



Patpatia & Associates, Inc.

Insurance Practice

Liability-Driven Investments – Investment Strategy & Benchmarking





Foreword

Over the past year a number of our insurance clients sought our input on best practices in general account investment benchmarking. To accommodate these requests, and to bring a disciplined approach to an understudied field, we elected to undertake a comprehensive investment benchmarking survey to identify the market trends and evolving approaches that are gaining acceptance.

We could not have anticipated a better response from the more than 50 firms that chose to participate. It has reinforced how the full spectrum of insurers continues to struggle with these concerns. Indeed, investment benchmarking has increasingly become a hot topic among our insurance clients. Each year the role of investment benchmarking has evolved as the insurance industry matures and firms adopt more sophisticated techniques and approaches.

What constitutes investment benchmarking for insurers? What investment benchmarking approaches do insurers employ? Why do leading insurers employ a Liability-Driven Guidepost Benchmarking program? What practices do insurers utilize for this Liability-Driven Guidepost Benchmarking program?

There is no simple answer to any these questions, but each one is addressed within this survey, frequently with surprising results. The central underlying theme, across all insurers, is of a transition from investment benchmarking as a strict measure of performance into an actionable “guidepost” to direct investments and managing enterprise risks. Developing and implementing an investment management process that incorporates the unique characteristics of insurance liability contracts presents a great challenge, even for the largest of firms.

Almost all insurers that we spoke with expressed an on-going interest in evaluating and improving their investment benchmarking program. Many insurers are currently reviewing their processes, while others were actively implementing or just completed new approaches. We hope that this survey is valuable in developing and executing enhancements for your company’s investment benchmarking program.

We are truly appreciative to all the participants in this survey. To the Chief Investment Officers and investment department personnel who gave your time, we thank you for your willingness to provide your valuable views, perspectives and insights on investment benchmarking. Without your help, this survey would not exist.

