF	**WBS-Linked** Cost Breakdown	**Multi-Method** Depreciation

Multi-Jurisdiction Fiscal Modelling

Mining projects operate under fiscal regimes that are more complex than standard corporate tax. Royalties may be ad valorem, profit-based, or production-based. Tax rates may be graduated. Loss carry-forward rules vary. Interest deductibility may be capped. Some jurisdictions impose mining-specific taxes or rent provisions on top of corporate income tax. Getting this wrong can shift the project NPV by hundreds of millions of dollars.

MiningIQ's fiscal engine is configurable per jurisdiction and models the full tax waterfall:

- Corporate income tax with jurisdiction-specific rates and graduated thresholds
- State and federal royalties with configurable calculation bases (revenue, profit, production volume)
- Mining-specific taxes and resource rent provisions
- Tax loss carry-forward with jurisdiction-specific limitation rules
- Interest deductibility caps and thin capitalisation rules
- Tax depreciation schedules separate from book depreciation
- Tax credits and incentives (where applicable)

The fiscal regime is configured once per entity and applies consistently across all scenarios. The effective government take — the combined impact of all taxes and royalties as a percentage of revenue — is calculated automatically and presented in the IC report so the investment committee can see the true post-tax economics.

Financing, Debt Service, and Dividends

The financing module tracks debt at the instrument level. Each debt facility has its own terms: drawdown schedule, interest rate (fixed or floating), repayment profile, grace period, and covenant requirements. The model calculates period-by-period interest expense, principal repayments, and tracks the outstanding balance.

Debt Service Coverage

The debt service coverage ratio (DSCR) is calculated every period. The model identifies the minimum DSCR across the debt life and flags whether covenant thresholds are met. Dividends are controlled by configurable policy rules — they can be set to commence only after debt repayment, or after the DSCR exceeds a specified threshold, or on a fixed schedule. The peak funding requirement — the maximum cumulative cash outflow before the project becomes self-funding — is identified automatically and reported as a key decision metric.

What the IC Sees

The financing summary in the IC report presents: peak gross debt, peak net debt, total interest cost over the life of mine, maximum and minimum DSCR, total dividends, peak annual dividend, and the first dividend year. This gives the investment committee immediate visibility into the project's bankability and return profile without needing to interrogate the underlying model.

Bayesian Risk Analysis

The risk engine in MiningIQ is not a Monte Carlo simulator. It uses a Bayesian framework that fundamentally changes how uncertainty is represented and communicated to decision-makers.

Why Bayesian, Not Monte Carlo

Monte Carlo treats variables as independent: A standard Monte Carlo simulation assigns a distribution to each input variable and samples them independently. This produces physically impossible combinations — scenarios where commodity prices are at the 95th percentile while operating costs are also at the 95th percentile, even though in practice high commodity prices drive cost inflation. The result is a distribution that overstates the tails and understates the central tendency.

Bayesian models incorporate what we know: The Bayesian approach starts with prior knowledge — the correlations that mining engineers and economists understand from experience. Commodity price and exchange rate are correlated. Grade and recovery are correlated. Operating cost and production volume are linked. These relationships are encoded in the model, which means the risk distribution reflects realistic combinations of outcomes, not random noise.

Probabilities update, they don't restart: When new information arrives — updated drilling results, revised pricing forecasts, a cost overrun on a comparable project — the Bayesian model incorporates it by updating existing probabilities rather than rebuilding the entire simulation from scratch. This makes the risk model a living tool that improves with each iteration of the study, not a one-time analysis that becomes stale as soon as assumptions change.

Risk Outputs

Each risk run produces a full NPV distribution from 2,000 samples, with each sample running through the complete financial model — not a simplified proxy. The outputs include:

- P10, P50, P70, and P90 NPV values — calibrated confidence intervals for the project's value
- Probability of negative NPV — the single most important risk metric for an investment committee
- Tornado chart — showing which key drivers (price, FX, capex, opex) have the greatest impact on NPV
- NPV exceedance curve — the full probability distribution with the base case highlighted
- Price vs Opex heatmap — NPV under simultaneous adverse movements in the two most sensitive variables

Critically, the tornado chart is computed by running the full financial model at each flex point — not by linear approximation. This means the sensitivity captures non-linear effects like tax thresholds, royalty step changes, and debt covenant triggers that a simple sensitivity table would miss.

