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NEUBERGER BERMAN

Real World Credit Modelling for Insurance Fixed Income Investing

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Executive Summary

- Credit is usually the largest asset component in an insurance balance sheet; however, credit modelling at insurance companies is often focused on capital, risk and ALM, quite often leading to a disconnect between actuarial teams and investment teams
- Here we present our systematic approach to credit modelling, targeted at practical and efficient insurance fixed income portfolio management. Highlights are:
  - Portfolio rebalancing and transaction optimization for tailored objectives
  - Capital-aware fixed income and sharing responsibilities between different teams
  - Improvements to credit simulation for investment decision-making purpose
  - Business model challenges, diversification, and utilizing forward-looking views in investment decision-making

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1. Fixed income portfolio rebalancing and transaction optimization

With tailored objectives and using a customized optimiser for max efficiency

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Objectives commonly seen in insurance FI

- Book yield and return-on-SCR
- Duration and quality
- Liquidity and cashflows
- Turnover and P&L realisation
- Concentration limit and restricted exposures
- Matching adjustment (annuity book)

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Challenges in practical portfolio implementation

- Multi-dimensional and sometimes contradicting objectives
- Practical considerations associated with market accessibility
- A (too) large universe of selection vs limited research capacity
- How to combine fundamental opinion and quantitative optimisation?
- Manual or automatic portfolio construction?
- Conclusions differ by time horizon of consideration

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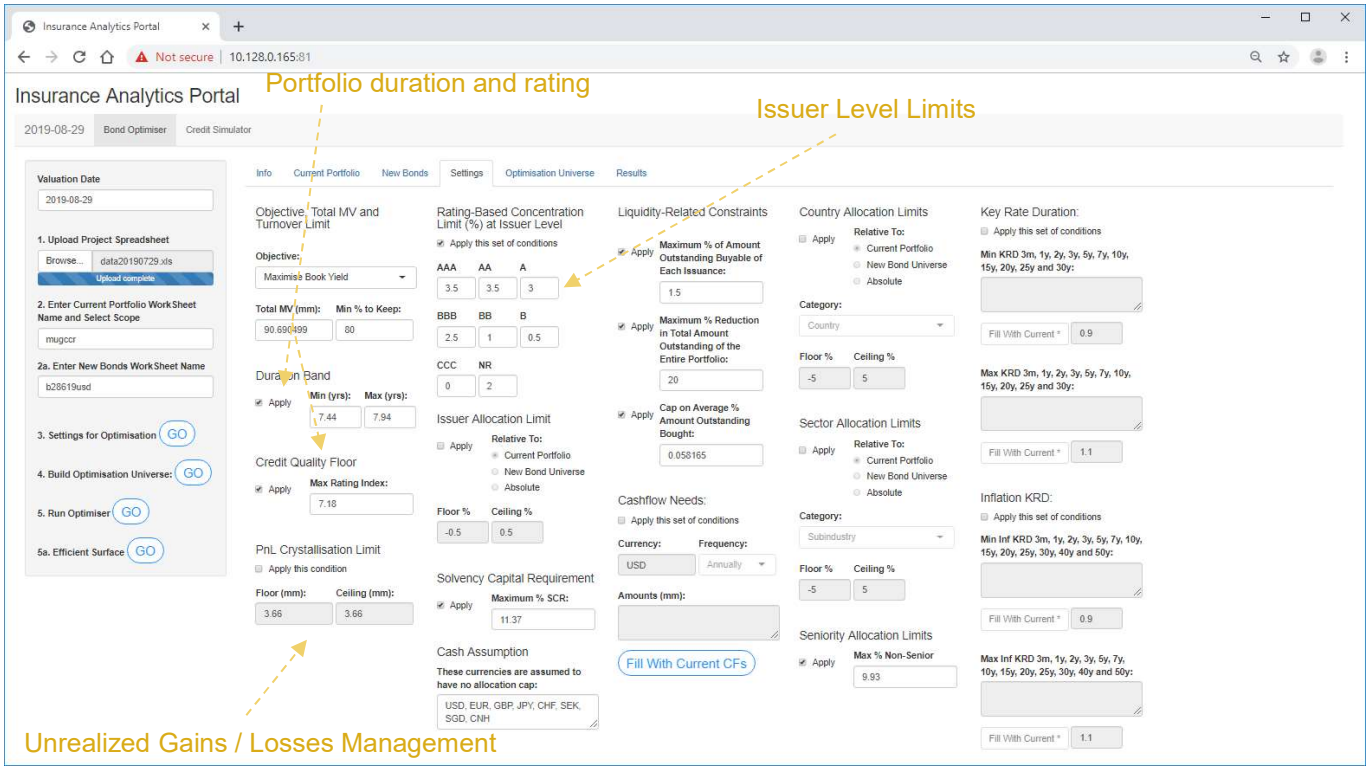
A tailored bond optimiser to tackle these issues



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A glance at the output

	Book Yield	OAS / bps	Spread SCR	Duration / yrs	Average Rating
Current Portfolio	3.52%	97.1	11.37%	7.94	A3/Baa1
Optimised Portfolio	3.98%	134.9	11.37%	7.94	A3/Baa1

% MV new	Unrealised P&L	No. of Positions	Average % A. O. bought	% Senior Issues
NA	3.66mm	163	0.06%	90.0%
20%	3.26mm	198	0.06%	90.0%

What differentiates this approach:

- Robust linear/quadratic engine
- Can handle large investment universe
- Can intake credit opinions
- Sleek user interface
- Quick turn-around (seconds)

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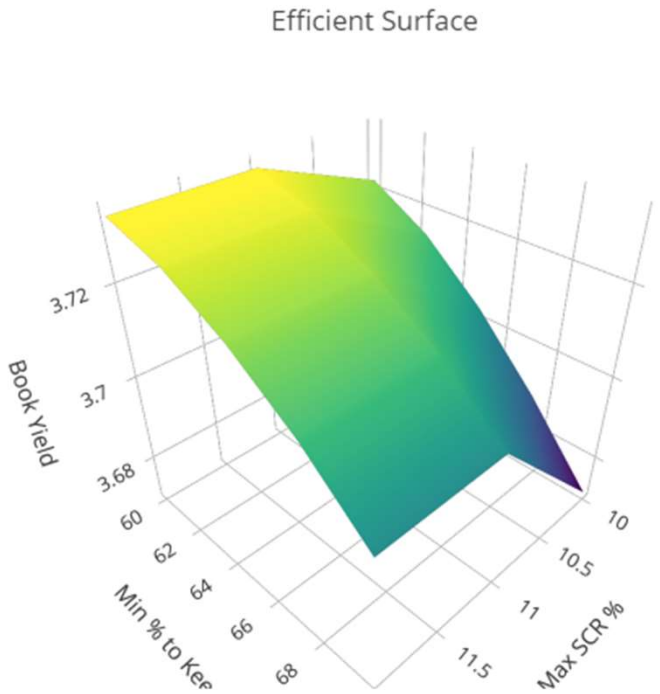
Sensitivity analysis and the “efficient surface”



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2. Capital-aware fixed income

Sharing responsibilities between the portfolio manager, the solutions actuary and the CIO

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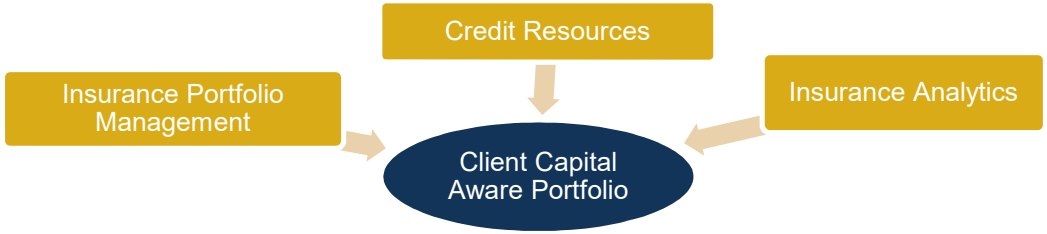
Capital aware fixed income - motivation

- Optimizing on solvency capital is not always efficient for managing assets
- Balance sheet risks may develop over the course of an economic cycle
- “Capital-Aware” approach:
  - Incorporates solvency capital considerations as an important input, but not the ultimate decisive factor, into our portfolio construction process.
  - Combine quantitative tools and qualitative factors to target portfolio solutions that are both economically sound and efficient in their use of regulatory capital



