

# The benefits of Full Valuation ALM

*Transforming insurance for increased accuracy, consistency and bottom-line profitability*



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## Introduction

Insurers today are facing multiple global challenges to their growth and bottom line profitability. These include: (i) the increasing complexity of insurance products; (ii) emerging, risk-based regulations with increased requirements for accuracy and consistency of calculations across the organization, and; (iii) increasing risk levels as insurers deal with persistent low-yield environments by seeking improved returns from broader, and more diverse, asset classes. Traditional approaches to asset liability management (ALM) modeling have contributed to these problem areas, as different departments within a firm often take either an asset or liability centric approach to ALM. This divergence can often lead to a lack of consistency across the enterprise, which may not only result in regulatory scrutiny but also, more seriously, a potential lack of accuracy on both sides of the balance sheet.

In this paper, we show insurers how they can address these multiple challenges through an integrated, dynamic approach to ALM modeling, which can yield significant improvements for a firm in terms of improved accuracy, consistency and decision making. For clarity of demonstration, the paper will focus on three key function areas in a standard insurance organization:

- *Actuarial departments*, which are typically focused on product pricing and financial reporting.
- *Risk management departments*, which are responsible for managing risk governance and reporting at both group and individual entity levels.
- *Asset and liability management groups*, who need to set the firm's investment policy, including mitigating the financial impact of adverse economic conditions.

For each function area, we will demonstrate how they can derive potentially significant benefits from a shift to an integrated approach to ALM modeling, with aggregated benefits for the insurance organization as a whole.

Finally, the paper will detail how IBM Full Valuation Asset Liability Management offers insurers a solution to achieve the above benefits, while addressing the primary competitive challenges they face in the marketplace. Leveraging advanced IBM technologies, best practices and vast experience in banking, financial and insurance markets, this powerful solution can be used in diverse function areas of an insurance organization to provide detailed asset and liability calculations in conjunction, enabling granular calculations on both sides of the balance sheet.

## Transforming the actuarial function

While actuaries have a wide and diverse range of responsibilities within an insurer, generally their roles encompass two key functions: pricing new products and financial reporting. Pricing new products involves setting assumptions—such as mortality, surrender rates, mix of business and investment return—to reflect the expectations of what the insurer will experience. This ensures that the premiums (or fees) calculated meet the required level of profitability given the expected circumstances. Financial reporting involves actuaries determining various reserve levels for capital requirements and reports (regulatory, IFRS, GAAP, economic), as well as accounting items such as Deferred Acquisition Costs (DAC).

In order to perform these two key functions, actuaries have traditionally used either: (i) proprietary actuarial and financial modeling tools, or (ii) software purchased from a third party vendor. In either case, these tools tend to typically be very liability-focused and, while they may have some asset modeling capabilities, they also tend to have certain drawbacks. For example, such tools often only represent a simplified version of reality because approximations are performed at an asset class level (as opposed to granular modeling at an instrument level), and/or they may lack the ability to model complex derivatives—an area that is becoming increasingly important for insurers! As well, in circumstances where assets are modeled in a completely separate tool, all interactions between assets and liabilities will be lost.

In the past, such approximations may have been unavoidable due to technological limitations or the lack of the required capability to encompass both assets and liabilities. Today, given recent exponential increases in computing power and the increased awareness in the insurance industry of the importance of understanding both sides of the balance sheet, such approximations should no longer be considered the only—or, indeed, the optimal—approach available.

## Improving the pricing of new products

If the assets used in pricing calculations are approximated or simplified in any way, this can lead to significant mispricing of the products or mis-reporting of profit on business written. In order to price products more accurately, granular asset modeling needs to be incorporated into ALM modeling—bringing with it the ability to capture the dynamic interaction between assets and liabilities.

	Period Return	Actual Mix	Modeled Mix
<b>Bonds</b>	4.00%	74.30%	75.00%
<b>Mortgage backed securities</b>	7.00%	9.40%	0.00%
<b>Common stock</b>	10.00%	4.30%	20.00%
<b>Contract loans</b>	7.00%	3.80%	0.00%
<b>BA &amp; Other</b>	3.50%	3.50%	0.00%
<b>Cash &amp; short term investments</b>	2.50%	2.90%	5.00%
<b>Derivatives</b>	15.00%	0.70%	0.00%
<b>Real estate</b>	5.50%	0.60%	0.00%
<b>Preferred stock</b>	7.00%	0.30%	0.00%
<b>Securities lending</b>	6.00%	0.30%	0.00%
<b>Total return</b>		4.70%	5.10%

Figure 1: Comparing actual investment return with that derived using approximate assets—based on an assumed asset composition of a typical life insurer.