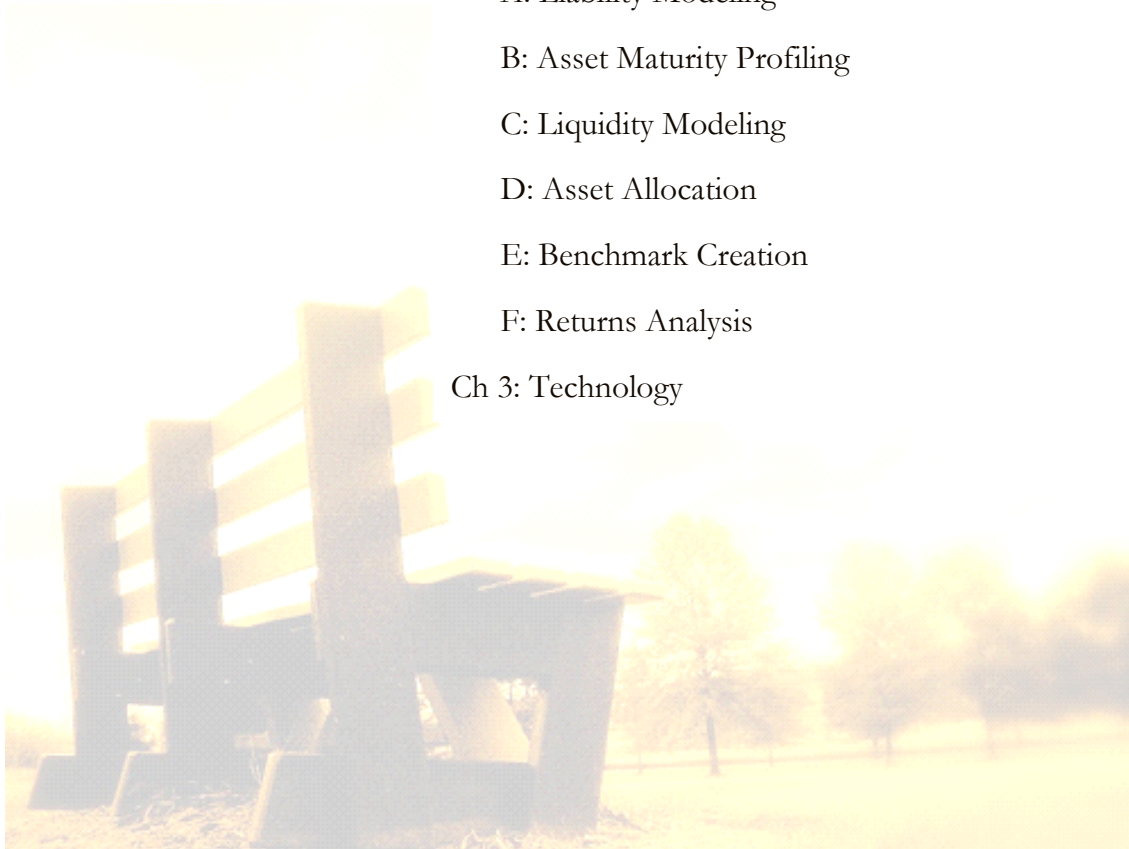
Sunny Patpatia

Sunny Patpatia
President & CEO
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Survey Topics

This survey of insurance companies reflects the roles, approaches, practices, and techniques employed by insurers to benchmark their general account investment programs. Questions were grouped in the following topics to best organize the discussions and survey results.

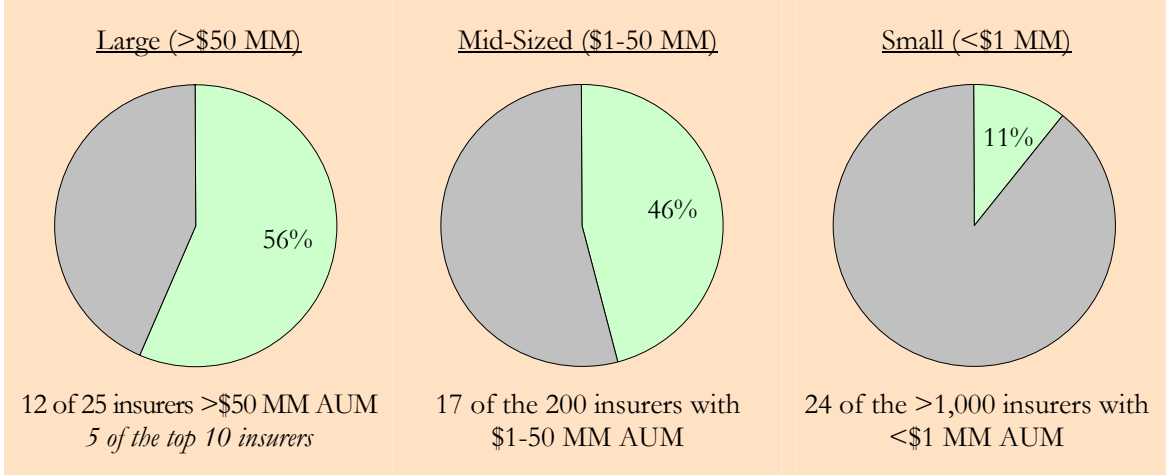
- Strategic Role of Benchmarking
- Asset Maturity Profiling
- Benchmark Construction
- Asset-Liability Modeling
- Asset Allocation Development
- Performance Analysis

The majority of firms excelled in some functions and were deficient in others. Our inquiries, therefore, were tailored to each insurer, focusing in greater detail upon their strengths and identifying the key rationales behind their individual approaches.

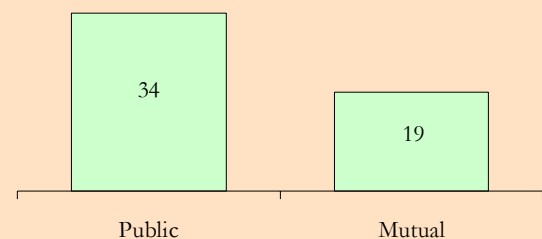
Respondents

This universe of survey participants includes 53 firms across the full spectrum of size (AUM), type (public vs. mutual), and business lines (life vs. P&C). To protect the privacy of the firms and maintain the accuracy and integrity of the responses, all responses from firms and individuals are reported on an anonymous basis.

