

Insurance Insight Series

Author

Adam Koursaris

Senior Director

Product Management

Contact Us

Americas
+1.212.553.1653

Europe
+44.20.7772.5454

Asia-Pacific
+852.3551.3077

Japan
+81.3.5408.4100

Creating an Integrated Investment Value-Chain

Introduction

The best insurance investment managers today are going beyond traditional portfolio management. They are integrating their investment value-chain to create optimal portfolios in the context of their company's liabilities, capital, regulatory regime, and planning objectives. This approach enhances value across a range of business functions and increases risk-adjusted return on capital for shareholders.

To develop holistic or integrated asset management and ALM solutions for insurance, asset managers are using data and models from across the business and integrating them into the management decision-making process. This approach requires tools that use cash flow information from actuarial models, and reflect the needs of the asset management function in terms of asset data, capital market insights, and investment process.

There are many important and complex modeling and analytic challenges to be addressed to ensure that integrated asset management can lend effective insight into the management decision-making process. This paper describes these challenges, and the associated benefits of improved liability-aware asset analytics:

- » Monte-Carlo scenario modeling of asset and liability portfolios
- » Demand for more sophisticated and granular credit risk analysis
- » Modeling liquidity premia and costs in insurance portfolios
- » Building effective cash flow matching strategies
- » Investment guarantees and asset-liability interaction
- » Focus on capital requirements
- » Optimizing return on capital
- » Integrating proprietary economic and capital market views
- » Analyzing exotic asset strategies

Future papers in this series discuss each of these benefits in more detail, using case studies to illustrate how analytics and integration can be performed for effective holistic asset management.

Introduction

The best insurance investment managers today are going beyond traditional portfolio management. They are creating an integrated investment value-chain that encompasses actuarial, risk, asset and liability management (ALM), and asset management skills to create optimal portfolios in the context of their company's liabilities, capital, regulatory regime, and objectives. This approach enhances value across a range of stakeholders, and increases risk-adjusted return on capital for shareholders.

A new risk management regime for insurance

Driven by new regulations, valuation methodologies, accounting standards and global emerging best practice, actuaries and risk managers have made significant advances in the way they work. For the most part, these developments have introduced more economically based approaches and promoted improved valuation and risk measurement techniques. This movement is exemplified by Europe's Solvency II but is developing in many other territories too, including International Capital Standards, China Risk Oriented Solvency System, Life Insurance Capital Adequacy Test (LICAT) in Canada, and United States Own Risk and Solvency Assessment (ORSA).

Substantial investment has been made in new tools, models, and processes to produce timely, granular, and accurate measurements and to ensure that these metrics receive attention at the most senior levels of the business.

These developments bring opportunities for asset managers. The new economic principles and market-based approach to the management of insurance businesses relate closely to the

approaches, beliefs, and capabilities of most asset managers. So this modern transformation provides an opportunity to manage insurance assets in a way that is more integrated, holistic, and consistent. At the same time, demoting many older, conflicting metrics should reduce many of the contradictions and inconsistencies that have frustrated sound investment decisions in the past.

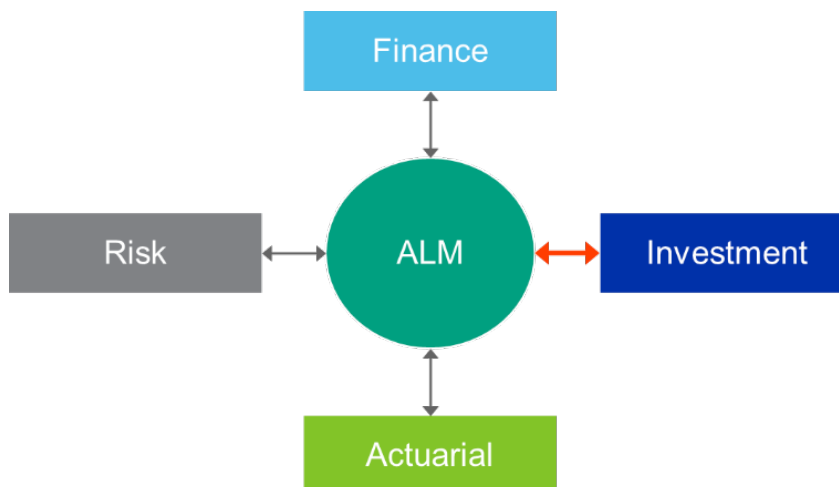
To make the greatest contribution in these new regimes, asset managers need to complement their deep insights into asset risks and returns, and economic research and analysis, with comparable appreciation of the rest of the insurance balance sheet.

