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Viewpoint

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RISK SOLUTIONS | WHITE PAPER

Incorporating Solvency Capital in Strategic Asset Allocation

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Strategic Asset Allocation (SAA) is a key process for insurance companies to manage their risk and generate returns. A well-designed SAA framework can help companies find the balance between generating higher returns (and therefore profits) and protecting their balance sheet during a market downturn.

The design of any SAA framework is driven by two questions: which financial metrics should be included in the "risk" and "reward" measures, and which metrics is my toolset capable of modelling? It can be difficult to know which metrics to include within the framework.

Take the example of With Profits policies that are sensitive to portfolio returns. Modelling the full dynamics of these liabilities, which are both scenario-dependent and portfolio-dependent, can be a computationally expensive exercise, particularly if a lot of portfolios are evaluated. However, the impact on the efficient frontier of fully capturing the liability dynamics may not be material—but this materiality cannot be known until after time and effort have been spent developing the model.

What about incorporating solvency capital within the SAA process? To provide some insight, Conning has looked at a notional UK insurer with liabilities of £700 million and assets of £1 billion. The results of the study showed that including solvency capital in the framework will have a material influence on the efficient frontier and that the time horizon of the optimisation is a key consideration.

Optimising Economic Value

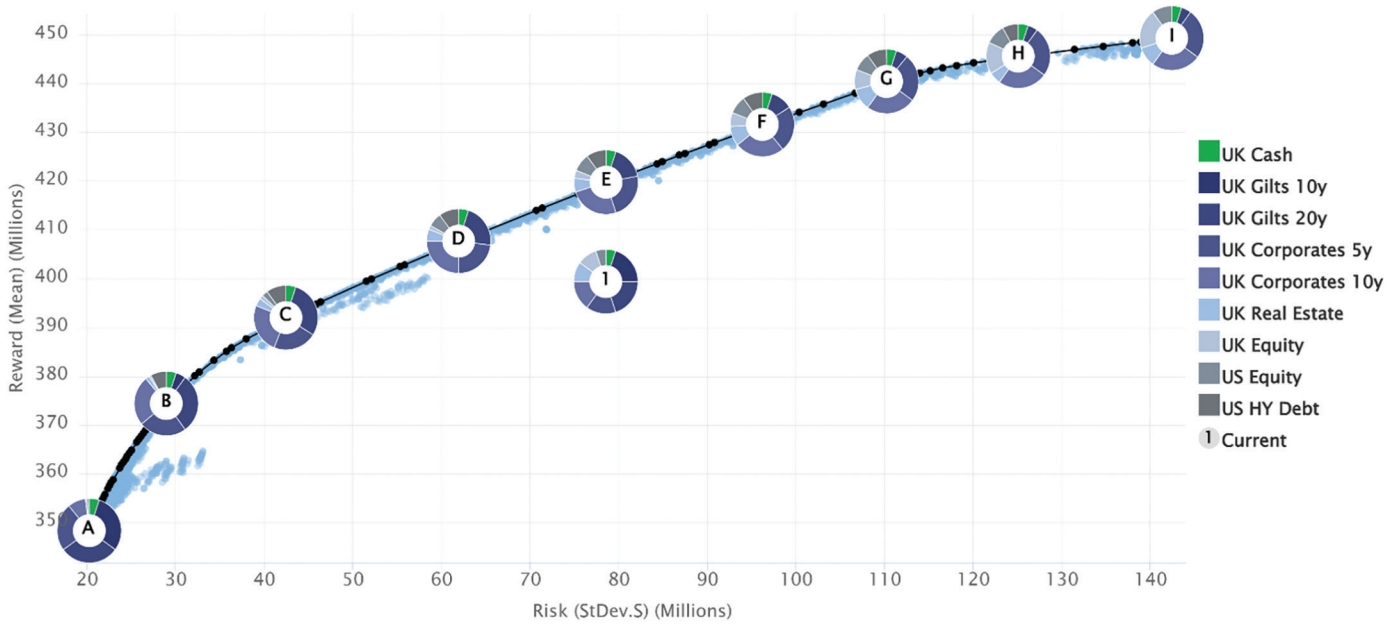
We first analyse how an existing portfolio might change if the optimisation metric is Economic Value, calculated as the Market Value of Assets minus the Present Value of Liabilities, in five years' time. To maximise Economic Value while controlling volatility, the optimiser must balance three conflicting objectives: allocating to the appropriate maturity buckets so that changes in the liability valuation in each scenario (due to variations in the discount curve) are offset by changes in the bond values, avoiding longer-duration fixed income which has higher volatility, and maximising the diversification benefit between asset classes.

