Institute and Faculty of Actuaries

ESGs for Capital and Beyond… Smart decisions in an uncertain environment

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Moody's Analytics

20 October 2017

9:30 – 10:20

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Agenda

- Introduction
- ESGs for Capital Modelling
  - GI focus: Real World ESG for Internal Model
  - Current market challenges (Regulatory vs Economic)
- ESGs for beyond Capital…
  - SAA / Investment Decision Making
  - Stress / Scenario testing (Case Study: Brexit)

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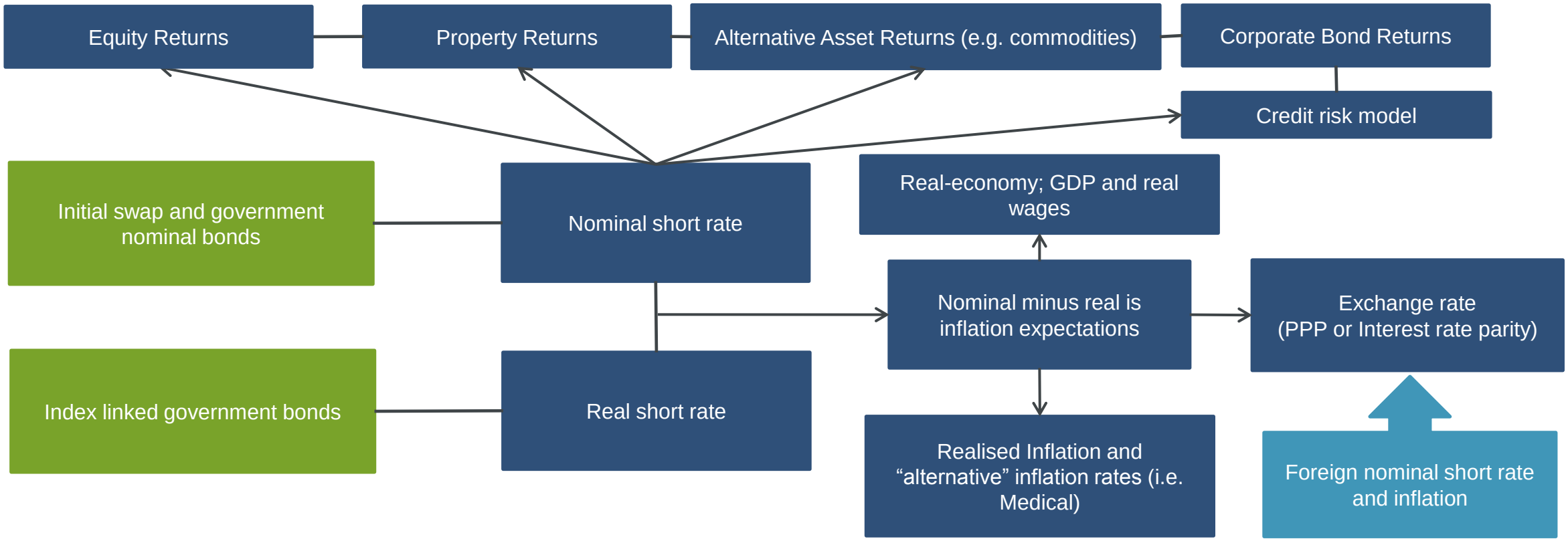
Introduction

“The past few years have seen an unprecedented combination of new insurance regulations, challenging investment conditions and unexpected geo-political events. In this session, we will explain how Economic Scenario Generators (ESGs) can help insurers navigate this uncertain environment.

The session will address some of the modelling and calibration challenges of using ESGs for capital modelling, strategic asset allocation (SAA) and stress testing. We will also address some of the practical considerations of gaining model approval.”

Economic Scenario Generator: Model Structure



- Joint distribution
- Correlation relationships between the shocks to different models
- Economically rational structure

Real World Modelling
What do our clients use the ESG for?

Capital calculation

Predominately used by clients for projection of credit, default, market and other risks over a 1 year or a similar short term horizon for Value at Risk calculation as part of Regulatory or Economic Capital framework.

SAA and Investments

Our asset and portfolio capabilities help our clients assess the performance of their investment strategies under a range of conditions.

Scenario Testing

What will happen to my business under a “hard Brexit” scenario? How will my investments perform under a “stagflation” scenario? Narrative real world projections provide our clients with that insight.

Product design/pricing

Many insurance contracts are dependent on the level of interest rates, inflation or asset returns. That’s why our clients use our models to produce realistic distributions.

Real World Modelling

Considerations & Challenges

In developing a solution for real world projection, firms must consider:

- Length of projections: 1yr, 10yrs, 50yrs,…
- Calibration data: use of current market data, length of history, pooling of data
- Risk/asset coverage & level of granularity
- Technical modelling considerations: e.g. fat-tails, stochastic volatilities
- Stylised-facts: Is a view of the world baked-in to the model?

