

Inferring Life Insurers' Capital Market Assumptions and Re-optimizing SAA with a Novel Approach to CMA Framework

Capstone Project Proposal

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Summary

U.S. life insurers face similar regulation and broadly similar liability structures, yet their strategic asset allocations differ in ways that are not fully explained by simple ALM rules of thumb. This project will identify what those portfolios imply about each firm's capital market assumptions, then compare those implied views to a new benchmark CMA framework that I will build. The framework will anchor fixed income returns to starting yield with explicit reinvestment mechanics, will build equity returns from cash distributions and growth, and will measure risk as long horizon forecast uncertainty using RMSE rather than one year volatility. For each insurer, I will hold its constraints constant, infer the return and risk views that rationalize its current allocation, compare those to my benchmark CMAs, then re-optimize an SAA under the same constraints using the benchmark inputs. The result is a practical, decision grade comparison that highlights where allocations appear to rely on different views of long term returns, risks, and correlations, and what each insurer's allocation would look like under a consistent, transparent CMA process.

Problem Statement and Objectives

Many institutional CMA processes lean on backward averages or on short horizon volatility scaling. My objective is to test whether a yield anchored, cash flow aware, RMSE based approach to long horizon CMAs leads to meaningfully different strategic allocations once real insurer constraints are honored. The core questions are, first, what return and risk assumptions are implicitly embedded in the observed portfolios of selected U.S. life insurers, second, how those implied assumptions compare to the benchmark CMAs I will construct, and third, how each insurer's optimal allocation would change if the benchmark CMAs were used without changing its constraints, governance, or balance sheet posture.

Scope and Sample

The empirical sample will include four to six publicly listed U.S. life insurers such as MetLife, Prudential, Lincoln Financial, Corebridge, Principle Financial Group and Voya. For each company I will compile a consistent asset taxonomy that separates public fixed income by maturity buckets, structured credit, private credit, commercial real estate related assets, public equities by category, alternatives, and cash or short term investments. I will document the ALM and capital context that is observable from filings, for example target liability duration bands, RBC considerations, rating agency sensitivities, and disclosed asset class limits.

Estimating Expected Return/Risk/Correlations for CMAs and Optimization

The CMA and optimization workflow is designed as a single, coherent loop, used in two directions, inverse to infer implied views from observed portfolios, and forward to re-optimize under the same constraints.

Fixed income returns are modeled by maturity buckets with starting yield as the anchor. Intermediate buckets compound approximately five years at current yield to worst and five years at a forecast reinvestment rate, long buckets blend current yield with a duration based capital gain or loss to an end horizon yield, and benchmark horizon buckets rely primarily on starting yield. Spreads are set from long samples that span at least one recession, and expected credit loss is incorporated using default rates and loss given default from Moody's or S&P, applied as a haircut to carry and as a parameter in stress checks.

Equity returns are estimated at the sector level using dividend yield and net buyback yield from Bloomberg, combined with five year growth aggregated bottom up from Capital IQ company forecasts. A modest, rules based valuation normalizer is applied only where there is consistent evidence that valuation helps explain medium horizon excess returns.

Alternatives are handled parsimoniously. Private equity, infrastructure equity, and private credit start from reputable industry CMAs as placeholders, private credit includes an explicit expected credit loss and a modest illiquidity premium, and equity like alternatives are mapped to the equity block for risk aggregation. Allocations are interpreted as total committed capital.

Risk is framed as long horizon forecast uncertainty. For each asset class, RMSE of multi year forecast errors is estimated and translated into a 10 year risk number, which supplies the diagonal of the risk model.

Market dependence in correlations follows the Amundi style regime logic. Correlations are defined on local currency total returns, rolling windows are used to detect regimes, and the stock bond correlation is conditioned on inflation level and volatility, positive when inflation is elevated and volatile, small negative or near zero when inflation is anchored. Credit blocks include the usual negative co movement between rates and spreads. These correlations, combined with RMSE based volatilities, form the covariance matrix. Sensitivity is shown across a compact set of regime consistent states, for example positive, near zero, and negative stock bond correlations.

- **Inverse optimization**, observed weights and documented constraints for each insurer feed a penalized inverse mean variance routine that respects box and linear constraints, delivering an implied expected return vector that rationalizes the portfolio, with regularization toward the benchmark CMA vector to maintain economic plausibility.
- **Forward optimization**, the same constraints are held fixed while the benchmark CMAs and the covariance above are used to produce an updated strategic allocation,

with differences in weights, expected return, and 10 year surplus risk reported, and a brief RBC efficiency lens where capital treatment is standard and public.

Data and resources

Filings will include 10-K and 10-Q, statutory schedules where available, investor day decks, and rating summaries for capital and constraint references. Bloomberg will be the primary source for yields, prices, spreads, index level fundamentals, dividends, and buybacks. Capital IQ will be used to collect bottom up company level five year growth expectations that are then aggregated to sectors. Credit loss parameters will be sourced from Moody's or S&P default studies. All modeling will be implemented in Excel and Python.

Deliverables

A capstone report that conforms to Tandon formatting, a concise presentation deck suitable for a public defense, and a technical appendix with data dictionary, parameter tables, and documented code for the inverse and forward optimizations. Exhibits will include, for each insurer, observed allocation, implied CMAs, benchmark CMAs, re-optimized allocation under the same constraints, and a short interpretation.

Milestones and timeline

- Weeks 1 to 3 – finalizing sample, taxonomy, and data templates, beginning data extraction
- Weeks 4 to 6 – building the benchmark CMA engine for fixed income, equities, and initial alternatives placeholders, implementing risk estimates and the correlation methodology, assembling the covariance
- Weeks 7 to 8 – implementing and validating inverse optimization per insurer, document implied CMAs
- Weeks 9 to 10 – running forward optimizations with benchmark CMAs under each insurer's constraints, producing comparisons and visuals
- Weeks 11 to 12 – drafting report and deck, integrating feedback, finalizing deliverables
- Weeks 13 to 14 – final review and polishing of report and deck, preparing presentation materials
- Week 15 – last corrections in the report and presentation

I will schedule regular check-ins with Professor Conklin, share interim exhibits at each development stage, and incorporate mentor feedback.

Potential Value to the Financial Community

- For life insurers: a transparent yardstick to assess whether current SAA is anchored to realistic long-term returns/risks, with actionable deltas to improve surplus growth and RBC-adjusted efficiency.

- For asset managers: insight into insurer demand under improved CMAs (e.g., duration/maturity preferences, role of private credit) and a regime-aware covariance treatment that better matches client horizons.
- For researchers: an auditable inverse-optimization procedure that respects institutional constraints and reframes risk around forecast RMSE rather than 1-year volatility, consistent with leading long-term strategy research.