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Portfolio construction

- SCR/Yield Prioritization
- Credit quality limitations
- (Key rate) duration target
- Sector and specific risk

- Benchmark analysis: available yield and quality/duration/diversification/market accessibility
- Quality focus and currency split
- Evaluation of benchmark and manager approved universe constituents
- Frame portfolio universe w.r.t. targets and constraints, taking into account availability/capacity

- Establish optimisation anchor points
- Review series of model portfolios to evaluate trade-offs
- Identify practical considerations
- Confirm final results

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Day-to-day management

Portfolio manager

- Inventory available spread/yields
- Evaluate credit curves/relative value
- Propose issuer/issue adjustments
- Confirm guidance compliance
- Evaluate and iterate portfolio composition
- Determine the final solution
- Trade execution

Solutions actuary

- Review/confirm SCR profile of strategies
- Enterprise-wide capital budgeting
- Verify impact on quality/duration/yield/ OAS/SCR/etc.
- Run optimisation for yield enhancement
- Endorse the final solution

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3. Credit simulation for investment purpose

Fine-tuning and making it more relevant

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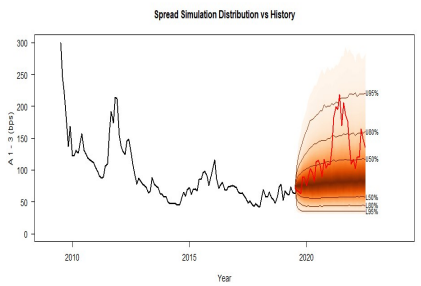
What are being modelled

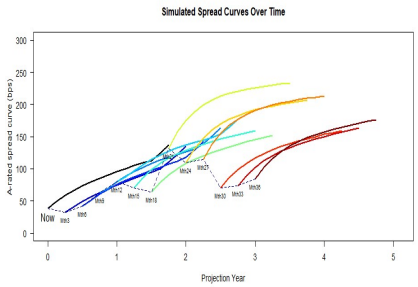
Credit model

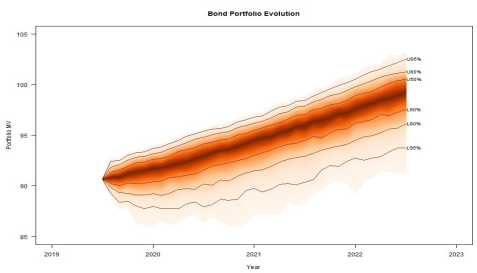
- Future spread movements, rating migrations and defaults at an issuer level
- Migrations correlated with spread volatilities and other issuers' movements, to better simulate tail scenarios

Bond portfolio

- Bonds with idiosyncratic spreads
- (Re-)investment strategy and assumptions
- Portfolio duration and/or rating targets







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Focus area of effort driven by purpose of modelling

Actuarial

- Capital Adequacy
  - Focus on tail outcomes
    - Emphasis on incorporating historical data/events
    - Often an instantaneous shock to current portfolio
  - Default / transitions commonly modelled in the counterparty module
- Liability pricing
  - Risk-neutral distribution - spread levels measure default probabilities
  - Projections can be very long-dated
    - Model stability over 50+ years is key

Investment

- Portfolio performance
  - Rating, SCR and credit quality evolution
  - Expected total return and worst case scenarios
  - Expected # defaults/migrations
- Forward-looking views
  - Expected credit spread levels in a year's time
  - Management actions: shifting duration/rating

Historical what-if deterministic scenario analysis are currently commonly used

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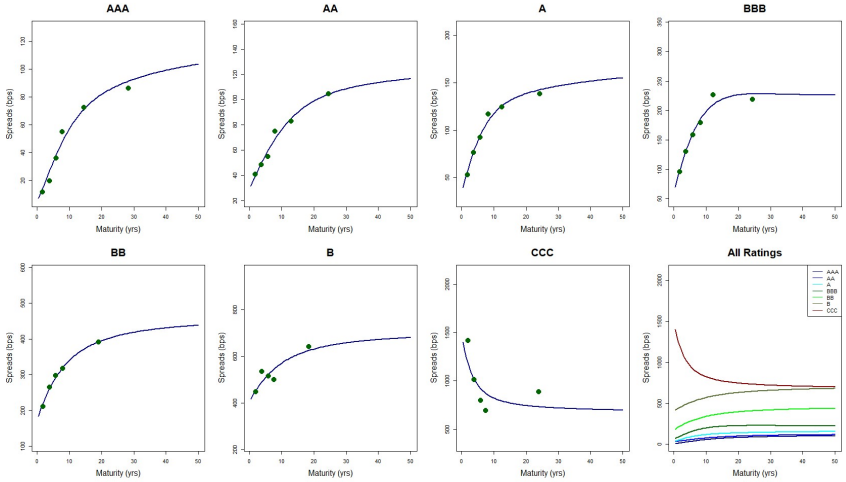
Key model feature – accurate term structure pricing

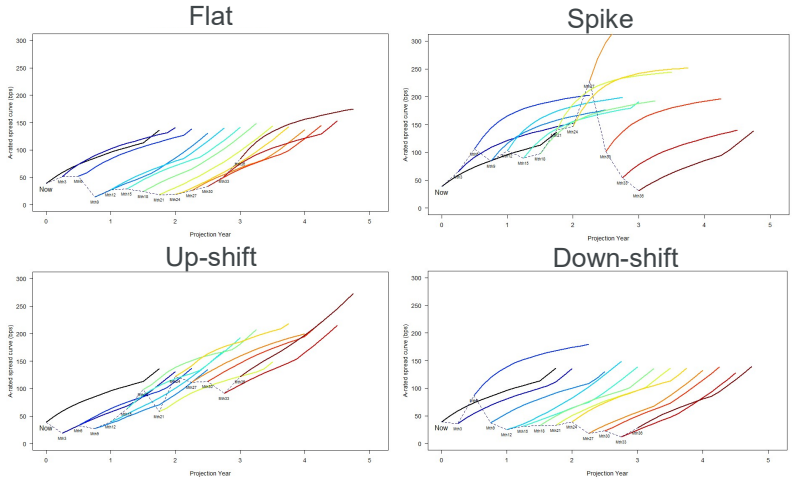
Fitting the t=0 term structure

- Consistent with market prices



And simulate term structure moves

- Expose most plausible and impactful scenarios



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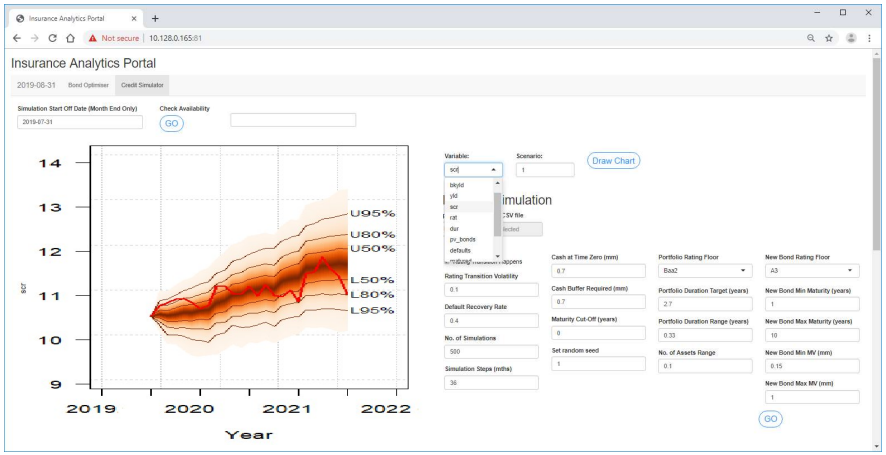
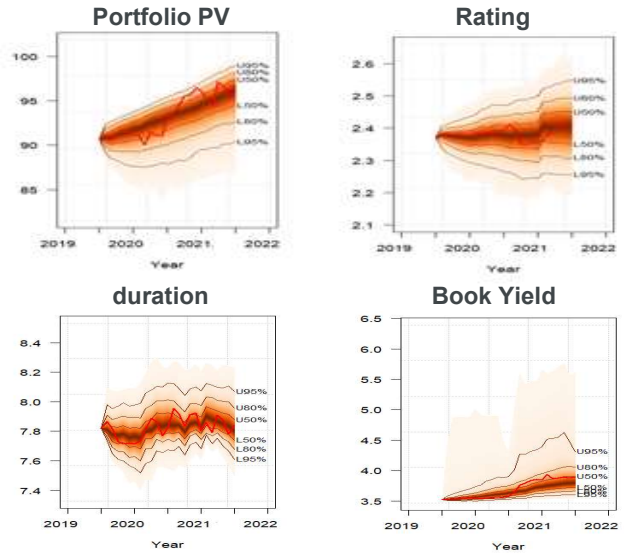
Projection of important portfolio metrics

- Answer the question: “where will my portfolio value, average rating, book yield and SCR be in 3 months to 3 years’ time?”





