The Portfolio Equation

An Insurance Portfolio Management Simulation

The Brief

A UK commercial insurer identified a persistent challenge with newly qualified underwriters and account managers. Although technically proficient in individual risk assessment and actuarial pricing, these professionals struggled to understand how their decisions aggregated into portfolio-level exposure. They evaluated and priced individual policies in isolation without recognising how seemingly independent choices create concentration risk, capital inefficiency, and catastrophic vulnerability.

The commissioning stakeholder articulated a specific behavioural outcome: when reviewing any new policy submission, an underwriter should instinctively ask, *"How does this affect our portfolio concentration, our capital ratio, our aggregate catastrophe exposure, and our reinsurance treaty limits?"*

The UK commercial insurance market operates on razor-thin margins — typical combined ratios of 95–100% — where profitable underwriting requires sophisticated portfolio construction, not merely competent individual risk assessment.

Five primary learning objectives were established:

1. **Loss Ratio Dynamics** — Understand how pricing decisions affect profitability over multi-year horizons, recognising that premium is immediate while claims emerge over 12–24 months
2. **Portfolio Concentration Risk** — Recognise how individual "good risks" can create portfolio "bad risk" through concentration
3. **Strategic Reinsurance Management** — Appreciate the trade-off between risk retention (profit potential) and risk transfer (capital protection)
4. **Capital Adequacy Constraints** — See how regulatory capital requirements bind underwriting capacity regardless of market demand
5. **Retention Economics** — Understand that customer renewals are significantly more profitable than new business acquisition

The brief specified a half-day format for 12–16 participants organised as 4 teams of 3–4, with a three-year narrative arc progressing from "Building the Book" through "Concentration Builds" to "Consequences Crystallise."

The Solution

The resulting simulation places four competing teams in charge of their own version of Keystone Insurance, a mid-sized UK commercial insurer. Over three simulated years, teams make strategic underwriting decisions — pricing strategy, new business selection, reinsurance treaty management, and client retention — that collectively shape their portfolio's profitability, resilience, and growth.

Core Mechanic: Delayed Claims Emergence

The simulation's central innovation addresses one of insurance's most counter-intuitive dynamics: the disconnect between premium collection (immediate) and claims emergence (delayed). Pricing decisions and policy acquisitions generate delayed loss ratio effects that only materialise the following year.

This creates a powerful learning experience: aggressive pricing looks exceptionally profitable in Year 1, with low visible loss ratios encouraging growth-focused strategies. By Year 2, as claims emerge, the true cost of aggressive pricing becomes apparent. Teams experience firsthand why early profitability is deceptive and why seasoned portfolio managers maintain pricing discipline even when competitors undercut.

The Concentration Index

Portfolio concentration is tracked on a single 5-level index, from Level 1 (Diversified) to Level 5 (Critical). Each policy card acquired may shift concentration upward, while strategic decisions can mitigate it. When catastrophe events strike, losses are multiplied by the concentration level — Level 1 portfolios pay half the base damage (×0.5), while Level 5 portfolios pay double (×2.0).

This mechanic transforms concentration risk from an abstract actuarial concept into an immediate, tangible consequence. A team that accumulated high-exposure policies without monitoring their concentration will suffer dramatically larger catastrophe losses than a diversified competitor facing the same event.

One-Shot Policy Cards

Each year, teams receive a fresh set of unique policy cards — 14 across the simulation — each representing a distinct commercial risk with its own premium, capital cost, loss ratio impact, concentration effect, and catastrophe exposure. Crucially, policy cards are one-shot: once declined, they never return. This creates authentic time pressure and forces teams to evaluate each opportunity against their current portfolio composition, not in isolation.