In Figure 1, we can see the divergence that is likely to occur between what is actually modeled, and the value of underlying assets comprising the portfolio of an insurer if a simplified approach to modeling assets is adopted. In this example, the return on assets actually held over the period is 4.7% (calculated by multiplying the period return by the asset mix) whereas the approximated return on assets is 5.1% — representing an overstatement of nearly 9%. Furthermore, this illustration underestimates the full impact of taking a simplified approach since it only considers one scenario at a specific point in time. In reality, product pricing is done stochastically. This means that the true impact will be greater since it is compounded over multiple time steps and multiple scenarios.

### Enhancing competitive advantage with a more accurate and consistent approach to modeling assets

Given that investment returns play a significant part in pricing most product types, it is clear that by simplifying the approach to asset modeling there is a significant risk of product mispricing. This inaccuracy could be compounded if models do not cover complex assets like derivatives, since the actuary could build up a very misleading picture of a product's risk sensitivity by ignoring any diversification benefits they provide.

By providing a better reflection of how a new product actually behaves in practice, the ability to model assets at a granular level reduces the traditional need to build margins into pricing assumptions. By doing so, an insurer can gain a competitive edge by either offering the product at a lower price to gain market share or pricing for a higher profit margin. Conversely, more accurate pricing could highlight when a product is actually contributing to losses which might not otherwise be so apparent.

### Improving the performance of financial reporting

For actuaries involved with financial reporting and information for risk management purposes, the ability to accurately model the asset side of the balance sheet has a number of important advantages, including saving time, expense and uncertainty in financial reporting while improving technical capabilities for better business outcomes.

Consistency is one of the most important aspects for a reporting actuary, especially when calculating reporting values such as reserves. Typically, most actuaries are far removed from investment decisions and many may not know what assets are backing the reserves. Currently most insurers have to invest a lot of time for reporting purposes, involving expensive resources, in order to try and reconcile all the numbers that come out of different actuarial and other systems from different departments.

Having a single full asset and liability modeling solution — i.e. one platform that models both assets and liabilities at a granular level — that can be integrated across different departments offers a number of distinct advantages.

These include:

- Providing better insight into the asset-side of the balance sheet, allowing accurate investment returns to be used in liability calculations.
- Reducing the likelihood of product mispricing, even those of a complex nature.
- Improving the accuracy of reserve calculations and other financial reporting metrics.
- Minimizing the likelihood of additional capital add-ons being imposed due to asset approximations or simplifications. Such additional charges potentially tie up large amounts of capital — which could be better employed elsewhere to help grow the business — or make the capital position look worse than it is which increases the risk of regulatory intervention.
- Improving the accuracy of calculating supportable bonuses to give a better view of the current bonus strategy — for example, to determine whether there is any margin to increase bonuses to improve market competitiveness.

## Transforming the life of the risk management function

The risk management function within an insurance company typically manages risk governance and reporting. An insurer might have multiple entities in different countries, each with their own actuarial modeling software and applications for assorted forms of asset modeling. This presents the risk management function with the difficult and time consuming task of collecting, consolidating and reconciling data from many sources to assess their full risk exposure.

Given that each application may have differing formatting requirements for scenarios uploads or data output, and may produce different levels of granularity of results, consolidating results entails a huge work effort to run even a single scenario — to say nothing of the thousands of scenarios required for effective risk management!

It is not uncommon for risk management to have to request that each entity provide the exposures for scenario-based shocks, rather than being able to calculate them themselves. Consequently, risk management has limited ways of running ad hoc scenarios if and when they are needed — for example, following a stock market fall or at the request of the board. The problem of using legacy and disparate actuarial systems within different entities and departments is accentuated if:

- *The applications are not suited to modern risk calculation.* Modern risk calculations generally involve some form of nested stochastic process where the real world projection will need to invoke a sub-calculation in order to determine an exposure at a given point in time. This is often beyond the capabilities of the legacy systems, or is not practical from a hardware or run time standpoint. If this is not done at all the insurer is at risk — for example, of unknown guarantees costs. If it is done crudely so that it does not truly capture and explain the level of exposure the insurer may need to apply prudent margins or at worst regulators may impose capital measures. In both cases, there is an opportunity cost of capital being tied up which could be put to more productive use.
- *There is a substantial difference in modeling approaches and methodologies.* In some firms, there may be a substantial difference in modeling approach and methodology between the different systems used to produce key financial and risk metrics. Such differences, aside from requiring time consuming and costly reconciliation exercises, can also have an adverse effect on the numbers reported by the insurer. This may lead to a potential loss of confidence within the marketplace about a firm's ability to compete, to say nothing of financial/regulatory penalties and loss of reputation.