Automated Investment Committee Report

The IC report is the final output of the system and the document that decision-makers actually read. In a traditional study, this report is written by hand — someone extracts numbers from the financial model, pastes them into a PowerPoint, writes narrative around them, and hopes that nothing changes before the board meeting. If an assumption is updated, the entire process repeats.

MiningIQ generates the IC report directly from the model outputs. The report is structured into standardised sections:

1	**Overview & Recommendation** Auto-generated narrative summarising the scenario's economics: whether the project shows positive NPV, what the key funding requirements are, and what the recommendation is based on the calculated metrics.

2	**Decision Summary** Key metrics at a glance: unlevered NPV, project IRR, peak net debt, payback period, C1 cash cost, AISC, AIC, and margin. These are the numbers the investment committee uses to make a go/no-go decision.

3	**Fiscal Regime & Government Take** Applicable taxes, royalties, and the effective government take as a percentage of revenue. Shows the committee what the host government captures and what remains for the project.

4	**Value & Cash Flow Profile** Period-by-period unlevered free cash flow with cumulative cash position. Shows when the project turns cash-positive and the shape of the return profile.

5	**Funding & Balance Sheet** Net debt trajectory, peak funding requirement, DSCR profile, dividend capacity, and the first dividend year.

6	**Sensitivity & Risk** Tornado chart, NPV exceedance curve, price vs opex heatmap, and the Bayesian risk summary (P10 through P90) with probability of negative NPV.

7	**Financial Statement Extract** Period-by-period income statement, balance sheet, and cash flow summary for the committee's reference.

The entire report regenerates in minutes when any input changes. The narrative updates automatically. The charts recalculate. The risk analysis reruns. This means the investment

committee always sees a report that reflects the current state of the model — not a snapshot from three weeks ago that someone forgot to update.

Technical Architecture

MiningIQ's enterprise financial model is a web-based application, not a spreadsheet. It runs on a structured database with a defined schema — not on a grid of cells where any cell can reference any other cell. This is what makes the model auditable at scale.

Model Components

Component	Function
Chart of Accounts	Maps every cost and revenue line to its financial statement position. Ensures the income statement, balance sheet, and cash flow are structurally consistent.
Fiscal Engine	Configurable per jurisdiction. Calculates corporate tax, royalties, loss carry-forwards, and mining-specific levies in the correct sequence.
Depreciation Engine	Multiple methods (straight-line, UOP, diminishing value). Separate book and tax schedules. Vintage year tracking for asset additions.
Financing Module	Instrument-level debt tracking. Interest, repayment, grace periods, covenant monitoring, and dividend policy.
Working Capital	DSO, DPO, and inventory day assumptions applied to revenue and cost profiles. Calculates period-by-period working capital movements.
Bayesian Risk Engine	2,000-sample analysis with correlation modelling. Full financial model evaluation at each sample. Calibrated P10–P90 distributions.
IC Narrative Generator	Auto-generates report text from calculated results. Identifies key points, value drivers, risks, and funding requirements.
MineCost Adapter	Structured mapping from MineCost WBS cost tree to financial model chart of accounts. Controlled sync with version tracking.

Why This Matters

A mining financial model is only useful if people trust it. Trust comes from auditability — the ability to trace any output back to its source input through a defined calculation path. Spreadsheets make this theoretically possible but practically impossible at the scale of a feasibility study.

MiningIQ makes it structural. Every number in the IC report has a provenance: it was calculated by a defined engine, from documented inputs, through a traceable chain. When an assumption changes, the entire model recalculates and the IC report regenerates. There is no manual step where errors can be introduced and no version where the balance sheet doesn't balance.

This is enterprise financial modelling built for the way mining decisions are actually made: under uncertainty, with multiple stakeholders, on tight timelines, where the cost of a modelling error is measured in hundreds of millions of dollars.

Want to see MiningIQ's enterprise financial model in action?

Book a technical discussion to walk through a live scenario.

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