A key question for the real world modeller is whether the need is for:

- Stability in projected paths & distributions: typical for risk management applications
- Stability in projected risk/return profile: typical for portfolio construction applications

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ESGs for Capital Modelling

20 October 2017

ESGs for Capital Modelling
1 Year VaR

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Internal Model and 1 Year VaR

Considerations and Challenges

In developing a risk aggregation solution, firms must consider a number of aspects:

- What are our key risks and how shall we capture them adequately?
  - e.g. credit granularity, model choice, fat-tails, tail-dependency?
- How should we approach model calibration? (e.g. ‘Point-in-time’ vs ‘Through-the-cycle’?)
- How will we set assumptions, maintain and update these through time (to regulatory standards for data quality)?
- How shall we value assets and liabilities in projected scenarios?
  - Do we need to think about compatibility/mapping to valuation models?
- Do you have a strong ‘house view’ on the technical modelling approach to be used? Is it important to you to use the same set of risk projections for other applications?
- How many scenarios must be generated? How frequently? What runtimes are required?
- How will senior management demonstrate understanding of the model used?

Market & Regulatory Themes

- Continued wave of Internal Model (IM) Applications
- Companies with IMs looking to see how they can leverage them to run their business better
  - Scenario testing, reverse stress testing, risk controls, KRIs, etc.
- Single calibration approach for both 1 Year and multi-year modelling
  - e.g. Capital team vs Investment team
- Challenging investment conditions - maximising returns in low rate environment
- More sophisticated modelling of ‘exotic’ asset classes
  - Modelling of illiquid assets, private debt, CDS, etc.
- Model Validation is a hot topic for Regulators in the UK and across Europe

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ESGs for beyond Capital…

SAA and Investment Decision Making

ESGs for beyond Capital…
SAA and Investments

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Strategic Asset Allocation and Investment Strategy Objectives

Diversification – look to build portfolios that are appropriately diversified across risks, where we may want to define those risks in relation to a liability or liability benchmark.

Risk Tolerance - should align with a Risk tolerance, possibly stated in quantitative terms.

Evolving Liabilities – may need to apply rebalancing rules, reflecting changing liabilities, requirements or risk tolerance.

Performance – optimise the overall portfolios return performance, again where return may be defined in relation to a liability.

Active benchmark - SAA should provide a clear benchmark for tactical or active management, performance, risk exposure.

Realistic Expectations - should enable realistic expectations for future performance given current market conditions.

The Problem: Complex liabilities, strategies or objectives

- SAA design is relatively simple when
  - Considering assets only
  - Single time period
  - Simple investment objectives
- Is more complicated when you have
  - Dynamic asset strategies
  - Dynamic liabilities
  - Asset-liability interaction
  - Options / guarantees
  - Multiple objectives
  - Path dependence

Example: UK Insurer - Investment team

Insurer has cashflows generated by their ALM system. Current portfolio duration substantially lower than liabilities. Propose more efficient investment strategies, to reduce capital risk / enhance earnings.

Management of collateral and transaction costs will determine value of hedging positions. Need to control cost of "portfolio churn".

Key analysis / "what if":

- Adjust yield curve exposure, duration, key rate durations, to better match liability
- Increase the credit risk exposure
- Include alt. illiquid assets: loans, infrastructure
- Change re-balancing rules for fixed income assets

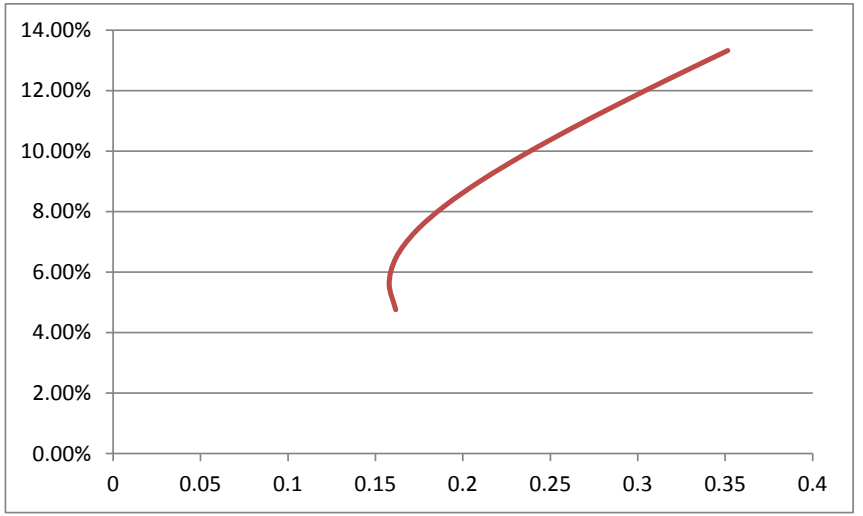
Key metrics:

