CUTTING THE GORDIAN KNOT:

A LOOK AT PORTFOLIO OPTIMIZATION TECHNIQUES FOR INSURERS

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As concerns about economic uncertainty persist, institutional investors face enormous pressure to make decisions that will help their constituents – employees, retirees, policyholders, to name a few – secure their financial futures. Tasked with balancing portfolio outperformance with stability while also meeting their fiduciary duties, investors must do this while not only navigating market volatility but also complex regulatory constraints. As such, each investment decision carries significant weight.

Building out a comprehensive asset allocation framework designed to address short-term bumps and long-term goals can help alleviate that pressure. However, I believe that the balance sheets and business objectives of institutional investors today are often too complicated for the traditional approaches to asset allocation implemented by many investment managers.

Many managers take a relatively uncomplicated, standardized approach to asset allocation rooted in Modern Portfolio Theory (MPT). The mathematical core of MPT is the mean-variance model, a straight-forward tool that leverages an extensive set of inputs – expected returns, volatilities, and correlations over the whole universe of asset class data – to provide an efficient frontier that lines up a series of portfolios from lowest probable expected returns (and lowest volatility) to highest expected returns (and highest volatility). The output is informative and can add a great deal of value in allocation decision-making, but I have to ask:

> **Portfolio optimization is not a one-size-fits-all process, so why are some managers relying on a one-size-fits-all approach?**

STANDING OUT FROM THE CROWD

A key challenge faced by managers relying on the mean-variance model lies primarily with the estimation of the forward-looking input parameters that characterize an investor's assets in quantitative detail. Over the years, investment managers have converged on a standard way of doing this involving market yields or spreads and simple statistics computed on historical performance data given at the asset-class level. While they may supplement these results with qualitative judgements or additional metrics, this underscores my earlier point: with many managers taking a universal approach to portfolio optimization, how does a manager not just stand out from the crowd, but stand above it?

The primary differentiating factor is data. Of course, everyone typically has access to the same public data, but the diversity and quality of less accessible data can be a distinguishing factor. For example, an organization that invests across both public and private asset classes, as PGIM does, can not only utilize the vast amount of public company data, but may also have access to a wide array of private asset data not easily accessible by other managers.

The expanded insights provided by such proprietary data could offer a powerful competitive advantage over some peers. Additionally, a manager that doesn't have the quantitative tools to efficiently and accurately synthesize large amounts of data may be at a disadvantage. Low-quality, incomplete data can lead to low-quality, incomplete results. Conversely, better higher-coverage data leads to more informed performance projections, which in turn translates into allocation recommendations more in line with the investor's risk and return objectives.

For some institutional investors, particularly insurance investors, even this level of data diversity and quality is not enough if used only within standard asset allocation models. Insurers are subject to binding reserve and capital regulations, and therefore, an approach that simply projects the pure-economic risks and returns of different asset classes may not be sufficient for their fiduciary and regulatory obligations. Rather, they require an allocation framework customized to their specific liability profile and regulatory regime. Because this regime affects how earnings are released from the investment vehicle, the actual earnings distributed back to investors may be a highly non-linear function of the allocation weights. In other words, projecting returns independently for each asset class isn't a reliable way to estimate future distributable earnings. Income generated by one asset class may ultimately impact both how much and when income from another asset class gets distributed. This creates a real problem for the mean-variance model which can't account for those kinds of interactions.

ALM SCENARIO GENERATION: INTRICACIES THAT DRIVE SOLUTIONS

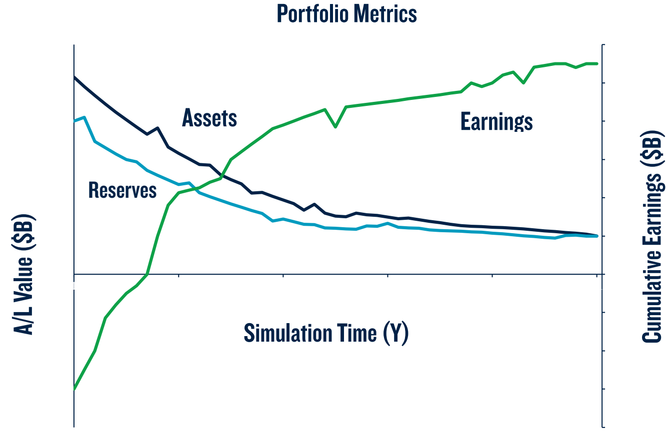
The comprehensive approach to helping an investor understand the problems they may face and providing insights into potential solutions to those problems is both rigorous and complicated. Factor-level models can generate any number of random scenario paths into the future. The more scenarios generated provide a more comprehensive view of the true economic variability an investor could encounter. Each run would typically generate anywhere from 100 to 1,000 paths, depending on the precision required for tail risk measurement. For especially sensitive calculations one might even use 10,000 different paths. And for each path, the full balance sheet of assets, liabilities, and hedges along with all the regulatory metrics, must be simulated step by step, decades into the future.

To ensure accuracy, a scenario generator must undergo an intensive calibration process by which its internal parameters are set to best reproduce the historical behavior of all the relevant risk factors, including correlations between them. At PGIM, this process is informed both by Prudential's long history of risk management expertise and by PGIM's views on long-term trends in various factors. These views emerge from separate proprietary models designed to integrate PGIM's internal cross asset class data – including credit migration and defaults for private assets – into the larger context of data that is available to financial institutions broadly, thus bridging the information gap often faced in asset allocation modeling.