Progressive Decision Architecture

Each year, teams make 5–6 distinct decision types simultaneously: strategy selection, policy acquisition, reinsurance positioning, retention investment, and (from Year 2) capital management. Strategic complexity builds across the three-year arc:

- **Year 1 (Building the Book):** Teams learn basic mechanics — policy selection, concentration tracking, and the relationship between loss ratio and combined ratio. Market conditions are stable, allowing participants to establish portfolio foundations.
- **Year 2 (Concentration Builds):** The first catastrophe event arrives, punishing concentrated portfolios. Year 1 delayed claims emerge, revealing the true cost of aggressive pricing. Capital management decisions introduce a new strategic lever.
- **Year 3 (Consequences Crystallise):** Full complexity. A major catastrophe with cyber modifier tests portfolio resilience. A regulatory stress test penalises undercapitalised teams. Three years of cumulative decisions reach their reckoning.

Assessment

Independent AI Assessment Score: 91/100

Dimension	Score
Mechanical Quality	22/25
Strategic Depth	24/25
Educational Value	23/25
Playability	22/25

Scored by Claude (Anthropic) using a structured playtest methodology: the AI independently played the full simulation, calculated scores using the documented rules, and evaluated across four standardised dimensions.

Alignment with Learning Objectives

The simulation demonstrates strong fidelity to the original brief across all five learning objectives. The delayed claims emergence mechanic creates the intended learning arc where Year 1 profitability is deceptively attractive and true portfolio performance only becomes visible in Years 2–3. The 5-level concentration index with threshold-triggered catastrophe multipliers directly models how individual “good risks” create aggregate “bad risk.” The reinsurance ceding system creates genuine strategic choice — retaining more risk increases profit potential but amplifies catastrophe exposure, while ceding more protects capital at the cost of net premium.

Facilitation Design

The comprehensive Facilitator Manual provides step-by-step setup instructions, a plain-language insurance concepts table, a 20-minute rules briefing guide with scripted talking points, and worked calculation examples — enabling L&D professionals without insurance expertise to deliver sessions confidently. The team boards embed quick-reference panels and scoring formulas directly onto the playing surface, reducing facilitator burden during gameplay. The three-turn structure with clear phase sequencing (Decision → Event → Calculation → Review) makes the session manageable for first-time facilitators.

Mechanical Rigour

The simulation was independently playtested by AI across multiple strategic profiles, confirming that every policy card, event response, and strategic decision produces quantified, unambiguous outcomes. The balanced scorecard scoring system (Combined Ratio 30%, Capital Adequacy 25%, GWP Growth 25%, Retention 20%) prevents any single-metric strategy from dominating, ensuring all five learning objectives remain in tension throughout the session. The one-shot policy card design eliminates dominant strategies — optimal choices depend entirely on current portfolio state, making each team's decision path genuinely unique.

Structural Excellence

The 4-hour duration accommodates the three-year arc comfortably with built-in breaks and a structured 30-minute debrief. The design principle — "Year 1 teaches. Year 2 reveals. Year 3 tests." — creates a natural narrative arc that mirrors how real insurance portfolios develop: early decisions appear sound, intermediate consequences emerge, and long-term resilience is ultimately tested. The escalating event sequence (market intelligence, catastrophe, regulatory review) authentically mirrors the pressures real portfolio managers face.

Summary Specifications

Attribute	Detail
Duration	4 hours (half-day)
Participants	12–16 (4 teams of 3–4)
Domain	Commercial Insurance Portfolio Management
Complexity	Intermediate-Advanced (Professional Level)
Core Mechanics	Delayed claims emergence, 5-level concentration index, one-shot policy cards, physical capital constraints,

Attribute	Detail
	reinsurance ceding, balanced scorecard
Physical Components	Team dashboards, shared market board, policy cards, strategy cards, event cards, event response cards, reinsurance cards, retention cards, capital management cards, reference cards, tokens, cubes, pawns
Facilitator Requirement	L&D professional with moderate experience; insurance expertise helpful but not mandatory

The Portfolio Equation was developed as a demonstration simulation to showcase The Sim Smithy's capability for translating complex financial services domains into engaging, tactile learning experiences.