The analysis (**Figure 1**) shows that portfolio E produces a c.£20m higher level of reward (average Economic Value after five years) for the same level of risk (volatility of Economic Value after five years) as the current portfolio, which is labelled as portfolio 1. Compared to the current portfolio, portfolio E shifts from 10-year government bonds to 5- and 10-year investment-grade bonds with a higher yield. The model retains investment in 20-year government bonds to maintain an asset-liability match. There is also a move from UK Real Estate and Equity to US and Emerging Market Equity, which have a higher expected return.

The next step in this analysis is to see how the optimal portfolio changes when solvency capital is introduced.

Modelling Toolset

The analysis shown in this paper is produced using the Conning Allocation Optimizer®. Although hundreds of portfolios are evaluated, for presentational reasons only ten portfolios are shown on the efficient frontier. Each portfolio, including the inefficient portfolios not shown in the charts, is evaluated across 5,000 stochastic scenarios produced using the GEMS® Economic Scenario Generator.



	1	A	B	C	D	E	F	G	H	I
GBP Cash	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
UK Government Bonds 10y	20%	30%	5%	0%	0%	0%	0%	0%	0%	0%
UK Government Bonds 20y	20%	30%	30%	29%	22%	17%	11%	6%	5%	5%
UK Investment Grade Bonds 5y	15%	24%	24%	22%	23%	23%	23%	24%	25%	25%
UK Investment Grade Bonds 10y	15%	9%	25%	25%	25%	25%	25%	25%	25%	25%
UK Real Estate	10%	1%	2%	4%	6%	7%	10%	11%	6%	10%
UK Equity (FTSE 100)	10%	0%	1%	2%	2%	4%	7%	10%	16%	20%
US Equity (S&P 500)	5%	0%	0%	3%	7%	9%	9%	9%	10%	10%
Emerging Market Equity	0%	1%	8%	10%	10%	10%	10%	10%	8%	0%
Duration	11.8	11.8	11.3	11.3	10.4	9.8	8.9	8.0	7.9	8.6
Economic Value – Avg (£m)	399.2	348.1	374.2	364.7	407.5	419.6	431.5	440.3	445.5	449.2
Economic Value – SD (£m)	78.6	20.3	29.0	25.5	62.0	78.6	96.3	110.3	125.1	142.5
Economic Value – 5th Percentile	270.3	316.0	327.3	322.5	306.6	292.2	275.0	261.7	237.5	216.9