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4. Case study: example Investment Grade bond portfolio of an insurer

Combining T=0 and forward-looking analysis

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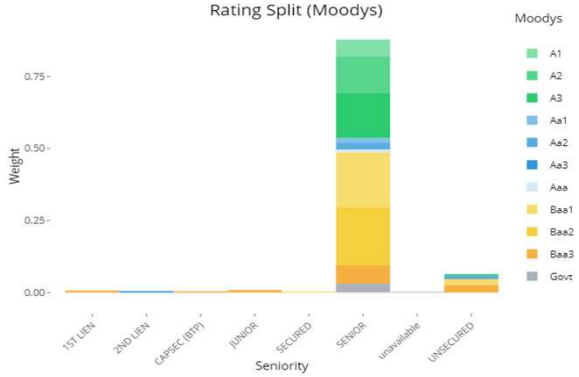
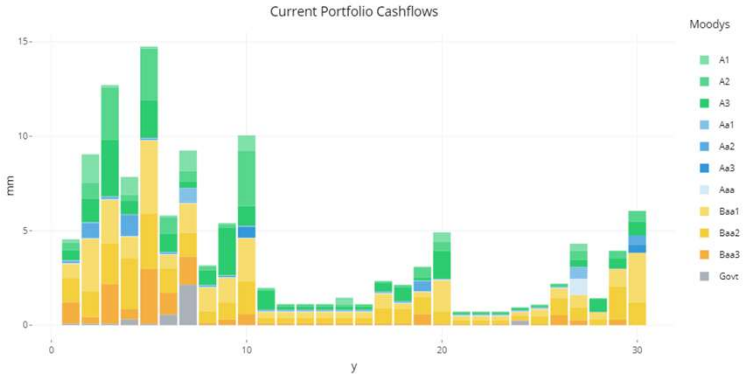
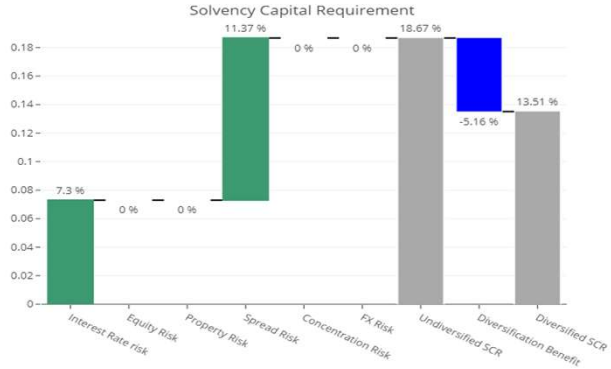
Current buy-and-maintain portfolio







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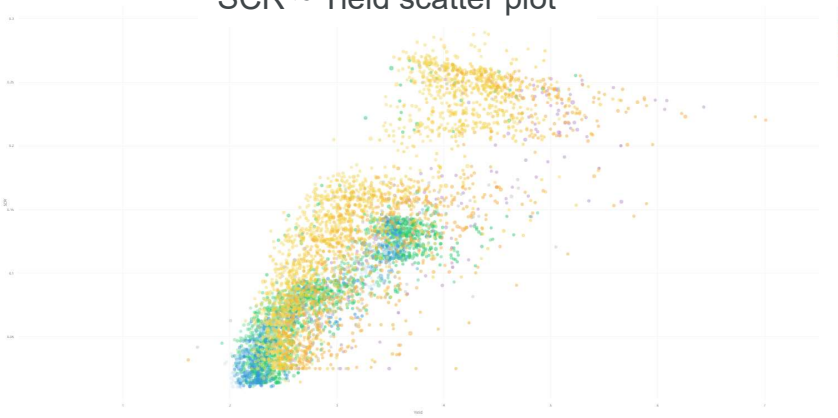
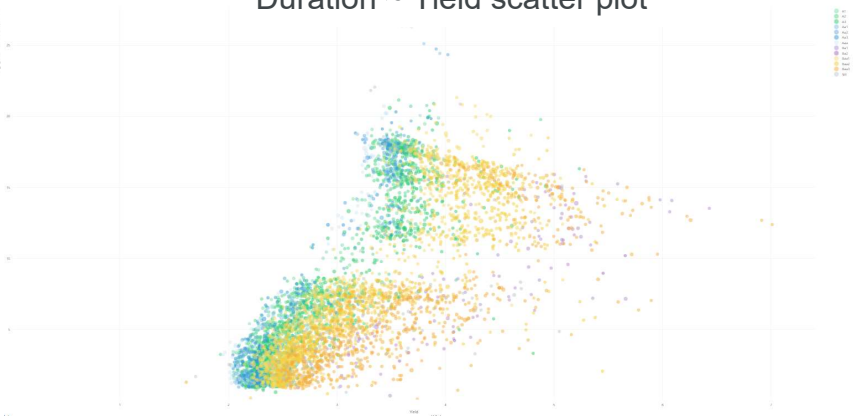
Investible universe

SCR ~ Yield scatter plot



Duration ~ Yield scatter plot



- ~ 5700 issues from the IG benchmark universe
- Our credit desk covers c. 30% of them, and issues 1) *can buy* 2) *restrict* 3) *avoid* opinions, which are reflected as allocation-bound-setting flags in our optimiser
- Smart beta and ESG factors can also be used

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Objectives

The CIO of an insurance company wishes to investigate the feasibility of the following (separate) model portfolios by changing the current portfolio, with minimal impact on quality, duration and other key metrics

- Model Portfolio 1: "**Book yield enhancement**"
  - Turnover no higher than 15% and realised P&L between [0, 5] mm
  - % of senior issues no lower than current level
- Model Portfolio 2: "**Capital saving**"
  - Reduce portfolio SCR from 11.4% to 9%, enhancing return-on-capital and generating headroom for alternatives assets under the same Group budget
- Model Portfolio 3: "**Cash generation**"
  - Generate 15mm cash in the coming year and 30mm cash in year after next (out of a 91mm total)
  - Income from coupon and redemption preferred over bond selling

She also wishes to understand near-term tail risks of these model portfolios; and the potential scope of variation of all the key metrics