- Earnings, capital (SCR), transaction costs

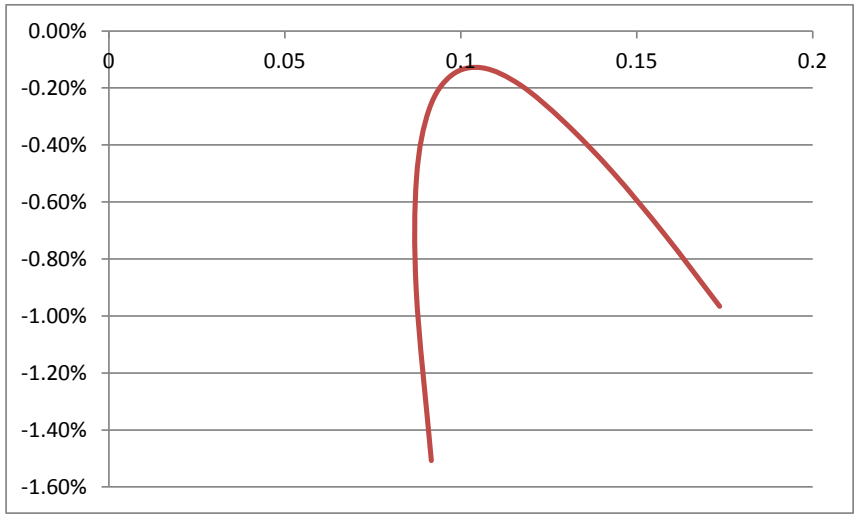
Considerations for SAA

- Consider both assets and liabilities
  - The interaction between asset and liability is extremely important to asset allocation
  - Different interaction might change the shape of efficient frontier
- Return and Risk Metrics
  - MCEV, P&L, Economic / Regulatory Capital, Volatility
- Horizon
  - Long term vs short term? Which metrics?
- Objectives
  - EBR (Equity backing ratio) – optimizing growth asset mix
  - Considering allocating to different ratings / tenors
  - Dynamic allocation over the horizon (time-varying allocation)
- Internal investment constraints

Without asset and liability interaction



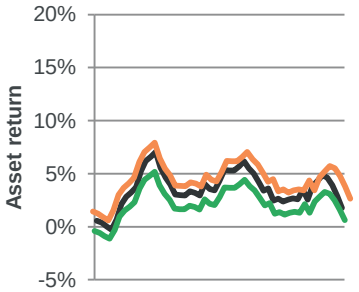
With asset and liability interaction



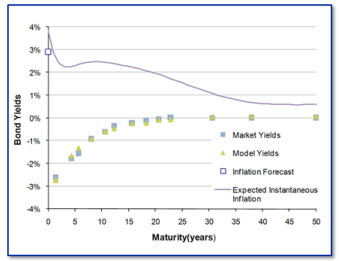
Using Scenario-Based Models for SAA & Investment

Model Calibration

HISTORICAL DATA

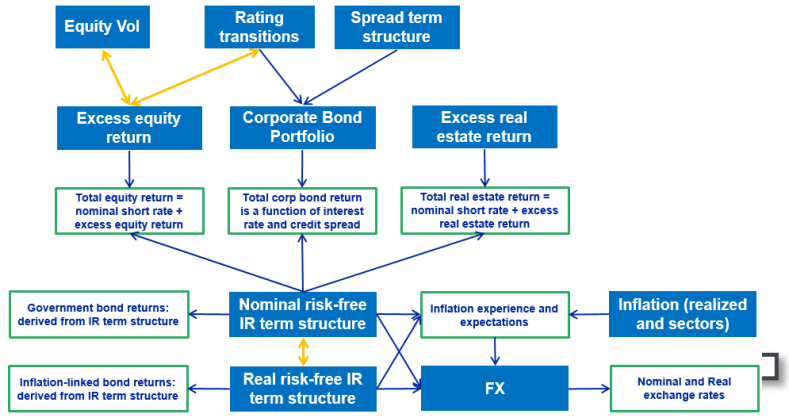


CURRENT PRICES / YIELDS



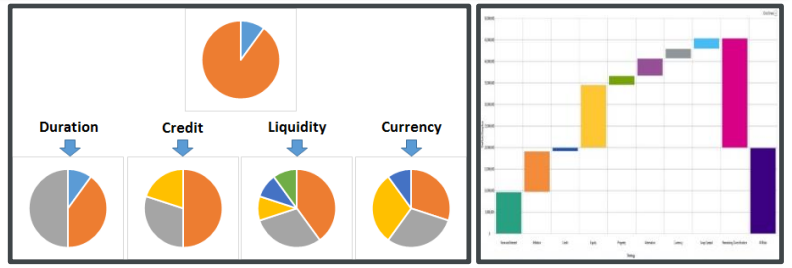
STRATEGIC "VIEWS"

	A1	A2	A3
A1		0.25	0.62
A2	0.25		0.35
A3	0.62	0.35	



Liability Model

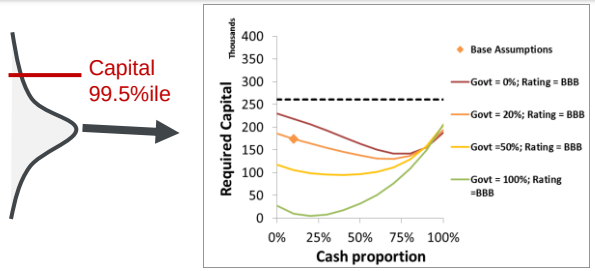
Portfolios: Current + Alternatives



Portfolio Management Strategy

- Re-investment of asset cash flows
- Payment of liability cash flows
- Rebalance asset allocation to targets (e.g. duration, credit rating)
- Apply constraints, e.g. book return limits