STAYING THE COURSE

Because the mean-variance model assumes a very simple form (static, joint normal) for the probability distribution of all its key variables, it doesn't have to do any explicit simulations. It's all implicit in the formulas derived by Markowitz. But, simple solutions cannot solve complex problems. To address the complicated needs of insurance investors, we need to move beyond this framework. The "return" of a given asset class can no longer be thought of as a single number, or even as a single stream of cash-flows, independent of the other asset classes. To serve these investors, a realistic allocation model must project the returns of the portfolio as a whole, and year-by-year over the full course of the liabilities. This is the only way to incorporate the impact of reserve and capital regulation, and it requires much more intensive, dynamic calculations. Simulations must be done explicitly, and static return, volatility and correlation data won't suffice. Those higher-level metrics must be disaggregated into more granular quantities involving interest rates, credit spreads, default losses, and hedge valuations in order to project regulatory metrics like best-estimated liability values, required capital, and capital redundancy ratios that ultimately determine quarterly earnings.

To deliver these intricate projections, a well-established asset-liability management (ALM) modeling capability is essential and can give managers a more concrete picture of the returns insurance investors can realistically expect, given any particular economic scenario extending into the distant future, a particular liability profile, and a desired investment portfolio. But a single economic scenario is generally not enough. Just as with the mean-variance model, a measure of risk – i.e., variability over different scenarios – is critical. The first step, then, is to generate a whole set of scenarios representative of the kind of economic variability that sophisticated investors need to contemplate.



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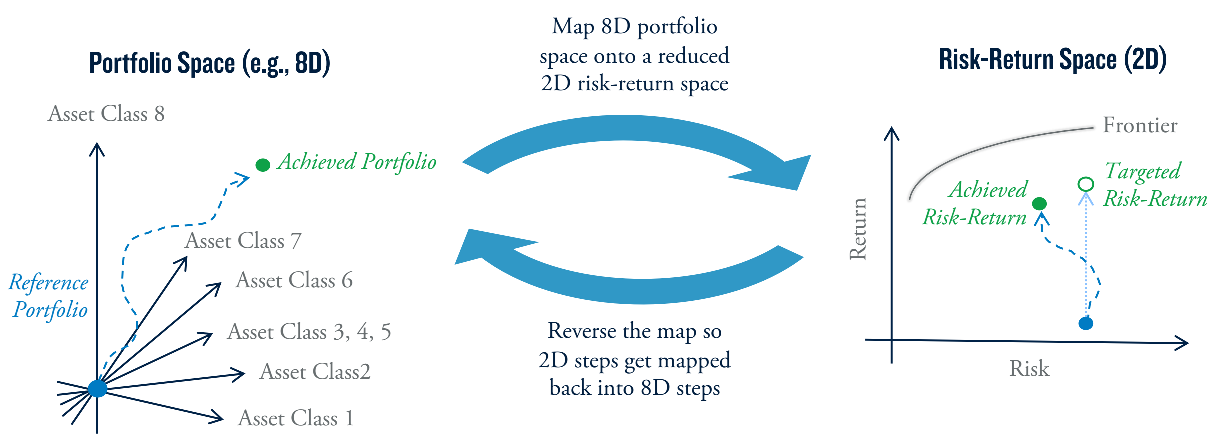
The simplest way to do this is by analyzing asset-class level historical data, but this method does not distinguish between key economic factors, thus making it difficult to isolate macro trends. Relying solely on asset-class historical data can lead to the assumption that asset-class trends will continue indefinitely. For example, simple historical asset-class analysis tends to implicitly assume that interest rates will keep moving downward over decadal timescales. In reality, that's extremely unlikely because of the zero lower-bound (or some slightly negative lower bound). A more robust approach is to build a set of coupled economic models describing the key risk factors – rates, spreads, defaults, currencies, equity returns, etc. – that drive these scenarios. Such a factor-level model can explicitly account for this kind of trend discontinuity, giving us more confidence in the associated long-term projections.

Once a scenario set is generated and ALM simulations are run, long-term performance metrics are generated for each scenario. In turn, statistical measures across the full set of scenarios – means, percentiles, conditional tail expectations, etc. – may be computed, giving the most holistic picture of the ALM problem faced by an investor.

CONCLUSION

The impact of economic scenario-based analysis also depends on investment strategies such as asset mix, reinvestment decisions, and hedging assumed in the simulations. However, the set of candidate portfolios that can be analyzed in this way is gigantic, increasing exponentially with the number of separate asset classes being considered. This is where I bring it back to the primary differentiator between managers: data. Access to data can be an important advantage, but how a manager processes that data is what truly sets them apart. In a situation such as this, they must have the ability to acutely identify the candidate strategies that will have the greatest impact on an investor's investment objectives. For example, at PGIM we have developed a methodology that allows us to distill the vast space of possible portfolios into a reduced, two-dimensional risk-return space resembling that of Markowitz's efficient frontier. This allows us to express intuitive notions of risk and return in terms of our more rigorous, holistic ALM metrics, and then to navigate a path through portfolio space that can unlock higher risk-adjusted returns.



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There is no one-size-fits-all approach to portfolio optimization, especially given the increasingly complex challenges faced by institutional investors. The right portfolio optimization tools have to be informed by robust client partnership, proven quantitative capabilities, and an integrated approach to multi-asset investing. When done right, this can deliver bottom-line solutions to the most complex allocation problems.

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All data is as of March 31, 2024.

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