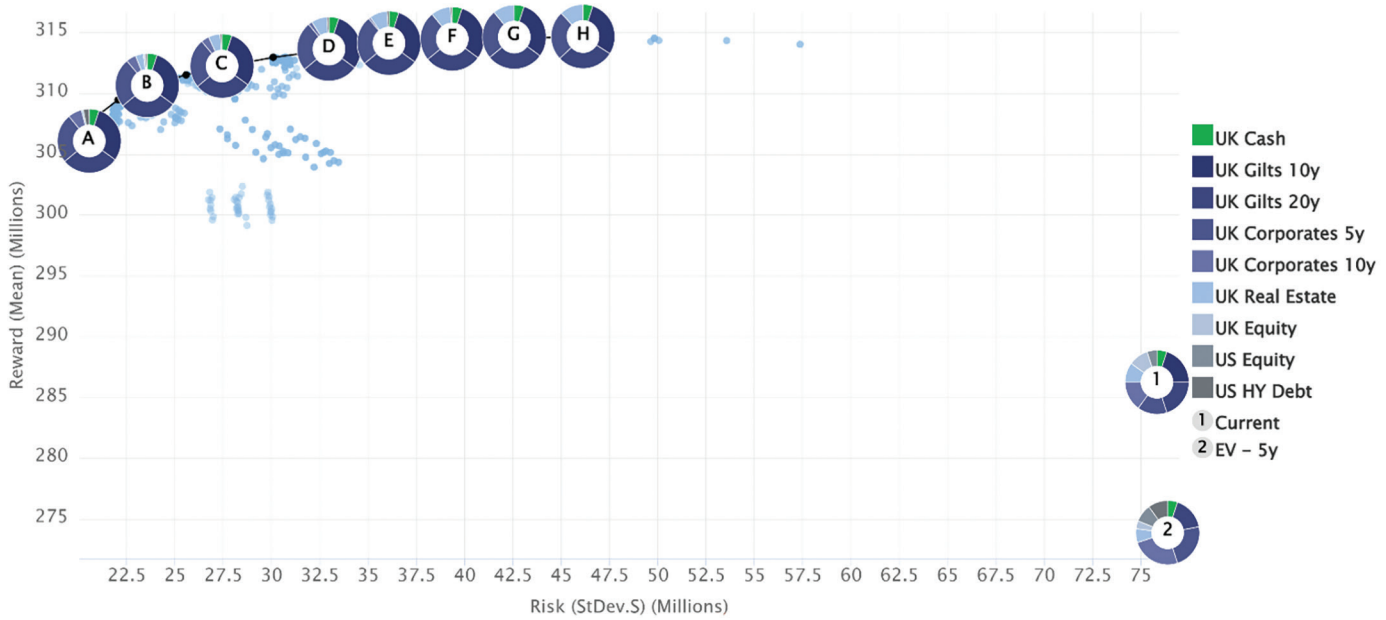
Figure 1: Economic Value for a range of portfolio allocations calculated at the end of a 5-year projection starting on 31st December 2022. ©2023 Conning, Inc. Source: Conning Allocation Optimizer® using hypothetical company data and investment returns and liability cash flows from GEMS® Economic Scenario Generator.

Optimising Economic Surplus

"Economic Surplus" is calculated as Economic Value minus the market risk Solvency Capital Requirement (SCR) calculated using the Solvency II standard formula. Under the Economic Surplus metric, the optimiser balances the same considerations as before—asset-liability mismatch, fixed income duration, diversification across asset classes—and, additionally, manages the trade-off between portfolio returns and the SCR.

With a 5-year optimisation horizon, something interesting happens: the optimiser simply picks the portfolios which minimise required capital, regardless of the fact that they have low portfolio returns.

Portfolio 1 (the current portfolio) and Portfolio 2 (E from the Economic Value analysis in Figure 1) have a much higher SCR than the low-risk portfolios on the efficient frontier, and the additional return earned by them over five years is not enough to offset the additional capital requirement.