Balance Sheet Projection



Using Scenario-Based Models for SAA & Investment

Key Benefits

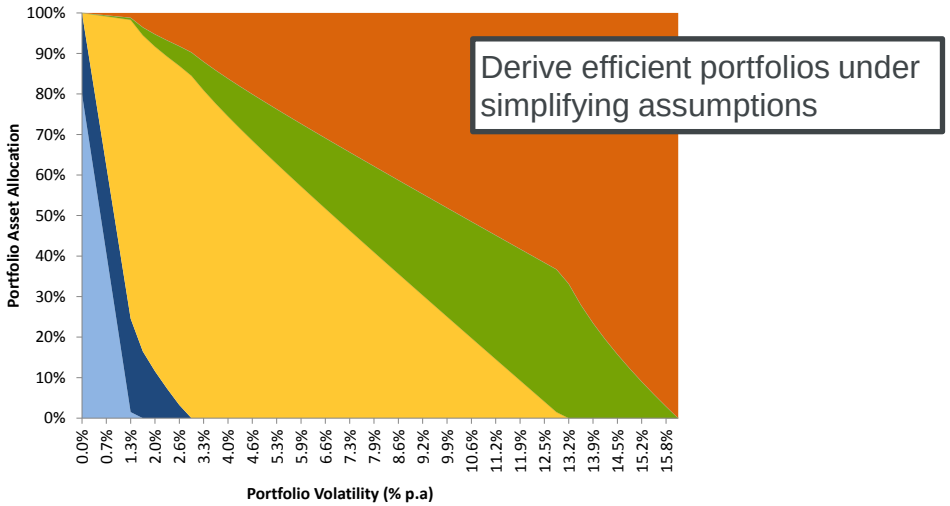
SAA and investment strategy modelling with an ESG provides the ability to:

- Assess the most useful metrics of risk and return
- Create bespoke portfolios to satisfy complex requirements and constraints
- Compare portfolio performance in a range of market conditions
- Analyse portfolios on a multi-timestep basis
- Include cashflows in portfolio projections

SAA and Investment Strategy Optimization

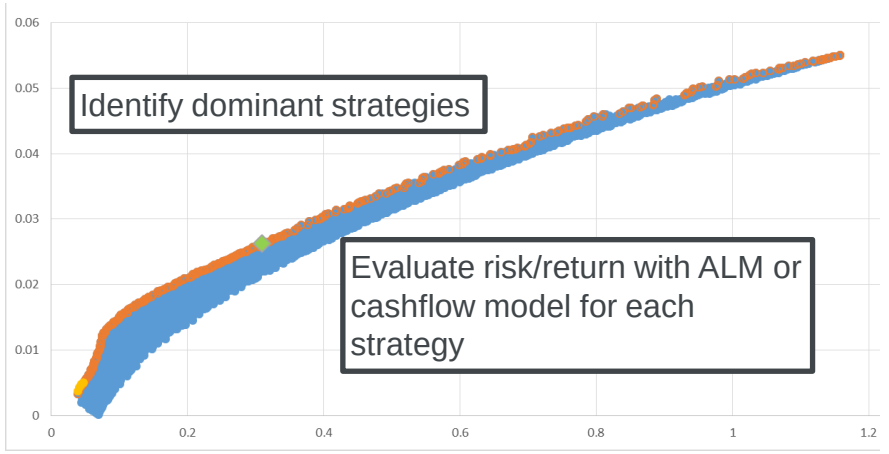
Standard and novel approaches

Analytical Solutions (MVO etc.)



- Fast and easy to explain
- Restrictive assumptions: single period, mean & variance only
- No treatment of liabilities or path dependency

Monte-Carlo (Brute force)

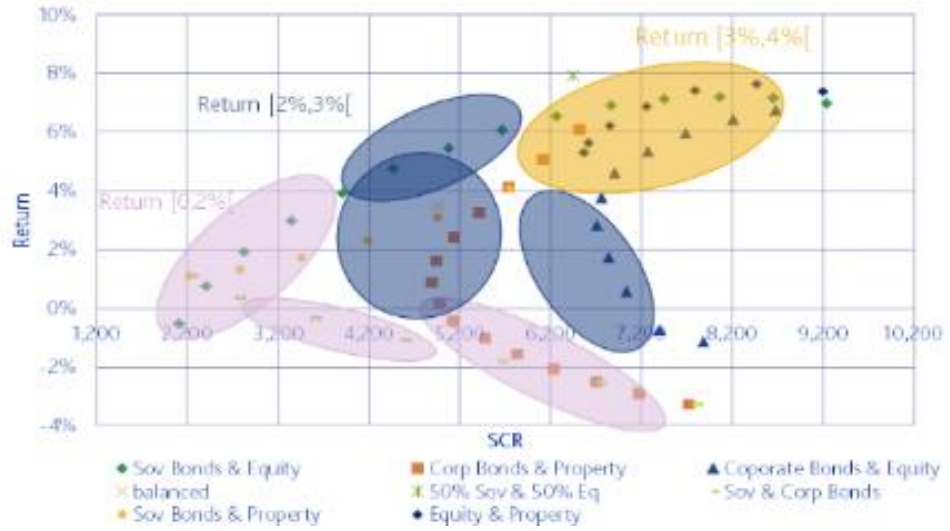


- Account for complex scenarios
- ALM/Cashflow evaluation can be slow. Requires large number of evaluations to sample parameter space
- Efficient frontier is typically noisy/badly sampled

