Scenario Generation Framework for SAA

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Agenda

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2. Scenario Based SAA
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Introduction to Scenario Generator

Economic Scenario Generation – Stochastic Modelling

“SG”	“ESG”
Economic Scenario Generation	Environmental, Social, and Governance

What is Economic Scenario Generator

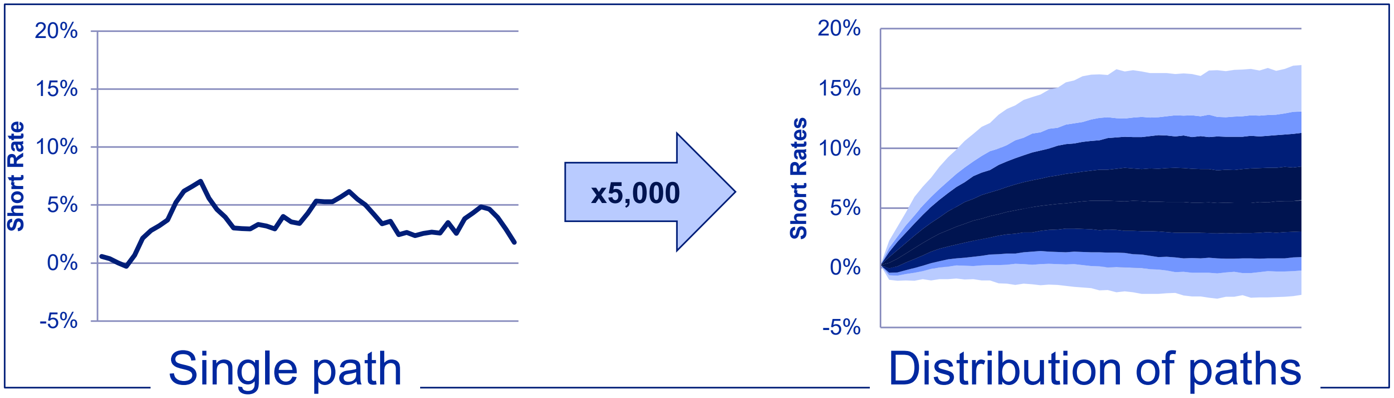
Generates scenarios for various economic variables and asset returns using Monte Carlo simulation

- Generate 1000s of different paths of an economy by stochastically modelling many different risk drivers
- Interest rates, equity returns, corporate bond returns