Integrating asset management into the insurance business

Asset managers who are adding the most value to insurers are enhancing the management of insurance assets by designing portfolios that reflect the liabilities of the insurer, cognizant of the capital regime under which they operate and the objectives and constraints of the insurer.

This is achieved by deepening the capabilities of the ALM team and working more closely with the asset management function.

The role of the ALM team is to act as a bridge between the insurer and the asset manager. It collects and amalgamates a variety of information and requirements from finance, risk, actuarial, product, and investment teams; leveraging the data and models used across the business and integrating them into the management decision-making process. The investment portfolio is strategically positioned to achieve the best outcomes in the context of the insurer's constraints and



planning objectives. When this relationship works well, the asset manager acquires the tools to make better investment decisions aligned with the objectives of the insurer's ALM function. All parties benefit from a more richly informed dialogue.

A naïve manager could select a portfolio of assets that offers a good risk-return trade-off and respects a duration and rating benchmark. However, a holistic, integrated asset manager is also able to contemplate the capital treatment of the assets, the liquidity offered and demanded by the liabilities, the interaction and feedback between assets and liabilities, the impact of transaction costs, and the way these elements combine with market and credit risk to create opportunities and risks. They are able to do these things quickly, to take advantage of market opportunities, integrate their own proprietary economic views and effectively capture the insurer's objectives and salient metrics in their analysis, to enhance risk-adjusted return on capital.

Integrated insurance asset management: Modeling and analytic challenges

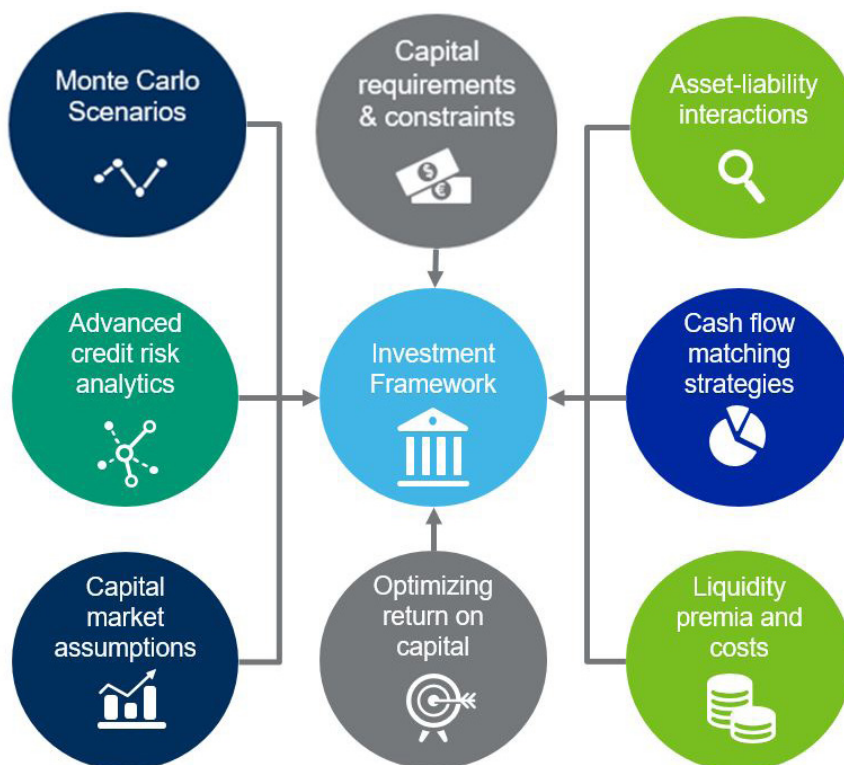
Frameworks for investment decision-making bring together many questions and analytics. While by no means exhaustive, the list below highlights some of the important analytic challenges. In future papers in this series, we will explore these

areas in more detail, using case studies to illustrate the analytics, integration, and benefits to the business.

Monte-Carlo scenario modeling of asset and liability portfolios

Many asset managers use risk management systems for monitoring asset holdings and analyzing portfolio risk, but these systems tend to focus on short-term, single time step risk metrics and ignore the longer term profile of most insurance portfolios. This means they fail to capture many important features and interactions like the path dependence created by bonuses and management actions, accounting, regulatory, and capital treatment of assets and liabilities, the evolution of capital requirements, and the liquidity risk of the portfolio. These all play an important role in the measurement of risk and performance for an insurer, and hence the choice of appropriate assets to optimize risk adjusted return.