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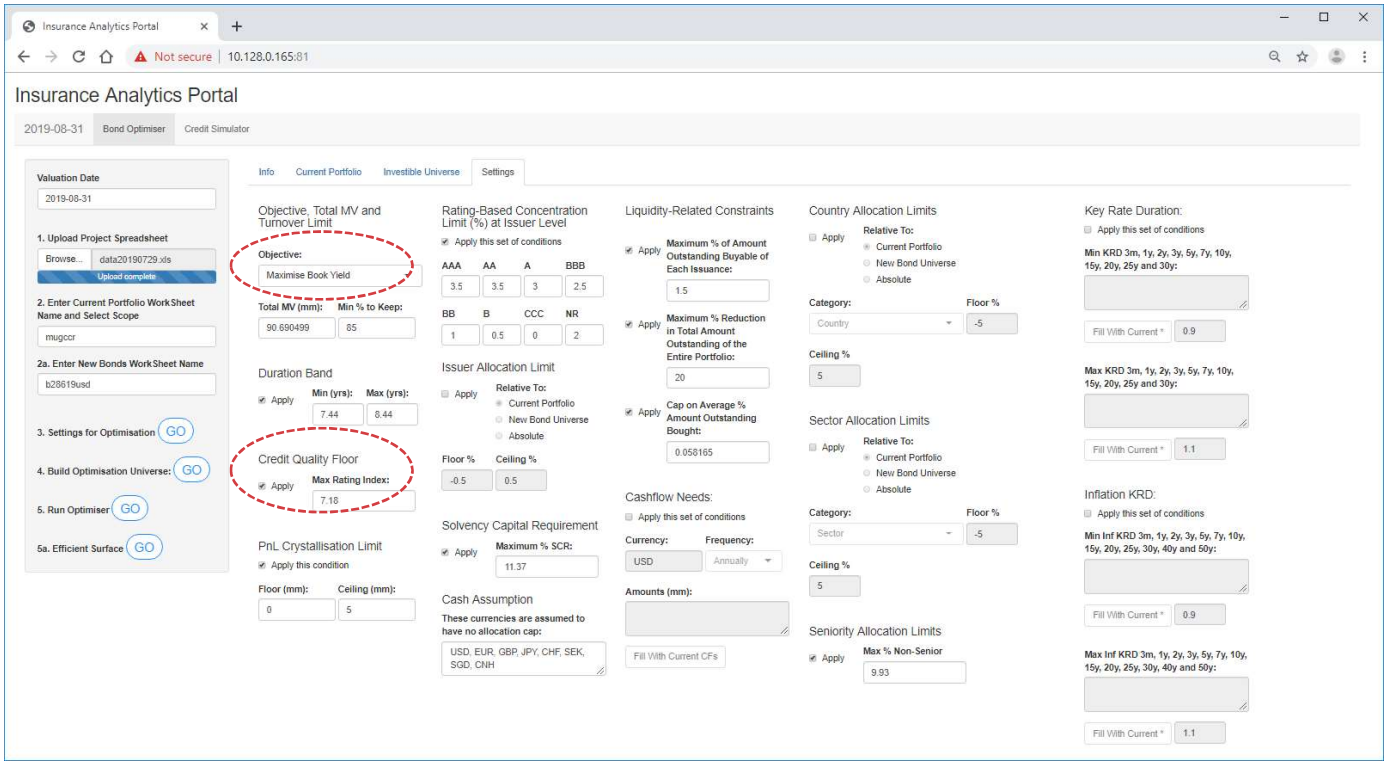
Model Portfolio 1 – Book yield enhancement



Book yield 3.52% → 3.91%

No changes in average duration, rating, SCR and other key metrics

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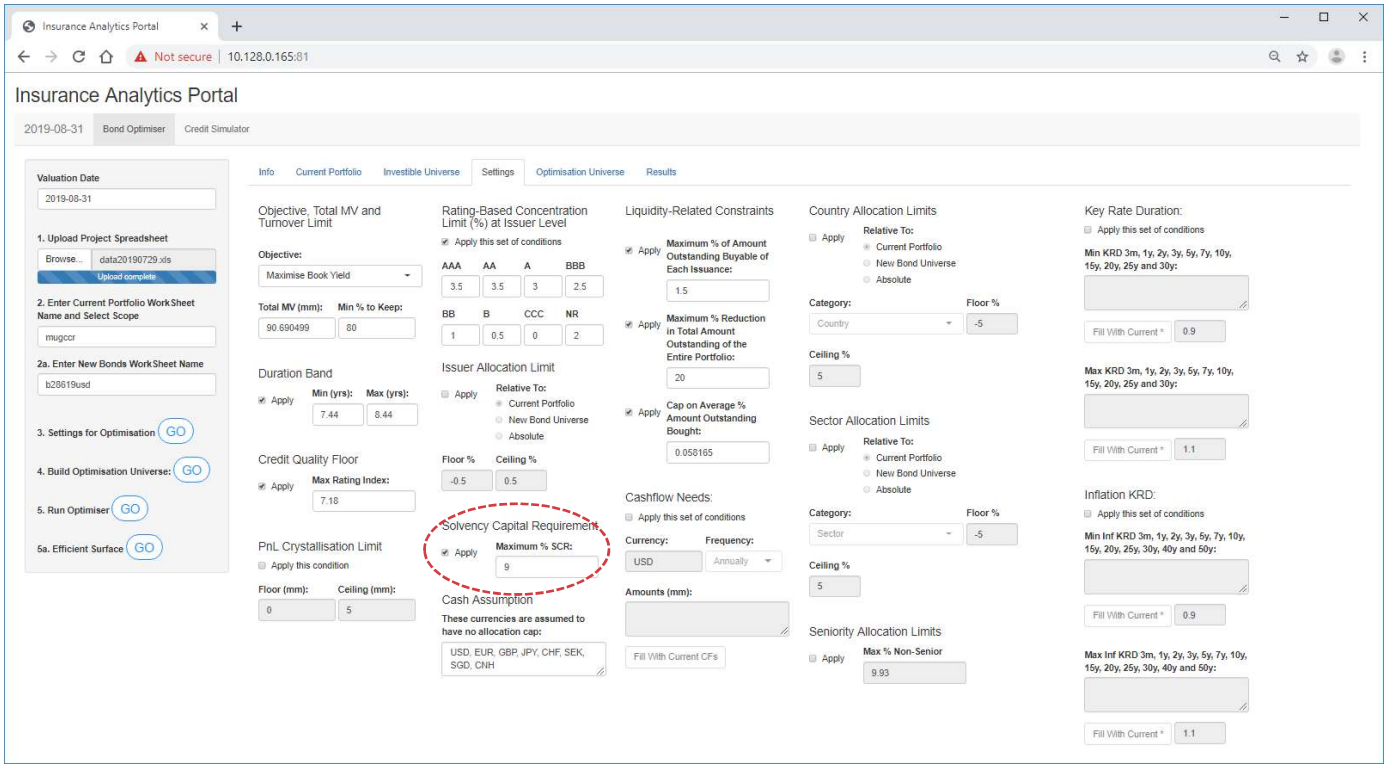
Model Portfolio 2 – Capital saving



SCR 11.4% → 9.0%

Book yield 3.52% → 3.61%

Return-on-capital 30.9% → 40.1%

~2mm SCR saved out of a 91mm bond portfolio; freeing capacity for up to 5mm into alternatives for the same budget

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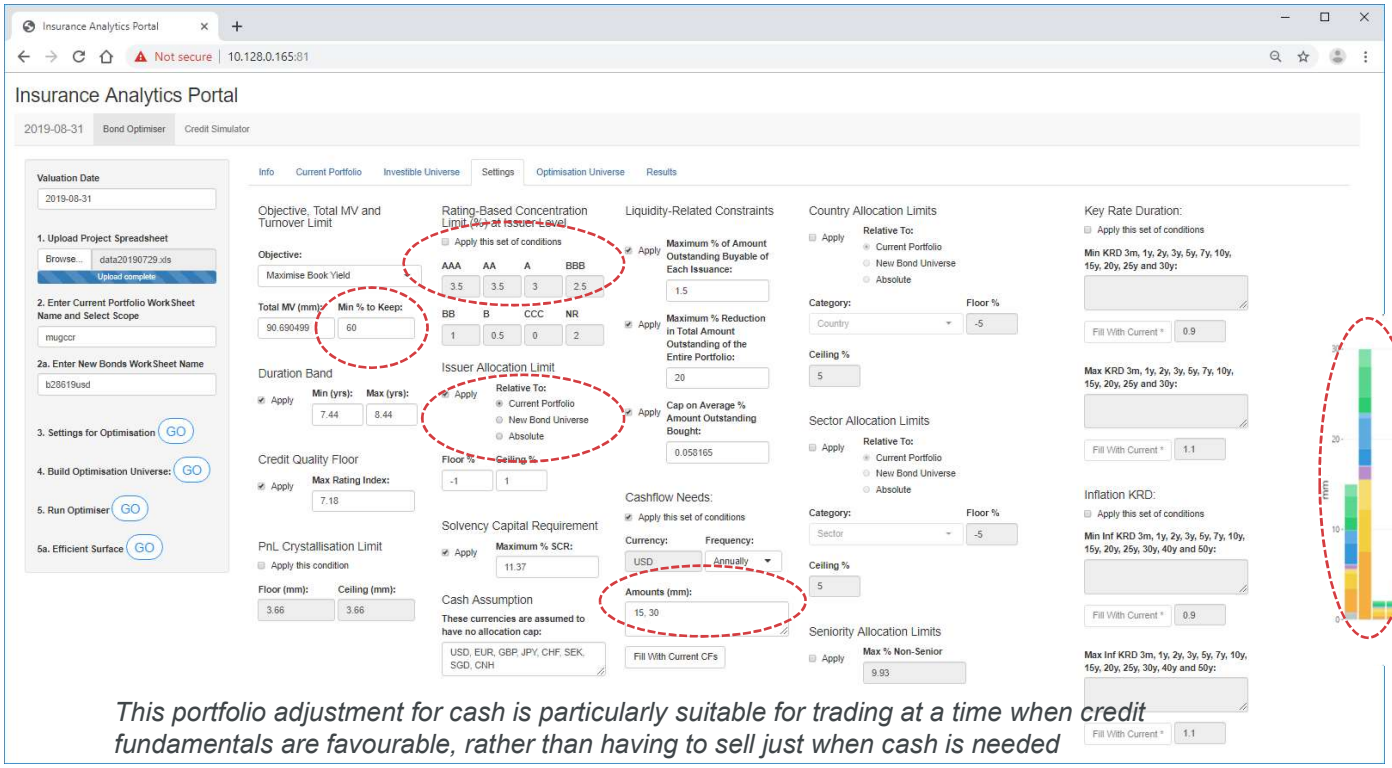
Model Portfolio 3 – Cash generation