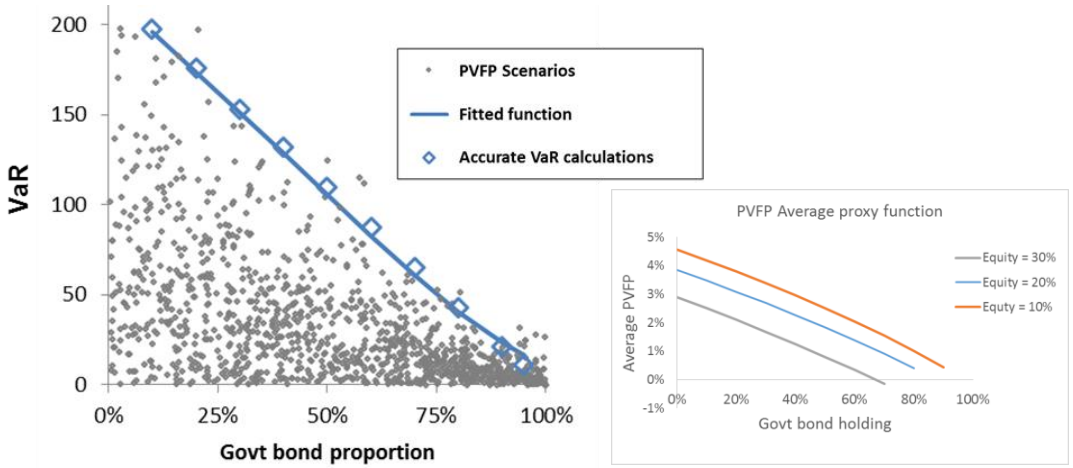
SAA and Investment Strategy Optimization

Standard and novel approaches

What-if Scenario Testing



Semi-analytic approach



- Capture dependence of risk/return metrics on strategy weights using a fitting (“Proxy”) function
- Require a relatively small number of ALM model evaluations
- Quickly evaluate required metrics under any potential asset allocation

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ESGs for beyond Capital…

Scenario Testing (Case study: Brexit)

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Scenario Testing

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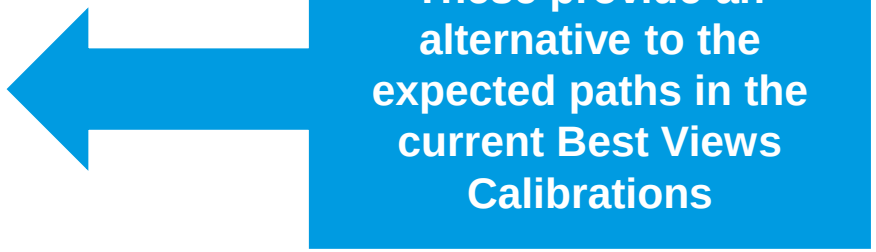
Scenario Testing

- Combining Narrative Scenarios with Stochastic Real World Modelling
- This scenario analysis can be used for business planning around specific postulated outcomes, such as “bad Brexit”, or a given election or policy outcome
  - Business Planning / ‘What-if’ Analysis
  - Portfolio projection and risk attribution
  - Asset allocation and portfolio optimization
  - Valuation and reserving
  - ORSA

Case Study: Brexit-based ESG Calibrations

An in-house team of Economists have produced a number of **Brexit** related scenarios covering the following types of narrative (with associated probabilities):

- Alternative UK Baseline
- Reject Brexit
- UK Splintering
- EU Partial Fracture
- Euro Zone Crack Up