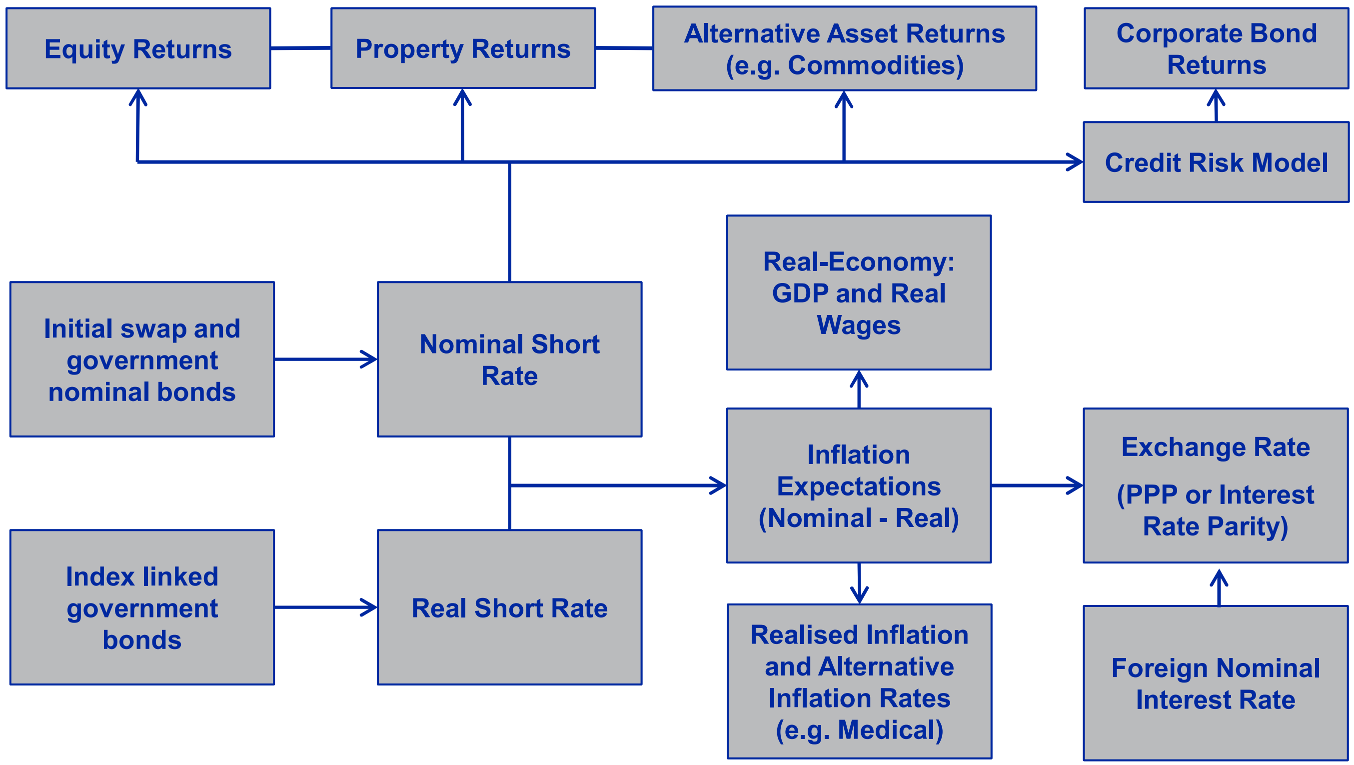
Two main uses:

- Real-world projections for risk management and SAA
- Market-consistent valuation for pricing

A simulation is a collection of many paths (trials)



ESG Economy Model Structure



- Equations describe stochastic evolution of key financial assets
- Correlations ensure plausible economic relationship between asset classes

Scenario-Based Framework

Risk measurement and portfolio construction

We use stochastic models to generate paths for economic risk factors, e.g.

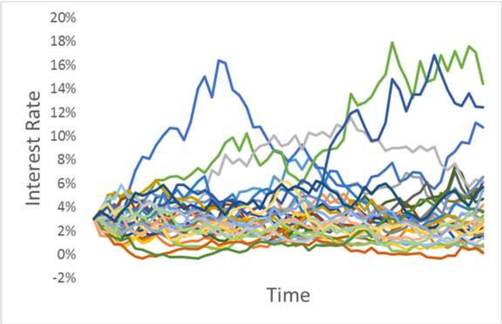
- Real and nominal interest rates
- Credit spreads
- Equity volatility
- Exchange rates

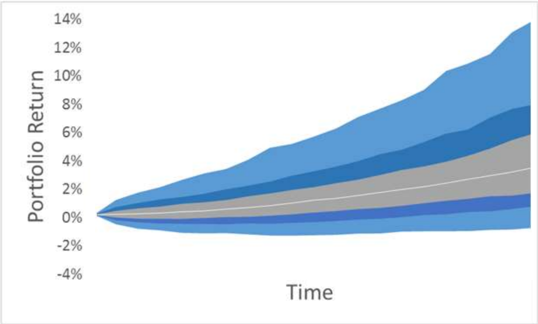
We use these risk factor projections to produce asset returns, e.g.:

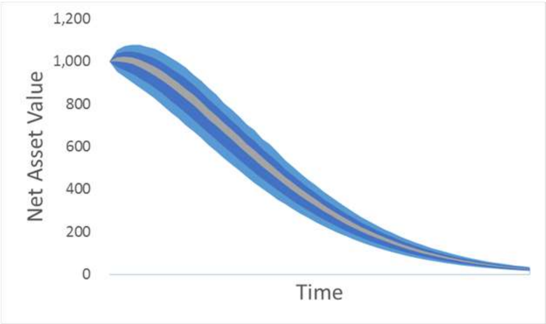
- Corporate Bond returns
- Equities
- Foreign assets
- Alternative and real estate assets

We combine these asset returns with portfolio information, rebalancing rules and potentially liability information.