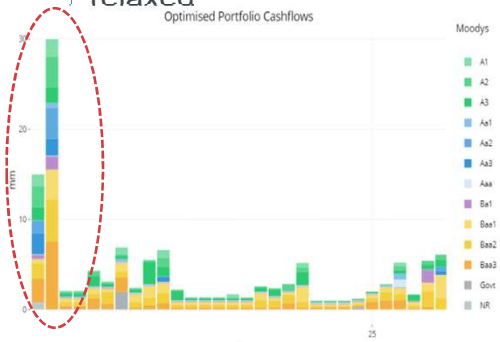


This portfolio adjustment for cash is particularly suitable for trading at a time when credit fundamentals are favourable, rather than having to sell just when cash is needed

Enough cash were generated with coupon and redemptions

Book yield 3.52% → 3.58%

Several constraints were relaxed



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Key metrics at T=0

Portfolio	Unrealised P&L (mm)	Positions	MV in scope (mm)	Duration	Rating	Rating Index	Yield	Book Yield	OAS	Herfindahl Index	Spread SCR %	Average % AO Bought	% Senior	New bonds	% MV old
Current	3.66	163	90.69	7.94	A3 / Baa1	7.18	3.07%	3.52%	97.08	78.23	11.37%	0.06%	90.07%	NA	NA
MP1	3.41	188	90.69	8.13	A3 / Baa1	7.18	3.39%	3.91%	126.42	78.22	11.37%	0.06%	90.07%	43	85%
MP2	2.91	204	90.69	7.44	A2 / A3	6.99	3.13%	3.61%	103.06	77.44	9%	0.06%	86.28%	75	80%
MP3	3.11	221	90.69	7.44	A3/Baa1	7.18	3.22%	3.58%	106.78	66.88	10%	0.06%	89.51%	104	60%

Usually, an optimizer tends to reduce the number of positions by focusing on and saturating the “best” asset lines

Specific constraints like capping the amount of outstanding bought may help increase the portfolio size

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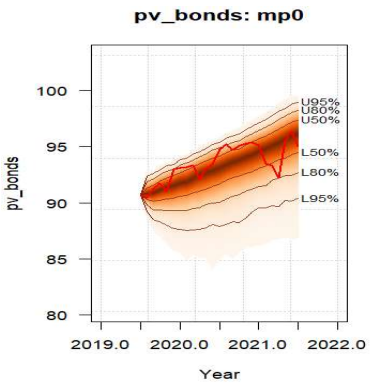
Market value

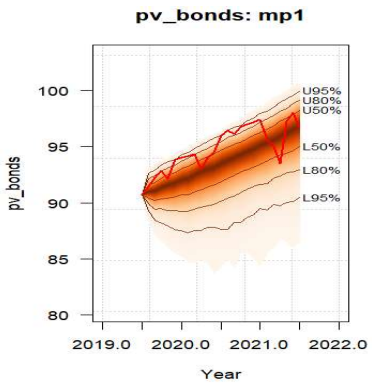
Quantiles and single scenario view

Current portfolio



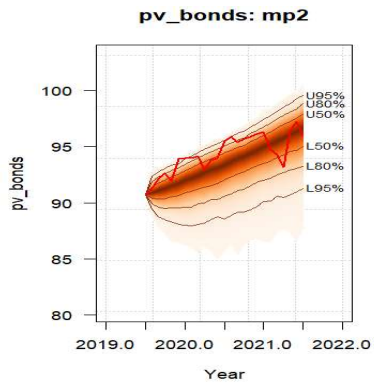
- 2-year average return: 2.71% (annualized)
- Lower end from current yield: 3.07%
- Caused by transitions / defaults and a light spread increase

Book yield enhanced



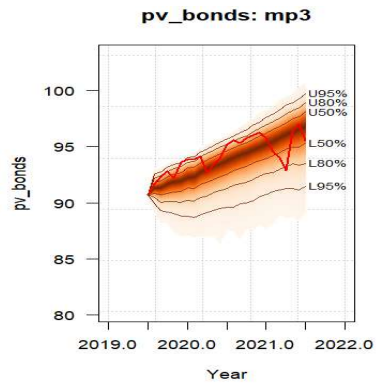
- 2-year return: 3.07%
- wider tails as spread and duration risk higher
- 1-year 5th *perc.*: -2.15% vs -1.90% *for mp0*

Capital saving



- Total return close to mp1: 3.02%
- Gain from lower duration as spreads increase
- Low SCR reduces risk: 1-year 5th *perc.*: -1.25%

Cash generation



- Early Cash generation reduces short term risk: 1-year 5th *perc.*: -0.3%

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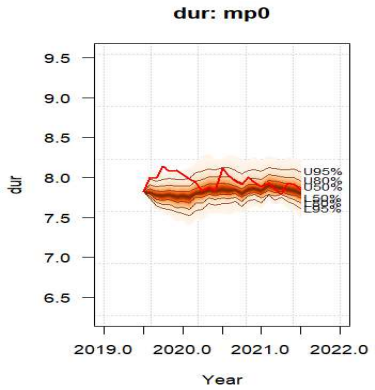
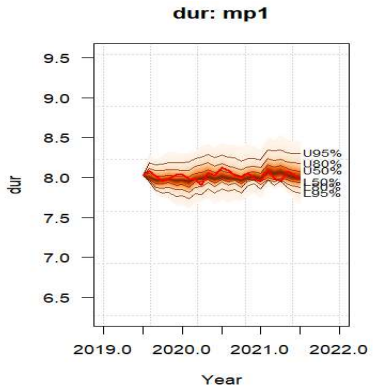
Duration

Quantiles and single scenario view

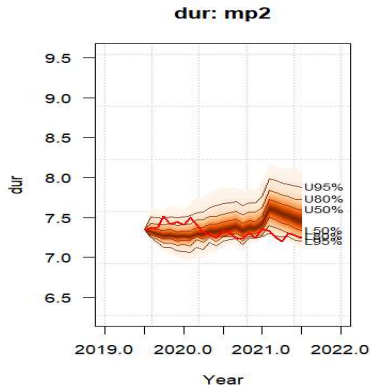
Current portfolio



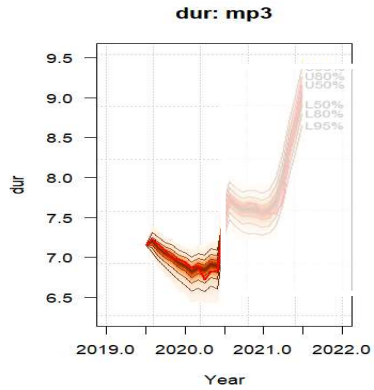
Book yield enhanced



Capital saving



Cash generation



- Portfolio duration is managed by reinvestment assumptions that can counterbalance the natural decrease for this portfolio