Some companies use multi-year stress tests that can incorporate more complex metrics. These usually feature a small number of narrative paths for the economy and asset returns. While interesting to consider, these can lead to a constrained view of risk and could miss many possible future scenarios where the insurer might face more severe difficulties. Relying on this narrative approach can encourage decisions that protect against



these specific outcomes but ignore other combinations of risks that might emerge. A lack of statistical distributions also means that it is difficult to compare alternative strategies in a consistent way.

Best practice frameworks for ALM analysis use Monte Carlo techniques to generate a large number of scenarios over a multi-year horizon. They allow the modeler to integrate views of risk premia on many asset classes and economies, integrate expectations on yield curve evolution and term premia, allow granular credit risk exposure measurement and projection, and integrate these economic projections using structures that allow for realistic correlation and tail dependence over multi-year horizons.

A well calibrated economic scenario generator with a set of realistic real-world models forms the foundation of robust Monte Carlo analysis.

Demand for more sophisticated and granular credit risk analysis

Credit risky instruments typically account for a substantial part of an insurer's asset portfolio. Historically insurers have held conservative portfolios with limited credit risk exposure. However, the low interest rate environment has encouraged insurers to increase investment in higher yield credit. This is not just a change in credit exposure, but also a move to alternative and illiquid assets such as commercial real estate, infrastructure, sovereign debt, and structured securities. These asset types exhibit risk complexities that demand more sophisticated credit modeling.

Furthermore, P&L determines policyholder bonus payouts and is an important consideration when optimizing insurance asset strategies. The introduction of International Financial Reporting Standard (IFRS 9) for insurers in 2021 is forcing institutions to base their analysis of credit risk on forward-looking risk measures. For the first time, many firms must consider name-level and even holding-level credit dynamics. IFRS 9 requires firms to jointly track forward-looking default probabilities for expected loss calculations, as well as rating migrations for rating-based staging rules that are used by many institutions in allowance calculations under the new rules. Taken together, these changes are forcing insurers to improve the quality and granularity of their credit models.

These emerging requirements align with the approach taken by asset managers to constructing fixed income portfolios,

where credit risk is measured and managed in a sophisticated way. Default probabilities are estimated for individual issuers, informed by company financials, credit ratings, credit spreads, and other factors. Portfolio risk is then measured by aggregating the individual exposures and considering the association between different companies, sectors, markets, and regions. The limitation with these asset management models is they are not designed to extend to the multi time-step scenario framework which is required to support insurance ALM.

In contrast, insurers' risk and actuarial functions have tended to view credit in a more abstract way, thinking more about the risk characteristics of portfolios of bonds of similar credit ratings and treating individual issuers within these groups as homogeneous units with undifferentiated industry drivers and correlations. While this methodology can suffice for product pricing or determining capital requirements, it throws away much of the insight possessed by the asset manager. It also means that inconsistencies arise in risk measurement and it becomes difficult to build a reliable link between investment decisions at the security or portfolio level and the outcome for an insurance group's return on capital or accounting results.

By blending the skills of the investment, risk, and actuarial teams, there is significant scope to combine best of breed credit modeling with sophisticated insurance analytics. This enables coherent investment and risk management decisions from selecting individual assets through to board-level risk oversight. In this way, the quality of the conversation and the resulting decisions are greatly improved.

Modeling liquidity premia and costs in insurance portfolios

For many insurers, particularly those with long-term liabilities, there is significant value to be gained from illiquidity. The sticky nature of insurance liabilities gives the insurer the opportunity to invest in less liquid assets and earn a higher yield.

To form a robust strategy the asset manager must understand these long-term liquidity characteristics in detail: what payments to policyholders are likely to be needed and what is the variability around them? What economic conditions would be associated with higher lapses or redemptions? How liquid are various classes of assets and what would be the cost of selling them under these different economic conditions? What additional yields can we expect to earn on these illiquid investments, relative to more liquid alternatives with similar risk profiles? What data is available to estimate this liquidity

premium and how reliable is it? How do these illiquid assets affect the capital requirement on the portfolio?

With low interest rates compelling a search for higher yields, understanding these features is vital.

In many cases insurers might lack the experience to confidently answer these questions and therefore to commit significant resources to many of these illiquid asset classes. This is where asset managers with experience analyzing and dealing in these investments can add significant value. Enabling an insurer to confidently exploit and manage these opportunities offers a strategic advantage over competitors.