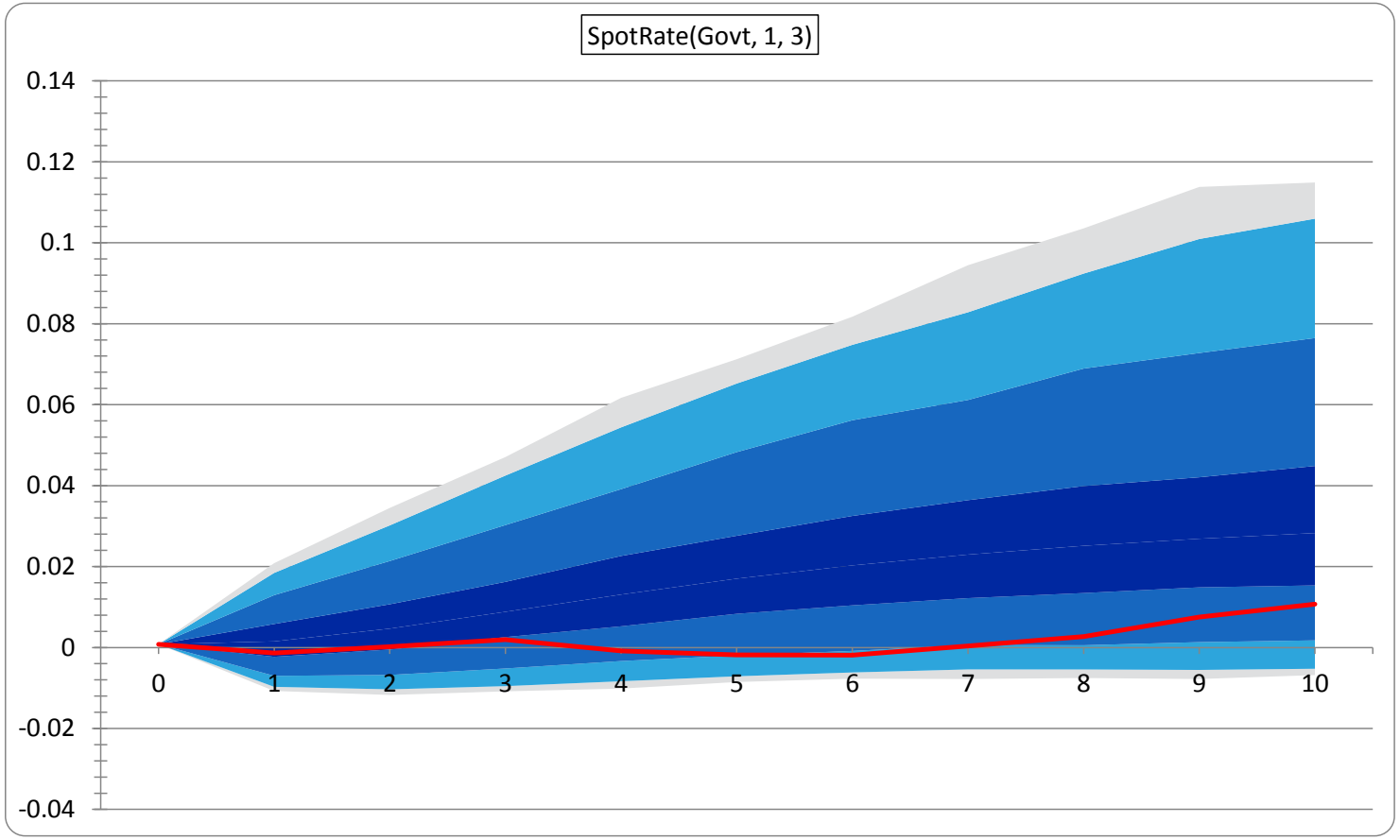


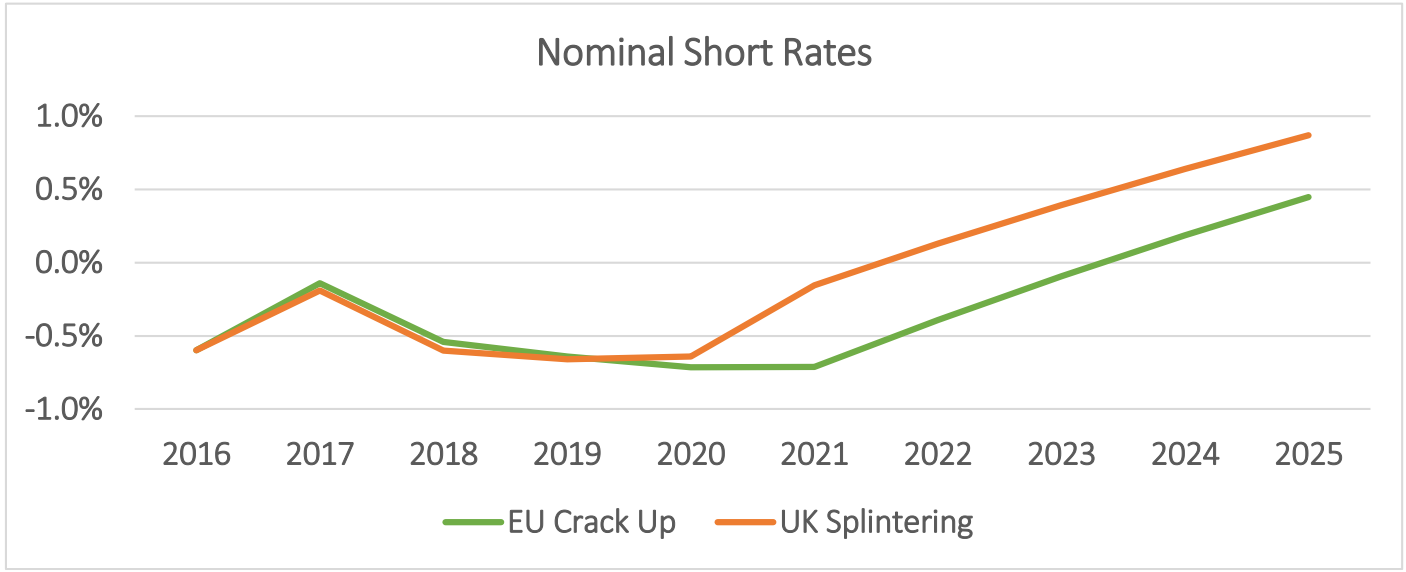
We are producing ESG Calibrations where the **mean/average path of the key variables** follows the paths identified in the narrative scenarios. Key variables are