	1	2	A	B	C	D	E	F	G	H
GBP Cash	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
UK Government Bonds 10y	20%	0%	30%	30%	30%	30%	30%	30%	30%	29%
UK Government Bonds 20y	20%	17%	29%	29%	29%	29%	29%	29%	29%	29%
UK Investment Grade Bonds 5y	15%	23%	25%	25%	25%	25%	25%	25%	25%	25%
UK Investment Grade Bonds 10y	15%	25%	7%	5%	4%	2%	1%	0%	0%	0%
UK Real Estate	10%	7%	1%	4%	6%	8%	9%	10%	11%	12%
UK Equity (FTSE 100)	10%	4%	0%	1%	0%	0%	0%	0%	0%	0%
US Equity (S&P 500)	5%	9%	0%	0%	0%	0%	0%	0%	0%	0%
Emerging Market Equity	0%	10%	3%	1%	1%	1%	1%	1%	0%	0%
Duration	11.8	9.8	11.5	11.8	11.8	11.8	11.8	11.9	12.0	12.0
Economic Value – Avg (£m)	399.2	419.6	350.8	354.1	354.8	357.3	358.6	359.8	360.0	361.8
Market Risk SCR – Avg (£m)	113.0	145.8	44.8	43.5	42.6	43.7	44.5	45.4	45.4	47.3
Economic Surplus – Avg (£m)	286.2	273.8	306.0	310.6	312.2	313.6	314.0	314.4	314.5	314.6
Economic Surplus – SD (£m)	75.9	76.4	20.6	23.6	27.5	33.0	36.1	39.4	42.6	46.2
Economic Surplus – 5th Percentile	160.8	148.1	273.6	272.7	269.6	262.1	257.3	251.8	247.1	241.5

Figure 2: Economic Surplus for a range of portfolio allocations calculated at the end of a 5-year projection starting on 31st December 2022. ©2023 Conning, Inc. Source: Conning Allocation Optimizer® using hypothetical company data and investment returns and liability cash flows from GEMS® Economic Scenario Generator.

The trade-off between additional return and additional SCR is illustrated clearly in the following chart (**Figure 3**), where the points from the Economic Value efficient frontier from Figure 1 (shown in red) are imported and the Economic Surplus metric is calculated for each portfolio. As the risk of the Economic Value portfolios increases, the increase in SCR outweighs the increase in portfolio return, and so the Economic Surplus reduces.