Building effective cash flow matching strategies

Insurance asset managers need to consider how cash flows might emerge in asset and liability portfolios and identify assets which can close cash flow gaps. However, rather than simply matching as closely as possible, the extent and accuracy of the cash flow match should be measured against factors like the need for diversification. For example, to assess the benefits and risks of introducing foreign bonds, it will be important to understand the secondary risks and liquidity requirements of the associated currency hedges.

Asset managers also seek to quantify the risks associated with credit defaults, downgrades, rebalancing, less liquid cash flow matching assets like equity release mortgages, infrastructure, or long-term real fixed interest.

The problem of designing a suitable cash flow matching asset portfolio becomes more complicated for insurance businesses where liability cash flows are uncertain; a complex function of market risk factors, new business, and asset strategy.

Investment guarantees and asset-liability interaction

For some simple lines of business, liability cash flows are relatively predictable and independent of asset returns. However, many insurance contracts have a participation component: the policyholder is paid a minimum guaranteed bonus, plus a portion of any profit or "upside" often linked to book value returns on the asset portfolio. Liabilities therefore vary with returns on the asset portfolio.

In this case, in addition to matching minimum guaranteed liability cash flows, it is important to consider how the book value and investment income of the asset portfolio could evolve, how surplus profits would be distributed and impact (increase)

liability cash flows. This creates interdependence between the asset allocation, the portfolio rebalancing strategy, and the liability cash flows.

Increasing the duration and credit exposure of the asset portfolio can increase the likelihood of matching the minimum guaranteed bonus rate, but this rebalancing needs to be implemented in a way which does not result in undue volatility in the P&L or trigger unwanted realized gain on the asset portfolio exceeding the guaranteed bonus rate.

Investment ALM frameworks that provide sophisticated economic distributions and asset analytics with sufficient liability information are required to identify optimal asset strategies. There are many approaches that can be applied according to the nature of the business and target risk metrics.

Focus on capital requirements and constraints

Responding to emerging global regulation, life insurers have built large and complex models to measure their capital requirements. These are important to the business and the outputs are closely monitored by senior management and market analysts. For example, in Europe, the Solvency Capital Requirement (SCR) has become a key metric in insurers' governance and management decision-making process. A key input to these capital calculations is the asset allocation of the investment portfolios. Even modest tactical asset allocation adjustments can have a material detrimental impact on the capital requirement. As such, it is important for asset managers to understand how investment decisions, for example changes in asset allocation, will impact capital.

However, because of the multiple aggregation layers, calculations and processes involved in an SCR calculation, it is not practical to re-configure and run the full "bottom up" liability and capital aggregation models under many different candidate asset-allocations. Most actuarial modeling systems are simply not designed to address the problems asset managers face on a day-to-day basis, as economic data and market shocks emerge, in a time frame that supports effective investment decision making.

By working more closely, and using Moody's Analytics solutions and insight, risk and investment teams have developed innovative solutions to this technical challenge. By leveraging model inputs and outputs from the SCR calculation process within the investment process, it is possible to generate robust estimates of the sensitivity of the SCR to asset allocation drivers.

Optimizing return on capital

The ultimate objective of the shareholders of an insurance company is to maximize return on capital. When considering different asset allocations or investment strategies, it is important to consider the impact on projected shareholder returns as measured by the net cash flows released over the run-off of the business.

To identify strategies which optimize risk-adjusted return, asset managers need to consider the impact of investment decisions on capital: both the current capital position, but also projected future capital - the expected capital release over time and the variability around this expectation.

This represents a very different and more complex portfolio optimization framework than a traditional asset-focused approach. The risk and return measures inherent in this approach require complex path-dependent calculations. But we can say with certainty that an asset portfolio which is optimal on an asset risk-return basis will not be optimal on a capital risk-return basis. Again, by leveraging liability and capital modeling data and models, it is possible for asset managers to develop "liability aware" portfolio optimization solutions.

Integrating proprietary economic and capital market assumptions and views

Asset managers employ economists and capital market analysts to research and develop proprietary views across a range of economic and market indicators. The outcome of any ALM analysis, in particular the choice of portfolio strategy, will depend on these economic views and capital market assumptions.