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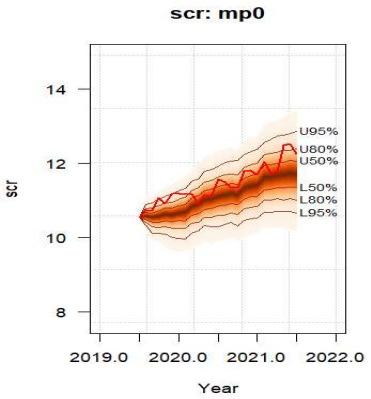
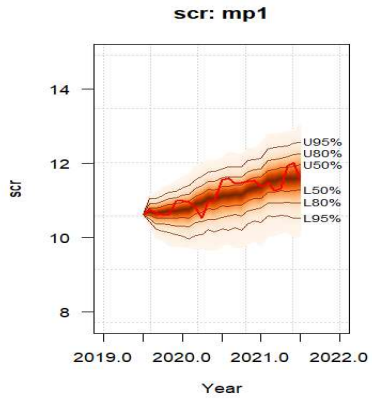
SCR

Quantiles and single scenario view

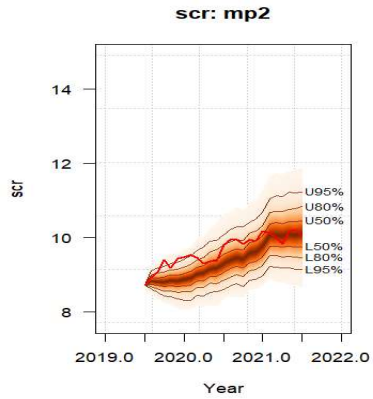
Current portfolio



Book yield enhanced



Capital saving



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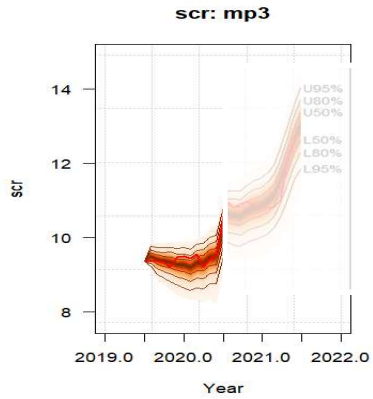

- SCR ranges over next two years will depend on the duration and credit quality targeted when reinvesting coupons, matured nationals and bonds sale

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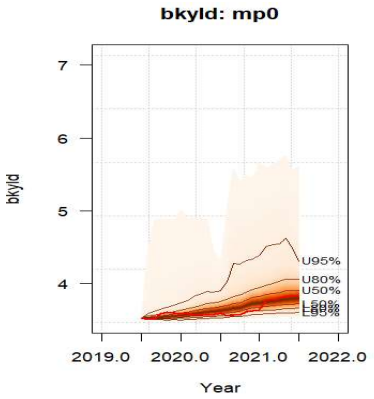
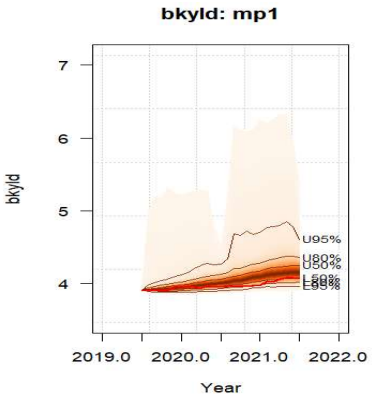
Book yield

Quantiles and single scenario view

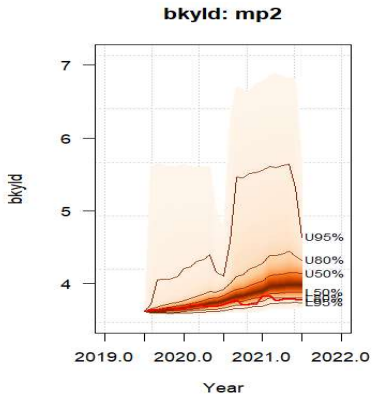
Current portfolio



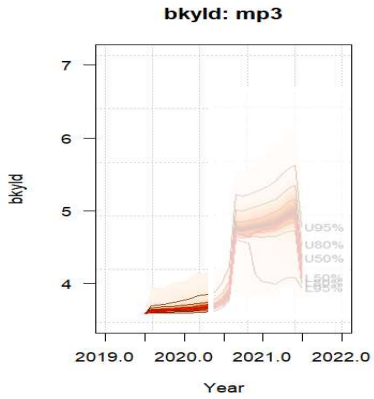
Book yield enhanced



Capital saving



Cash generation



- Book yield increases along with the observed moderate spread widening across scenarios
- Reinvestment flows causes higher variability in the book yield – the very-light orange color is the 99.5% percentiles

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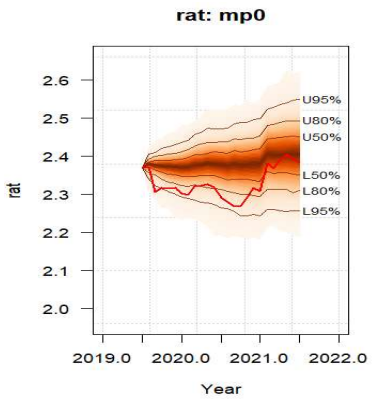
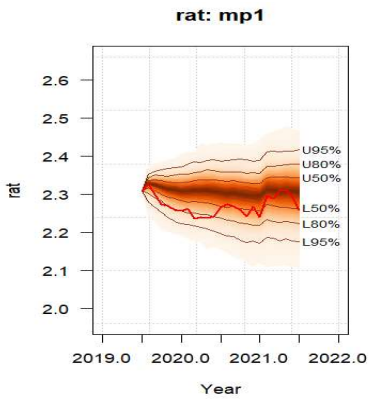
Rating

Quantiles and single scenario view

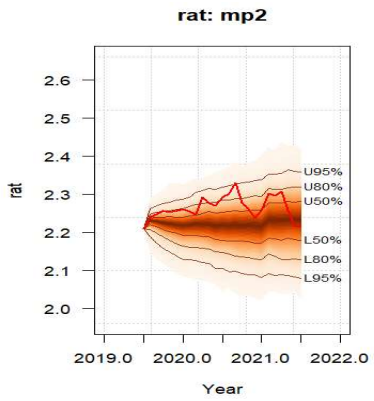
Current portfolio



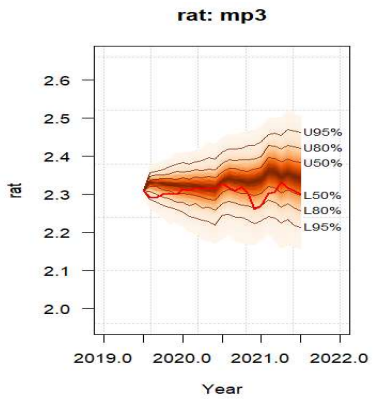
Book yield enhanced



Capital saving



Cash generation



- Portfolio rating is managed by reinvestment assumptions and can be shifted to new targets

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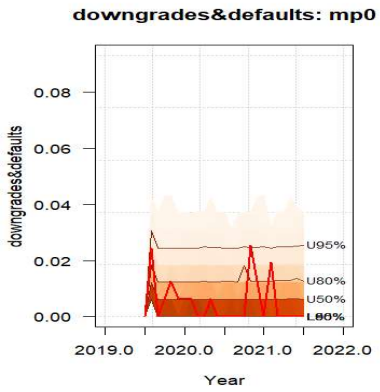
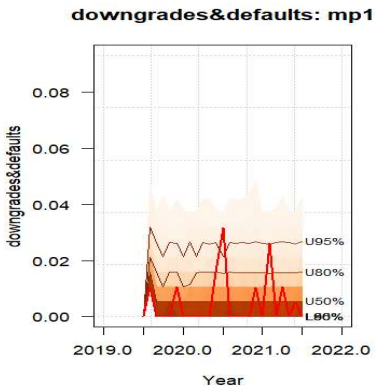
Defaults and downgrades

Quantiles and single scenario view

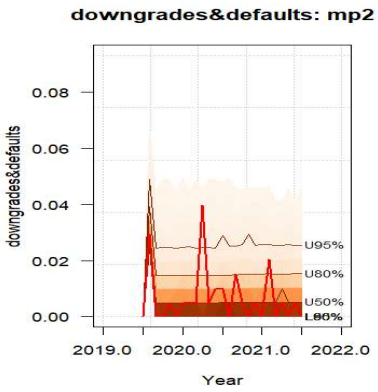
Current portfolio



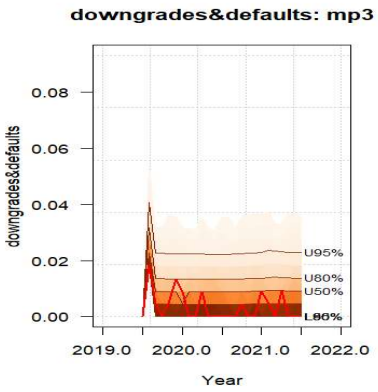
Book yield enhanced



Capital saving



Cash generation



- Results offer a representation of the downgrade / default exposure of the portfolio over time based on an historical transition matrix