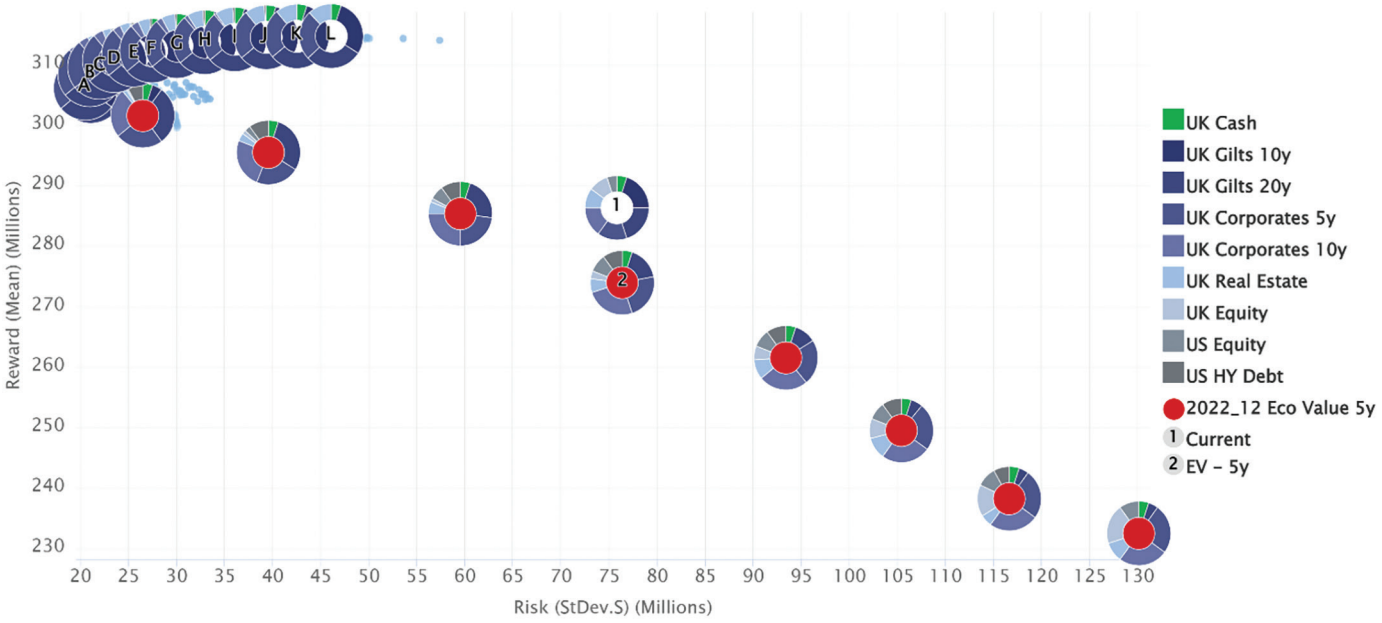
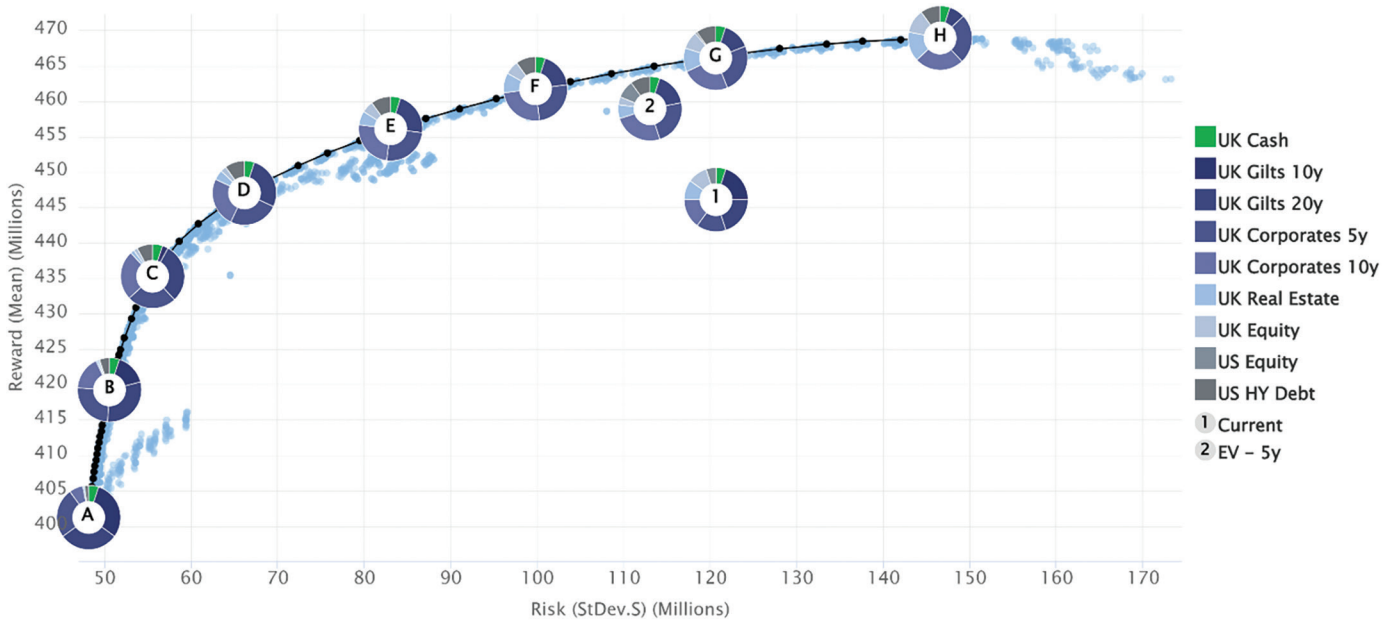


Figure 3: Economic Surplus for a range of portfolio allocations, including efficient points from an Economic Value analysis (shown in red), calculated at the end of a 5-year projection starting on 31st December 2022. ©2023 Conning, Inc. Source: Conning Allocation Optimizer® using hypothetical company data and investment returns and liability cash flows from GEMS® Economic Scenario Generator.