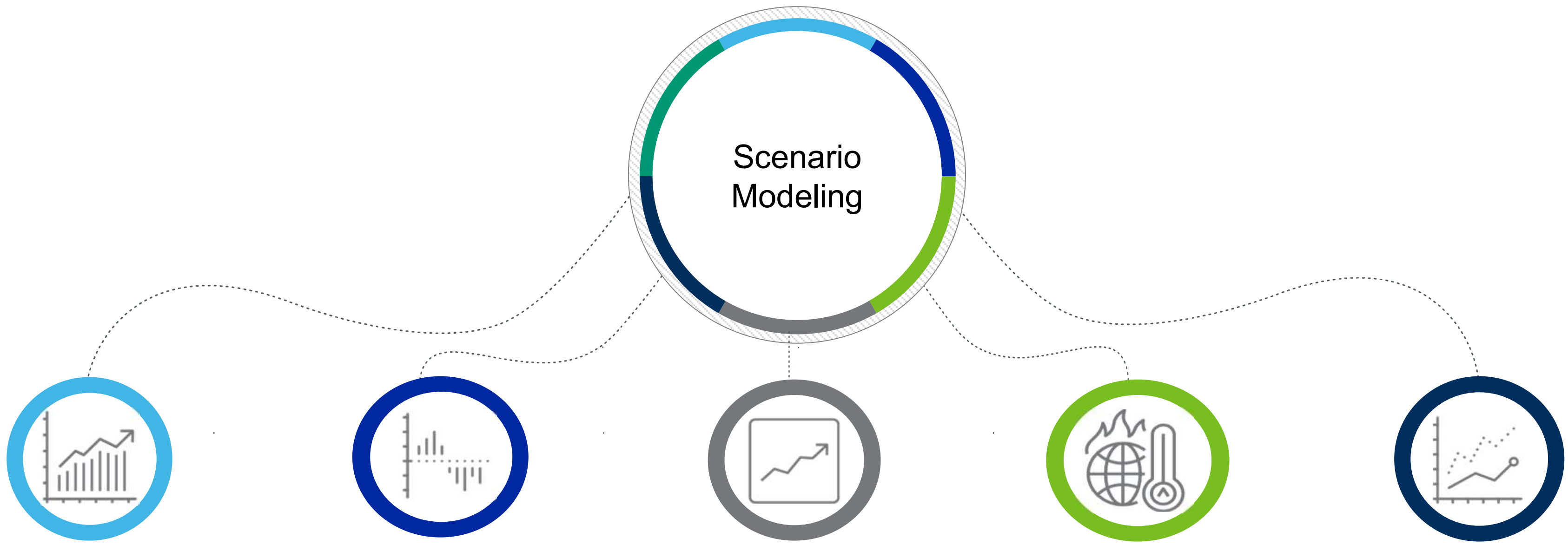
This is used to project and analyze candidate strategies.







Scenario Generator Applications



Investment Strategy

Setting investment strategy involves assessing potential future returns on investments

Risk & Capital Management

Assess risk of business decisions and current exposures

Narrative Scenarios

Economic forecasting of macro-variables, e.g., GDP, inflation or short/long rates