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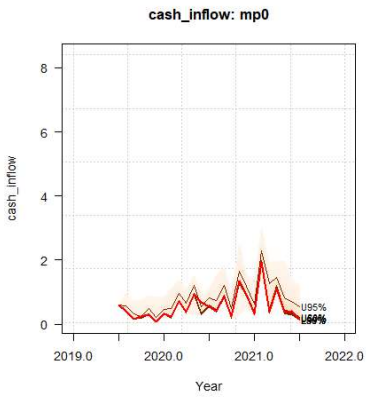
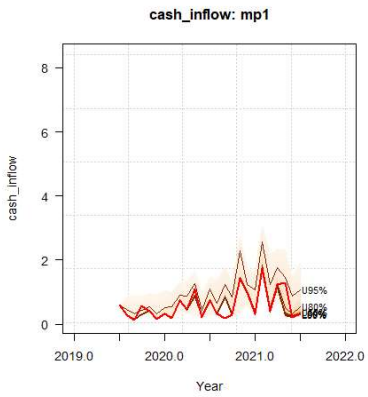
Cash inflow

Quantiles and single scenario view

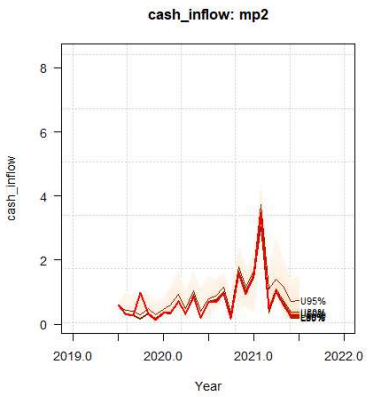
Current portfolio



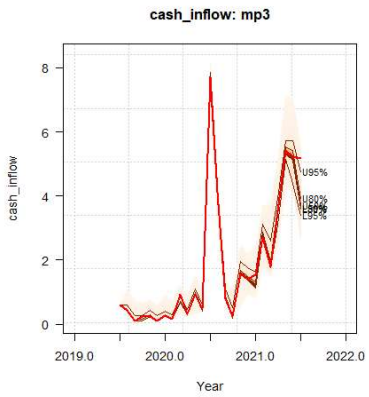
Book yield enhanced



Capital saving



Cash generation



- Hugh spikes after 12 months for the Cash generation portfolio – mp3
  - As current portfolio and benchmark only consider bonds of maturity > 1 year, the 1-year cash target can only be achieved by bond maturing in 12 months
  - A more nuanced approach should be implemented by including shorter-term instruments in the benchmark
  - Following 12 months offer a more gradual cash-flow generation pattern

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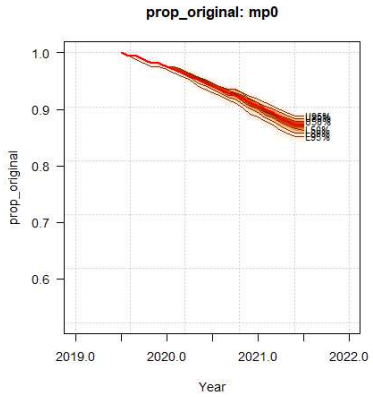
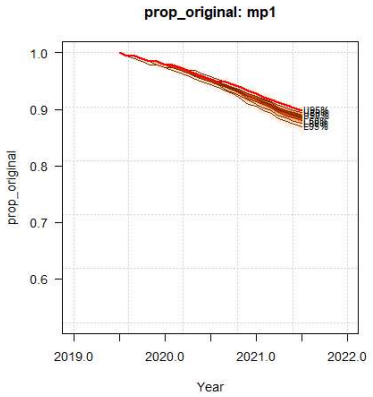
Proportional original

Quantiles and single scenario view

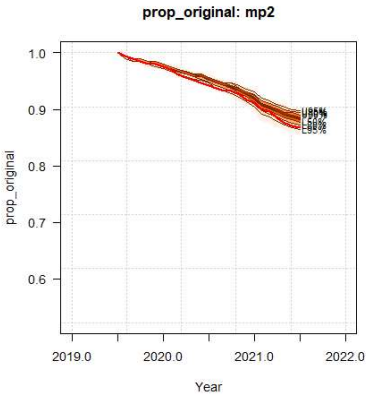
Current portfolio



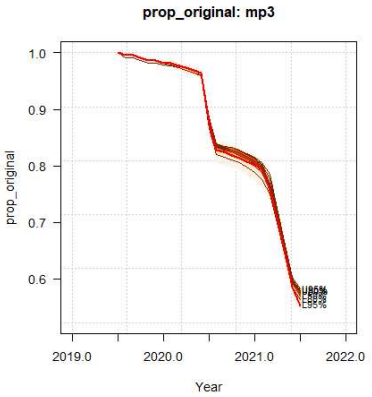
Book yield enhanced



Capital saving



Cash generation



- Natural redemption pattern of the portfolios (minus defaulted issuers) will decrease the proportion of original bonds over time
- Actions to increase cash generation over the first two years creates a more drastic pattern

- As the proportion of original bonds decreases, the initial portfolio construction becomes less and less relevant as reinvestment assumptions and strategy are taking over

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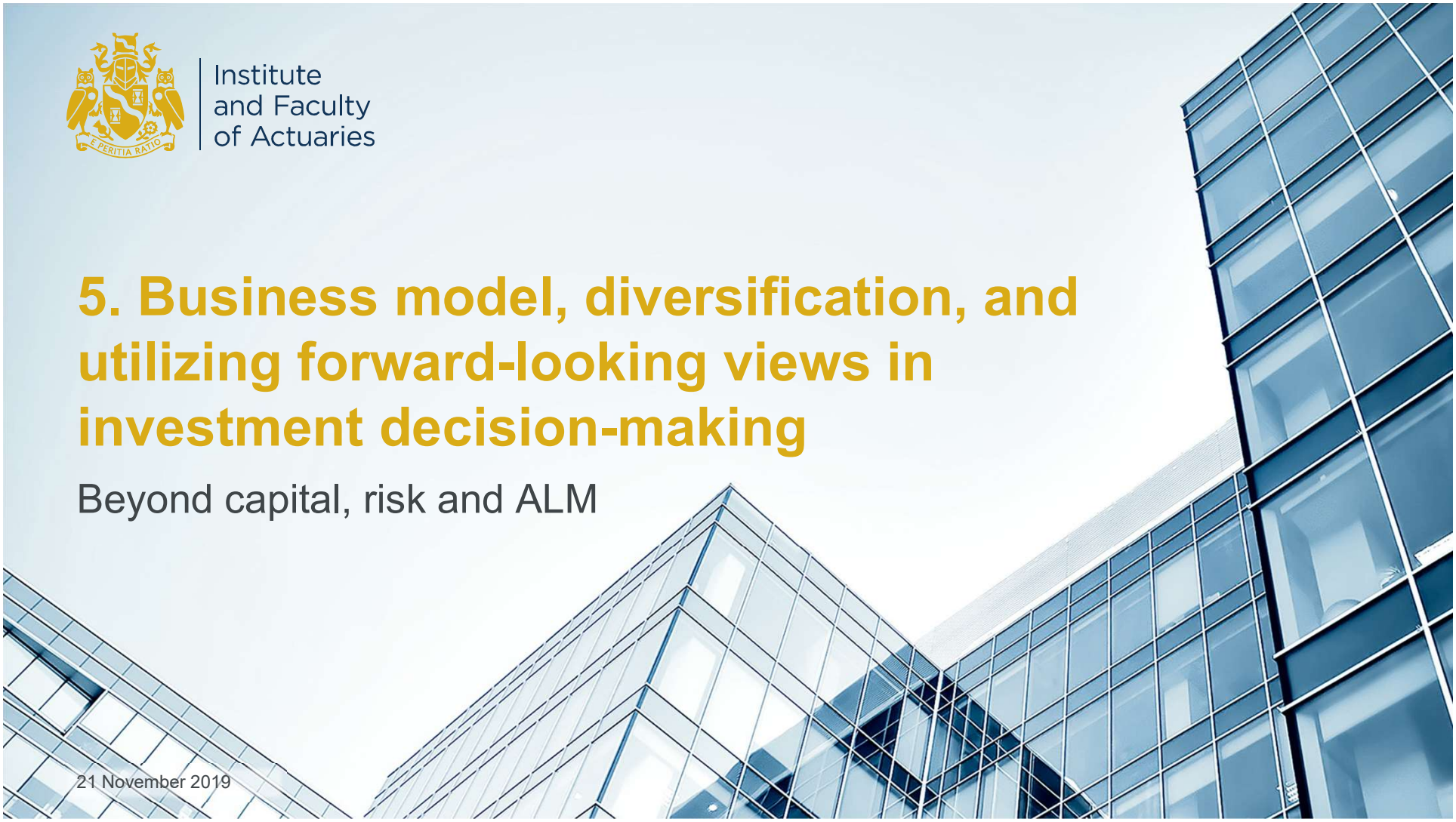