Conning Allocation Optimizer® Solvency Capital Requirement (SCR) calculation

The Conning Allocation Optimizer® focuses on modelling the element of solvency capital which is directly sensitive to the asset allocation: market risk. The market risk SCR is calculated for each scenario using the Solvency II Standard Formula approach. Interest rate risk is calculated for both liabilities and assets, with the discount curve/risk factor varying by scenario and time. Similarly, the spread risk factor varies by scenario and time. For other market risks, a constant risk factor is applied. The capital requirements for each risk are then aggregated using a two-stage correlation matrix to calculate the overall SCR for that scenario. This SCR is incorporated in the metric being optimised, Economic Surplus. The SCR can also be used as a constraint, e.g., the tool can exclude any portfolios which breach a required level of solvency in more than 5% of scenarios.

When the analysis is run over a longer horizon of 10 years, a different picture emerges: the additional returns generated by investing in asset classes with a higher risk charge outweigh the increased SCR. **FIgure 4** shows that portfolio G produces a higher level of reward for the same level of risk as portfolio 1 (the current allocation), even though portfolio G has a higher average SCR than portfolio 1 at the 10-year horizon (£144m versus £123m).



	1	2	A	B	C	D	E	F	G	H
GBP Cash	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
UK Government Bonds 10y	20%	0%	30%	16%	3%	0%	0%	0%	0%	0%
UK Government Bonds 20y	20%	17%	30%	30%	30%	27%	22%	18%	14%	8%
UK Investment Grade Bonds 5y	15%	23%	25%	25%	25%	25%	25%	25%	25%	25%
UK Investment Grade Bonds 10y	15%	25%	7%	17%	25%	25%	25%	25%	24%	25%
UK Real Estate	10%	7%	1%	1%	2%	5%	7%	10%	12%	15%
UK Equity (FTSE 100)	10%	4%	0%	1%	2%	3%	6%	7%	9%	12%
US Equity (S&P 500)	5%	9%	0%	0%	0%	0%	0%	0%	1%	0%
Emerging Market Equity	0%	10%	2%	5%	8%	10%	10%	10%	10%	10%
Duration	11.8	9.8	11.7	11.5	11.3	10.9	10.3	9.8	9.2	8.3
Economic Value – Avg (£m)	569.4	620.6	461.6	494.4	528.0	551.2	573.1	588.0	610.4	630.4
Market Risk SCR – Avg (£m)	123.4	161.8	60.4	75.3	92.8	104.2	117.1	126.4	144.4	161.6
Economic Surplus – Avg (£m)	446.0	458.8	401.1	419.1	435.2	446.9	456.0	461.7	466.0	468.8
Economic Surplus – SD (£m)	120.7	113.1	48.2	50.6	55.6	66.2	83.1	99.9	120.7	146.6
Economic Surplus – 5th Percentile	256.7	276.2	327.4	342.0	349.5	344.5	327.0	305.1	278.6	239.0

Figure 4: Economic Surplus for a range of portfolio allocations calculated at the end of a 10-year projection starting on 31st December 2022. ©2023 Conning, Inc. Source: Conning Allocation Optimizer® using hypothetical company data and investment returns and liability cash flows from GEMS® Economic Scenario Generator.

Importing the points from the Economic Value efficient frontier in Figure 1 (shown in red in **Figure 5**) and calculating the Economic Surplus after 10 years for each point shows how close the efficient frontiers are. The table above shows that portfolio G (efficient portfolio for Economic Surplus after 10 years) and portfolio 2 (efficient portfolio for Economic Value after 5 years) have a similar allocation. Portfolio 2 has a higher allocation to US Equity, while portfolio G has a higher allocation to UK equity and UK real estate. The differences in allocation can be explained by the relative capital charges for these asset classes. In fact, portfolio 2 has a higher Economic Value than portfolio G (i.e., it has a higher portfolio return over 10 years), but portfolio G has a lower SCR resulting in a higher Economic Surplus overall.