Climate Scenarios

Assess risks and opportunities from climate change and associated policies

Stress Testing

Used by regulators for assessing the business resilience

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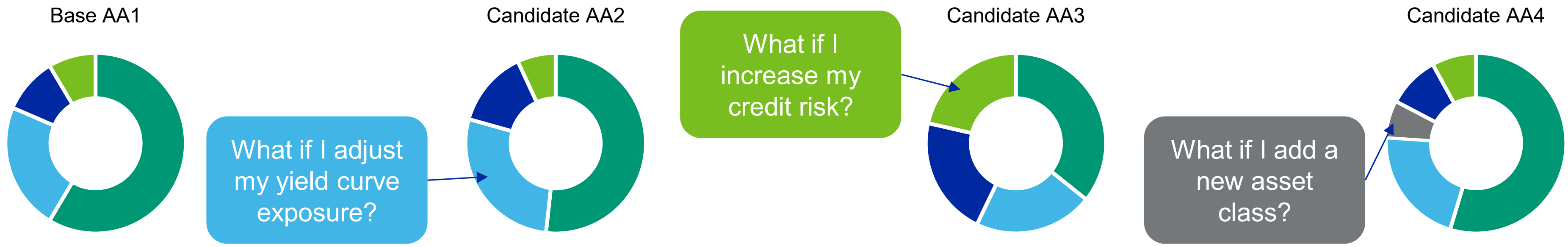
Scenario Based SAA

SAA Introduction

Investment Solution Design

How do I identify an optimal investment strategy for my insurance business?

» Analyse candidate asset allocations to answer “what if” questions, such as:



» Analyse the impact of different rebalancing rules and trading strategies on my portfolio outcomes.

» Compare outcomes for each strategy using risk metrics that are relevant to my business.

Traditional asset allocation approach

Mean-variance optimization (MVO)

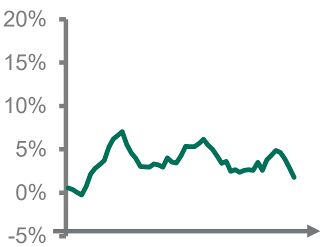
Average Return

Historical Risk

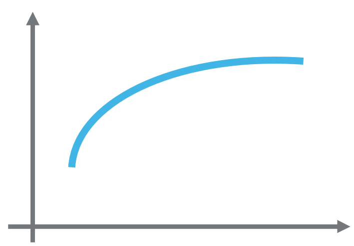
Correlation

Mean Variance Optimizer

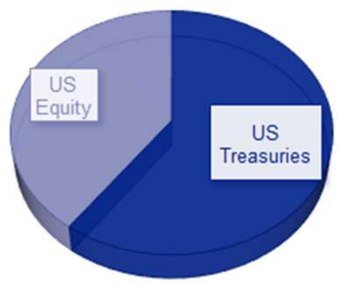
Asset Allocations



Historical Returns



Efficient Frontier

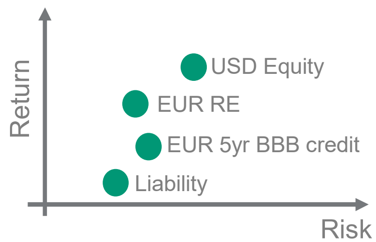


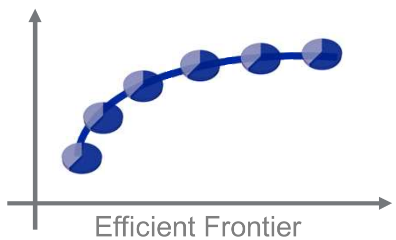
The traditional approach to asset allocation is MVO.

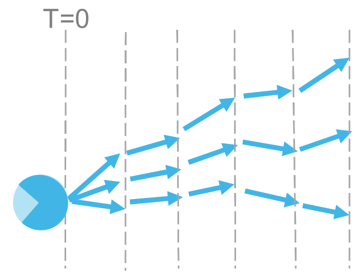
While simple, is it very limited in the richness of analysis:

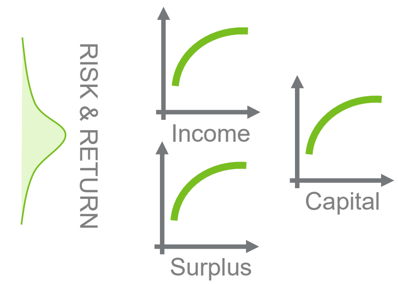
- × Single time-step
- × Simple asset return assumptions
- × Simple, single objective risk measure
- × Does not allow for complex liabilities

Scenario Based SAA Process









Scenario Modeling
Capital market assumptions

- Select assets, risk factors
- Review base assumptions
- Impose in-house cap market views
- Produce model & assumptions governance reports
- Create scenario data required for analysis (stochastic, narrative)