However, the asset manager's views might not cover all the risk factors that will be required for the ALM analysis of an insurance business. For example, the asset manager might maintain views on economic factors and asset prices over typical strategic investment terms of up to 10-15 years. But the calculation of metrics for an insurance business can depend on the path of these risk factors over a much longer term. Insurance liabilities can have longer duration than any of the asset manager's investment products or benchmark bond indices. For insurers, the tails of joint distributions of these risk factors will be important in modeling certain metrics such as capital. While the asset manager might have well maintained views regarding the central part of the distribution (mean, volatility), views on tail outcomes might be less well formed.

Finding an optimal integrated investment solution for an insurance business depends on this agreed set of views being used in conjunction with an accurate reflection of the liability dynamics. Often, a structural economic model will be used to "fill the gaps" between the asset managers views and the full set of risk factors that will be required to perform the ALM analysis.

Analyzing exotic asset strategies

Where asset managers look to include non-traditional assets within life insurance portfolios, it is important to analyze both the real-world dynamics of these strategies and the regulatory treatment. Many investors seek to profit from strategies that involve structured assets, derivative strategies, market inefficiency, and other complex features. It is important to understand the sources of risk premium for these funds and also the possible downside risks under various economic conditions and how they are related to other asset or liability holdings.

To enable insurers to exploit the opportunities that these more exotic asset strategies can offer, there is a need for integrated analytics that combine advanced asset modeling with liabilities and regulatory considerations.

Implementation challenges

In an insurance company, the risk, finance, actuarial, and investment teams all contribute in some way to the investment process. But for many insurance groups, these teams operate in siloes: different data, systems, models, and processes mean that it can be difficult to communicate the requirements, share data and align the interests and priorities of the different teams. It is challenging for a business to produce and use the analytics described in the previous sections of this paper.

Even with organizational desire and leadership, there are technical and operational challenges. The underlying actuarial and risk models are usually not built with ALM and asset management functions and activities in mind. Driven by the needs of the actuarial function, such as reporting and valuation, they will often operate at a level of detail that is highly granular ("bottom up"). For example, a single capital calculation can take a month to complete, considering the whole end-to-end process and the need to reconfigure models to generate the required runs. For making investment decisions, several different alternative portfolios, rebalancing strategies and runs are needed. These different strategies will need to be run over a large number of economic scenarios. The effort and timescales therefore limit the usefulness of these tools for real-time decision making.

While a “brute-force” integration of these tools might be conceptually simple, it is unlikely to be feasible in practice. The challenge is to identify ways that robust, accurate, and timely information can be harvested and used to deliver insight to the asset manager and senior management.

Solutions

Solutions to these technical modeling and analytic challenges vary by the nature of the insurance business and the specific activity. Some applications need deep integration with existing systems and access to detailed policy information and asset holdings. Others need a higher level of abstraction where only the features of interest are included.

Nearly all applications require ALM tools that leverage actuarial models and data, and reflect the needs of the asset management function in terms of asset data and investment process. These tools should be able to represent the main features of the liabilities and the associated asset-liability interactions, leverage the asset manager’s expertise and data, and deliver analysis within an appropriate timeline and cost.

Liability models that are able to run faster (leveraging cloud infrastructure) and embed enhanced asset functionality are part of the strategic solution. In some cases liability granularity might be simplified to aid calculation efficiency.

Proxy models of liability behavior also offer value in many cases. These models have been extensively researched and applied in a Solvency II internal model context. These models give a simple representation of the behavior of various elements of liability portfolio behavior, such as the valuation, cash flows, SCR, or other metrics. They can be extracted from existing models or enhanced for use of the asset management function.

Optimization frameworks have also seen significant new development. Emerging methods allow the integration of assets and liabilities to quantify risk and return metrics which are relevant to insurers. A combination of analytic and brute force optimization, these methods allow insurance asset managers to capture a larger set of assets and candidate portfolio strategies, to support more robust “liability aware” portfolio optimization.

Moody's Analytics offers a range of solutions to enable our clients to develop integrated asset management and ALM solutions for insurance. We provide robust software coupled with the practical insight and expertise of our advisory services teams. This enables our clients to exploit our years of experience solving complex insurance ALM and asset management problems.

CONTACT DETAILS

Visit us at [moodyanalytics.com](https://www.moodyanalytics.com) or contact us at a location below.

AMERICAS

+1.212.553.1653

clientservices@moody.com

EMEA

+44.20.7772.5454

clientservices.emea@moody.com

ASIA (EXCLUDING JAPAN)

+852.3551.3077

clientservices.asia@moody.com

JAPAN

+81.3.5408.4100

clientservices.japan@moody.com

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