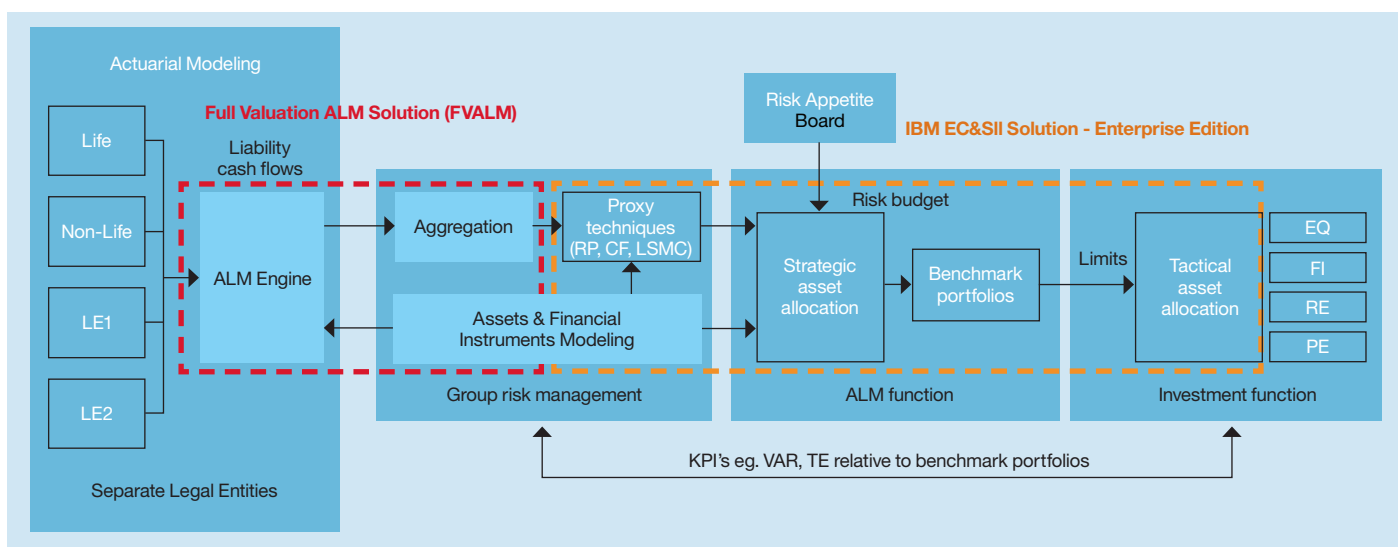


Figure 2: An enterprise risk management framework illustrating modeling consistency across the entire business.

- *The risk team lacks access to liability modeling applications.*  
In some insurance organizations, the risk management team does not have access to the firm's various liability modeling applications. This makes it extremely difficult to compile and assess the exposure to various actuarial assumptions such as mortality, longevity, or dynamic surrenders.

Proxy models of the liabilities (normally in the form of curve fitting, Least squares Monte Carlo or replicating portfolios) are often used by risk management in conjunction with granular asset calculations, to give them some access to the liability cash flows and to overcome the problems described above. These proxy models of liabilities would typically be based upon an ALM calculation where the liabilities are modeled in detail, but the assets are approximated. This means that any proxy model produced from these liability results has already included a form of approximation.

By providing the risk management function with a consolidated view of both sides of the balance sheet for the entire company, a single modeling platform which can accurately model both assets and liabilities would solve such problems. It provides the ability to run consistent scenarios for both assets and liabilities within a single solution in order to determine the net exposure to varying market or non-market risk factors. By then embedding the consistent ALM model into the end to end risk management process (see Figure 2), all departments will be making use of the same data and models to drive analytics, enabling risk-informed decision making and reporting across the business.