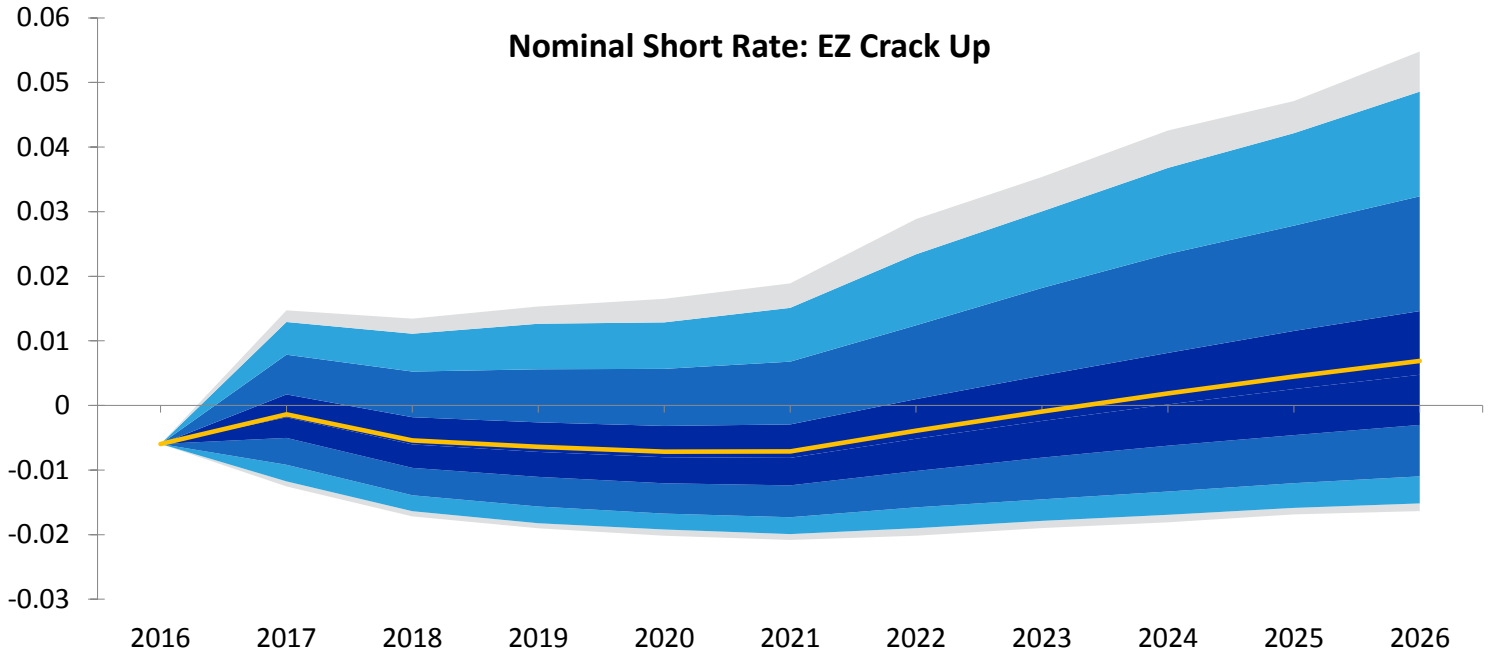
- Nominal Short Term and Long Term Rates
- Inflations
- Equity Returns
- Credit Spreads
- FX rates