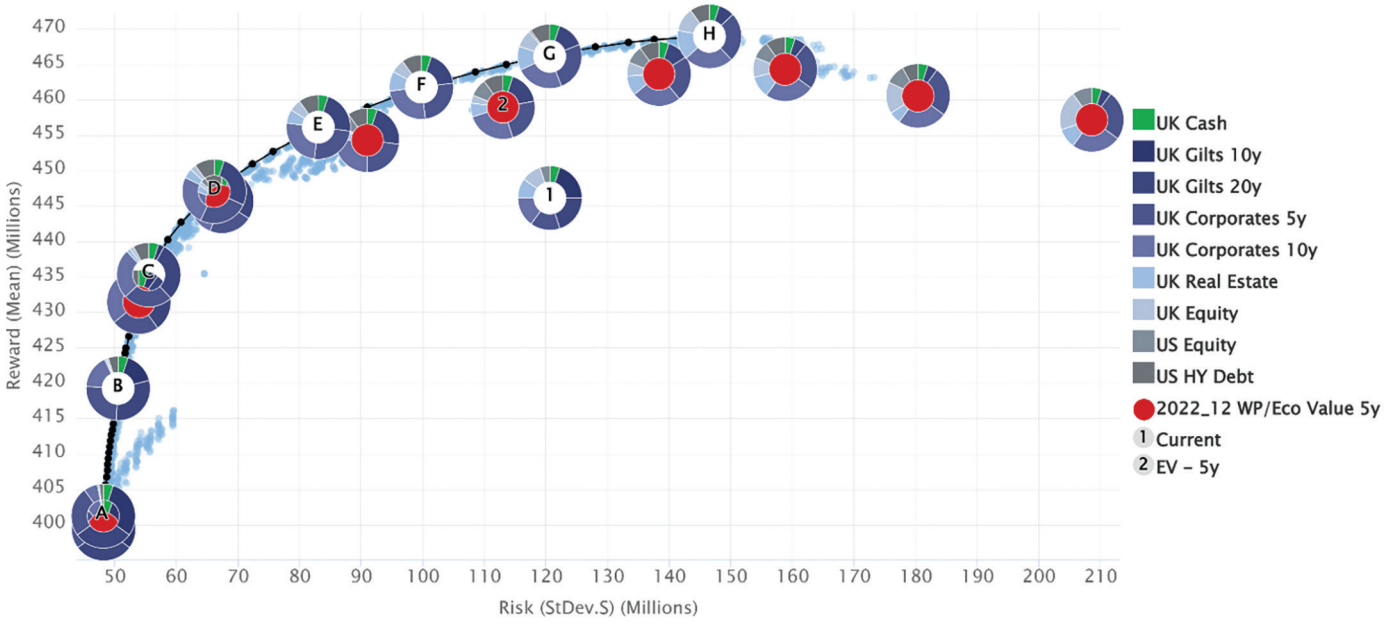


Figure 5: Economic Surplus for a range of portfolio allocations, including efficient points from an Economic Value analysis (shown in red), calculated at the end of a 10-year projection starting on 31st December 2022. ©2023 Conning, Inc. Source: Conning Allocation Optimizer® using hypothetical company data and investment returns and liability cash flows from GEMS® Economic Scenario Generator.

Conclusion

The ability to include solvency capital within the optimisation function of the SAA can be very beneficial; not only does it provide insight into the trade-off between capital and return, but it also helps control the interest rate risk by ensuring the fixed income allocation is matched to the liability profile.

However, as the analysis shows, if SCR is included within the efficient frontier, the analysis may need to be run over a longer time horizon than was otherwise the case—at least 10 years. Not only will this have implications for model run time, but it will also require the insurer to have robust assumptions about risk, reward, and correlation over this time scale.

In conclusion, the benefits of including solvency capital within the SAA process appear to outweigh the drawbacks. Multiple frontiers can be produced using a range of metrics and horizons to ensure that a variety of information is available. SAA is one of the most important decisions an insurer can make, and companies should ensure that they have the right information to make the best possible decision.

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