Optimization
Create candidate SAAs

- Review risk & return in existing portfolios
- Asset or Net Asset (ALM) view
- Track against business objectives: economic, accounting, capital
- Generate alternative ideas
- Optimize asset-only or asset-liability investment strategy

ALM Projection
Stochastic & Narrative Scenarios

- Multi-period projection of asset & liability values & cashflows
- Capture range of candidate investment strategies, include new / alternative asset classes
- Reflect investment horizon, cashflows, re-investment & rebalancing rules, constraints

Analytics
Portfolio Analysis & Selection

- Compare risk & return across wide range of metrics
- Assess portfolio strategies against business planning objectives
- Apply filters
- Detailed analysis for select strategies
- Generate analysis & reports to communicate investment decisions

Scenario-Based Portfolio Construction

Advantages over Mean-Variance Optimisation

Multi Time-step

Time dependent cashflows in/out. Event- or objective-driven (dynamic) portfolio rebalancing.

Liability Aware

Can incorporate liability cash flows, proxies or benchmarks.

Risk Metrics

Stochastic models generate a range of outcomes and produce sophisticated risk metrics.

Realistic Asset Dynamics

Incorporating features such as fat-tails and increased tail dependency.

Consistency

Assets and liabilities treated consistently with joint behavior of core economic variables.

Forward-Looking

Incorporating market or house views on equity volatility, yield curves, etc.

3

SAA: Applying In-House Views

Key Challenge: Applying in-house views

Any scenario generator is only as good as its calibration. Strategic asset allocation work can be particularly sensitive to assumptions and calibration approach.

If in-house capital market assumptions exist, how can these be applied within the modelling framework?.

» Can models be calibrated directly to assumptions?

» Are there gaps in assumptions that need to be “filled in” with third party assumptions?

Tactical Views	Medium-Term Assumptions	Long-Term Equilibrium/ Neutral Assumptions
Short-term view, typically managed outside SG	Often a key view for SAA work. Needs framework for updating and governance	Reflects long-run compensation for risk

- Even is there is no house-view for a particular assumption, some governance of assumptions will be required.
- If this process is outsourced, it can be difficult to justify asset return assumptions and investment strategy.

In-House Investment Management Process

How does the investment team use the SG to reflect assumptions and perform investment analysis?

Configuration of risk drivers and assets
- Understand required assets and risk drivers
- Configure the SG to include these

Calibration of models
- Decide whether to use 3rd party or in-house views for each risk driver
- Produce calibrations to the relevant targets

Comparison of investment strategies
- Perform optimisation using SG outputs
- Compare candidate strategies in the SG

Review and monitor SAA
- Every quarter, run SG to understand risk in SAA
- Produce balance sheet outputs directly from the SG

Benefits: SG for internal investment analysis

Internal Investment management want to understand and take ownership of risk in their investment strategy

- SG can be used to create real world scenarios that give ‘realistic’ distributions for asset returns and risk factors. These scenarios can be fed into investment analysis.
- By calibrating models to internal assumptions, investment managers can understand the impact of moving from base assumptions to internal views, gaining increased control and understanding of the assumption setting process.
- Investment managers can use resulting scenarios to project the distribution of returns for a range of investment strategies. This supports calculation of more relevant risk and return measures, and comparison of a range of investment strategies.
- Once a strategy is defined, can use the SG to monitor the risk as economic conditions change.

4 Summary

Summary

- Move to define investment objectives as a function of liabilities rather than asset-only, leading to significant review of investment strategies and asset allocation process.
- Low yield environments leading to increased investment in non-traditional, complex asset classes, which require enhanced modelling capabilities.
- Traditional ALM systems generally too cumbersome for use by investment team in asset allocation process. Need for dynamic, interactive “what if…” style analysis.
- Many portfolio risk systems don’t offer coherent multi-time step modelling of assets and liabilities, aligned with in-house economic and capital market view.
- Allows insurers to integrate SG output into investment and capital processes, achieving greater consistency across their business.

Q

Questions?

MOODY'S
ANALYTICS

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Decisions

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