This approach does not mean that each entity would lose control of their own modeling for their respective business area. The virtue of having consistent ALM software used by all areas of the insurer means that once a model is locked down locally it can be passed to the centralised risk management team to run as many additional scenarios as needed for group purposes.

### **Transforming the asset and liability management (ALM) function**

The ALM group within an insurance company is responsible for mitigating the financial impact of adverse economic scenarios and setting the investment mandate to maximise return within the risk appetite of the company. In the current persistent low yield environment insurers are increasingly looking to move some of their investments into more risky, but typically higher yielding, asset classes. However, to do this they need to understand the potential consequences this would have on their capital position.

In order to understand this, they need to be able extract key risk analytics for each product the company offers by running various shock scenario sets and determining the value of the liability under each shock. These shocked liability values can then be used within an empirical formula in order to determine statistics such as key rate durations, convexity, rho, delta, vega, gamma, and theta.

In theory this should be a minimum requirement of any software employed by the ALM group. In practice, however, ALM departments can find it very difficult in practice to derive the key statistics they require on the liability side because they are dependent on the various entities making up the business to produce them — and these same teams are already under significant pressures and demands on their time from financial reporting requirements and risk management.



Even if the ALM Group can get the required information from the various entities, it can still be very difficult to accurately determine the optimum investment strategies to follow in timely manner. This is because asset modeling often requires different modeling applications across multiple asset classes. For example, if an insurer uses different asset modeling tools to calculate derivatives and vanilla assets, and to perform hedging and cash flow matching, then the effort expended to gain an aggregated view to determine the optimum strategic asset allocation can be substantial.

Once again, the aim is to get consistency across the business and this can be achieved with a consolidated platform (see Figure 2), enabling the ALM group to use the same software employed by the local actuarial teams at an entity level. This allows the transfer of models, assumptions and data to be consistent, accurate and efficient so that, for example, the ALM group can run any scenario they want in order to test any investment strategies they need. At the same time, actuarial teams would know that the asset models they used in product pricing were transparent and match those used to make investment decisions.

## Conclusion

In the past decade, computing power and software sophistication have advanced to such a degree that it is now possible to transform the way insurers have traditionally approached ALM. However, on the whole, the industry has been slow to take advantage of these new capabilities, with many insurers still having one, or multiple, solution(s) for calculating liabilities with approximations for assets, together with a separate solution for assets that uses approximations for liabilities. At the same time, each insurer is striving to improve their market position and the real return to their policy holders and shareholders. However, greater returns are usually accompanied by greater risk.

The world is changing and risk-based insurance regulations are increasingly becoming the global standard. These require greater understanding of an insurer's risk profile. The ORSA, for example—part of the Solvency II accord—requires that companies are able to identify, assess, monitor, manage and report all of their short-term and long term-risks. This is virtually impossible to achieve without being able to accurately model all assets and liabilities in a consistent fashion across the business. If an insurer cannot clearly demonstrate that it is able to manage material risks as part of the ORSA, then this will inevitably be negatively looked upon by the supervisor when it determines whether any additional capital add-ons are required from the insurer.

IBM offers insurers around the world a fully integrated ALM solution which brings together our vast experience in the banking, financial markets and insurance sectors to address all of the above challenges. The IBM Full Valuation Asset Liability Management solution is designed to be used by different functions within an insurer, providing very detailed asset calculations in conjunction with very detailed liability calculations. Within this common platform, the asset and liability systems have been seamlessly integrated, enabling granular calculations of both sides of the balance sheet. The resulting holistic view of the balance sheet offers insurance organizations a range of benefits, including:

- Modeling consistency across the entire business, with all departments utilising the same data and results in all reports and calculations.
- Confidence in accurate insight into current and potential future exposures.
- Potential for increased profit as a result of more accurate pricing.
- More efficient financial reporting leading to cost savings.
- Confidence in addressing current and future regulation.

As we have shown in this paper, transforming the way ALM is conducted can significantly impact the efficiency and performance of key function areas in an insurance organization — with corresponding positive results for the bottom line of the business as a whole. IBM Full Valuation Asset Liability Management delivers both operational and strategic value to insurers, optimizing performance to transform the way insurers have traditionally conducted business, to enable more accurate and consistent calculations, and better risk-informed decision making for growth.

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Produced in the United States of America  
October 2014

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