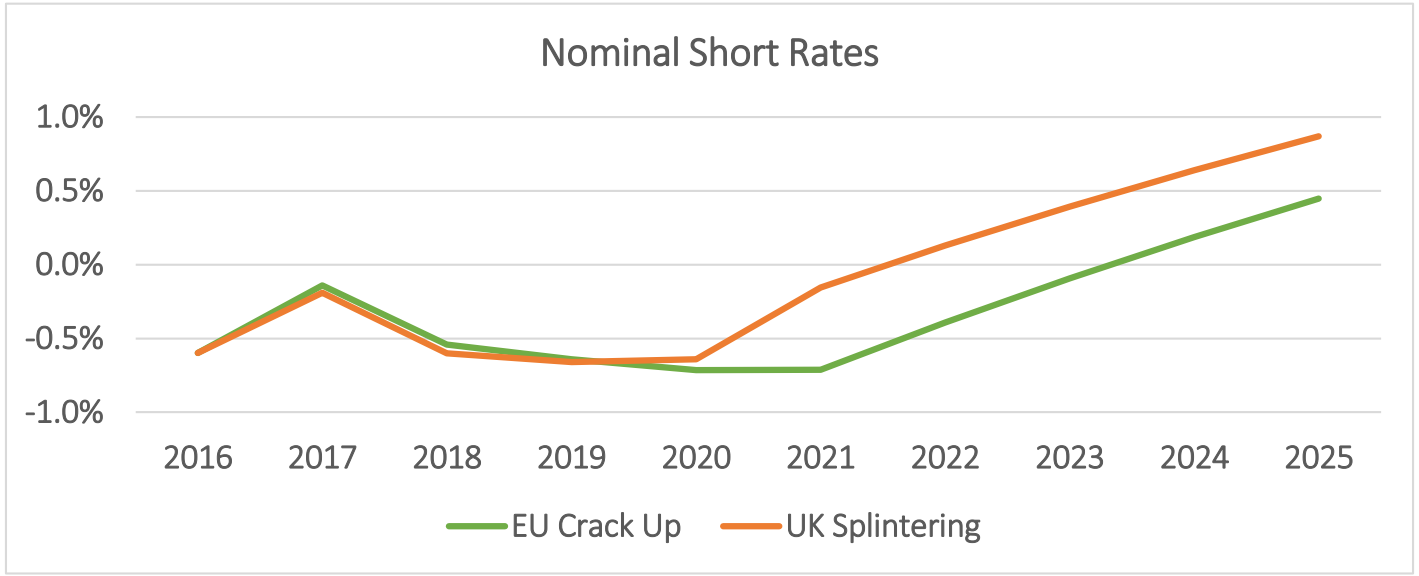
Brexit Stress Calibrations:
Example Validation

Stress Path – relative to standard calibrations




Nominal Short Rates
1.0%
0.5%
0.0%
-0.5%
-1.0%
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
EU Crack Up
UK Splintering


Nominal Short Rate: EZ Crack Up
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026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2016
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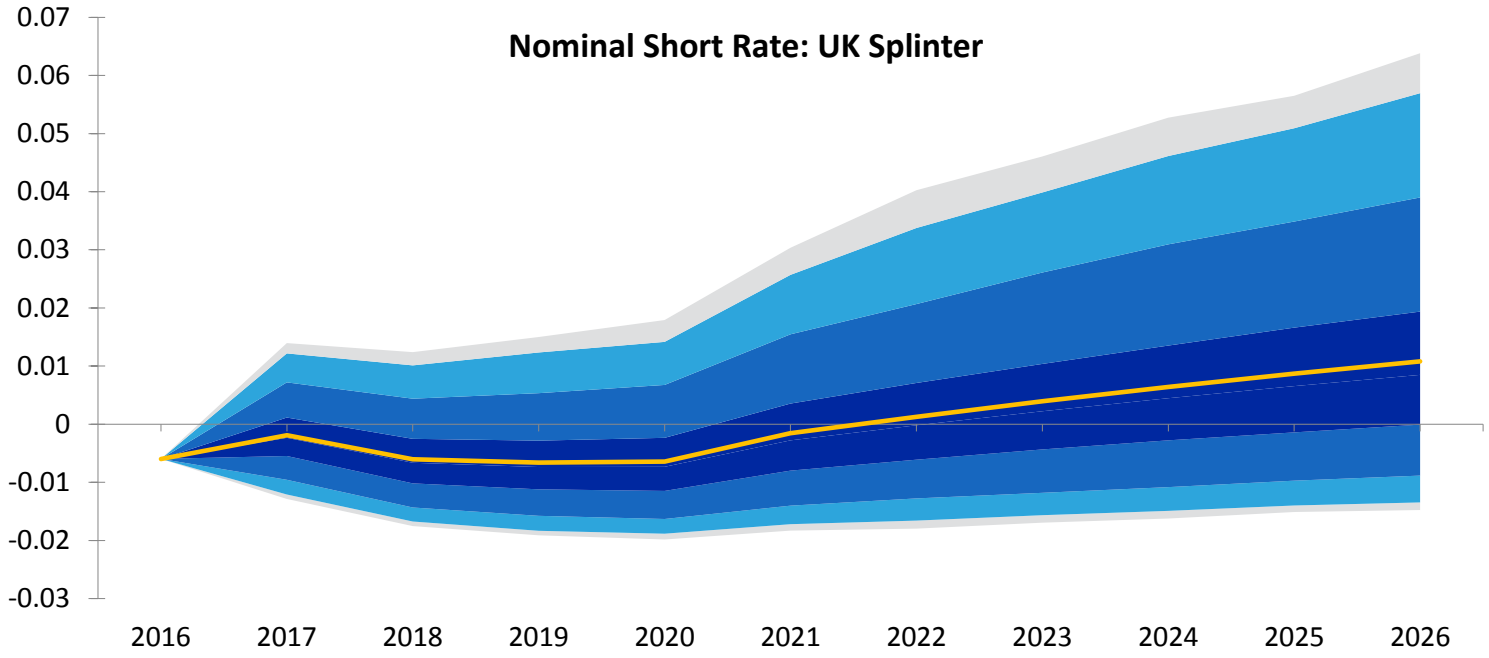
Nominal Short Rate: UK Splinter
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026

Questions

Comments