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5. Business model, diversification, and utilizing forward-looking views in investment decision-making

Beyond capital, risk and ALM

21 November 2019

Challenges to the insurance investing business model

- Life insurers:
  - Face migration and (regulatory-driven) forced-selling risk in the most yielding part of their portfolios
  - Quite often feel the pain of lack of solvency capital resources and restriction of arcane rules
  - Need tailored toolkits to reflect their balance sheet characteristics, assist the business, support their portfolio fine-tuning and assess performance
- GI companies
  - Rely heavily on investment income to remedy their underwriting losses
  - High turnover and frequent portfolio rebalancing
  - But cash rates are zero/negative and high quality universe kept shrinking
- Both
  - Low and negative interest rates, deep into an extended credit cycle

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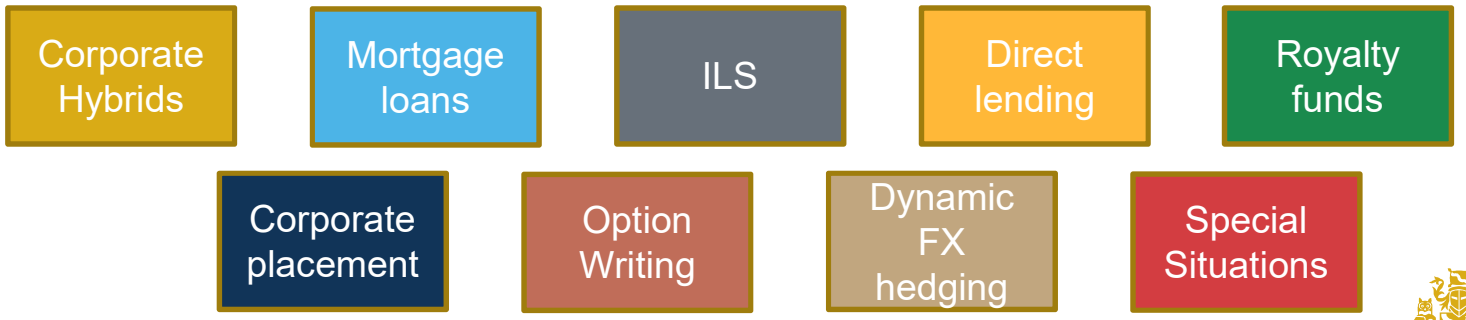
Diversification to mitigate default/downgrade risks

- Diversify underwriting and market exposure types
- Identify opportunities to access illiquidity and complexity premium
- Trade default probability for loss-given-default
- Actively reduce hedging costs on global assets



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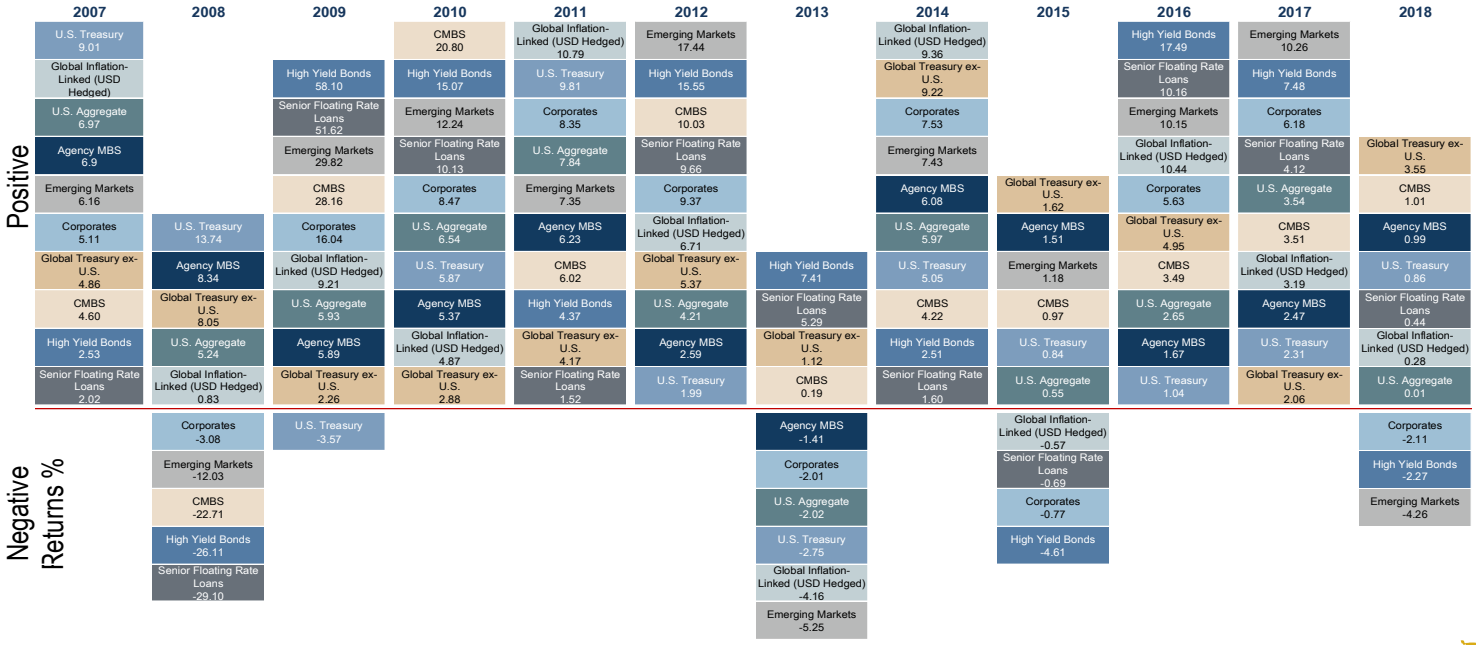
Investment opportunities vary over time



- Annual Returns Data as of December 31, 2018 . Source: BofA ML US High Yield Constrained(High Yield), JPM EMBI Global Diversified Index (Emerging Market), Bloomberg Barclays Global Inflation-Linked Index - USD Hedged (Global Inflation Linked), Bloomberg Barclays Global Ex-Treasury Index - USD Hedged (Global Treasury), Bloomberg Barclays US Credit Index, Bloomberg Barclays US MBS Index (MBS), Bloomberg Barclays US CMBS: ERISA Eligible Index (CMBS), Bloomberg Barclays US Treasury Index (US Treasury), S&P/LSTA Leveraged Loans (Senior Floating Rate Loans)
- Indices are unmanaged, are not available for direct investment and are not subject to fees and expenses typically associated with managed accounts or investment funds. Past performance is not necessarily indicative of future results. As with any investment, there is the possibility of profit as well as the risk of loss.

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Invest in a consistent, robust and forward-looking manner

- ✓ Systematically and efficiently construct/rebalance portfolios
- ✓ Analyse the impact of different investment styles and prospective strategies
- ✓ Quantify tail risk at the time horizon of interest
- ✓ Express house views and contemplate implications
- ✓ Target a stable solvency ratio and capital efficiency
- ✓ Inform decisions regarding income/dividend distribution
- ✓ Improve communication between the teams

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Questions

Comments

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