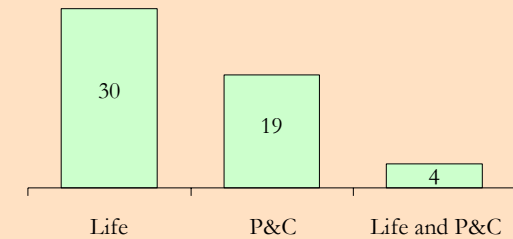
Survey participants – percentage of total assets by size



Type



Business Lines





Key Findings

The following points reflect the highlights of our collaborative discussions with insurers.

1. Investment benchmarking fulfils a diverse array of critical roles.

Each insurer conducts investment benchmarking for a variety of different purpose. As one would expect, measuring the performance of the investment department, individual portfolio managers, or third party money managers is a goal of the preponderance (>90%) of firms. However, a significant sub-set seek to deploy investment benchmarks to formalize investment policy, enhance risk management, and improve business line & corporate profitability.

2. No single approach current dominates the marketplace...

Generally, large insurers employ thoroughly integrated benchmarking approaches that incorporate asset maturity and liquidity profiling based on ALM modeling, as well as customization of market indices in line with portfolio allocations & constraints.

Several of the smallest firms, and surprisingly a few mid-tier players with as much as \$15 B in AUM, lacked any formal benchmarking program. Rectifying these shortcomings will be key for these firms, as effective benchmarks are fundamental to true enterprise risk management discipline.

Significantly, mutual insurers are lagging the marketplace. With a few notable exceptions, their reduced need to focus on stable quarterly earnings has resulted in less developed benchmarking processes and weaker ALM risk controls.

3. ... although Liability-Driven Guidepost Benchmarking provides the broadest benefits.

The most sophisticated firms are generally adopting what we have loosely termed “Liability-Driven Guideposts”. Firms indicated diverse benefits from Liability-Driven Guidepost Benchmarking, including improved comparability and oversight of portfolio managers, yield enhancement and loss mitigation, and the ability to incent portfolio managers based on liability demands.

Firms creating Liability-Driven Guidepost Benchmarks must integrate asset-liability management with investment policy development. This includes matching asset maturity structures to required liability payments, modeling asset prepayment behavior based on product optionalities, analyzing liquidity to cover downside risk, and setting asset allocations that maximize income or total return.

4. Liability-Driven Guidepost Benchmarking is rapidly being adopted as the market standard.

43% of respondents indicated that they were reviewing, implementing, or had recently completed enhancements to their investment benchmarking processes in an effort to integrate liability metrics into their investment policy and benchmark processes. While the majority were firms with over \$1 B in AUM, nearly a quarter of the smallest firms were exploring some type of benchmarking enhancement (e.g. custom blended indices, explicit cash flow modeling).

5. Liability-Driven Guidepost Benchmarking process generates actionable benefits to enhance the investment management process.

Through liability-based benchmarks, internal portfolio managers and third party managers receive explicit investment guidance for each product or business line. Although managers at some firms may exercise a degree of discretion in deviating from the benchmark allocations & term structure to capture additional returns, a clear “guidepost” is presented to which they are held accountable.

Risks are more efficiently identified, managed, and mitigated. Effectiveness of cash flow matching and allowances for sufficient liquidity are modeled to avoid excessive capital losses or earnings volatility. Furthermore, thorough benchmarking allows for the identification of “out of policy” exposures and their root causes, from investment policy to portfolio management.

Additionally, investment department and portfolio manager compensation may be effectively structured to reflect the needs of particular business lines, better aligning staff motivation with corporate profitability. Furthermore, out-performance may be attributed specifically to investment policy or portfolio manager decisions, increasing overall accountability in the investment function.

6. Both lack of understanding & limited experience with their use is preventing broader adoption of Liability-Driven Guideposts.

Of the 53 firms surveyed, only 16 respondent firms have implemented Liability-Driven Guidepost Benchmarking. While the largest firms had a clear understanding of the benefits, many have not comprehensively implemented the process due to its complexities.

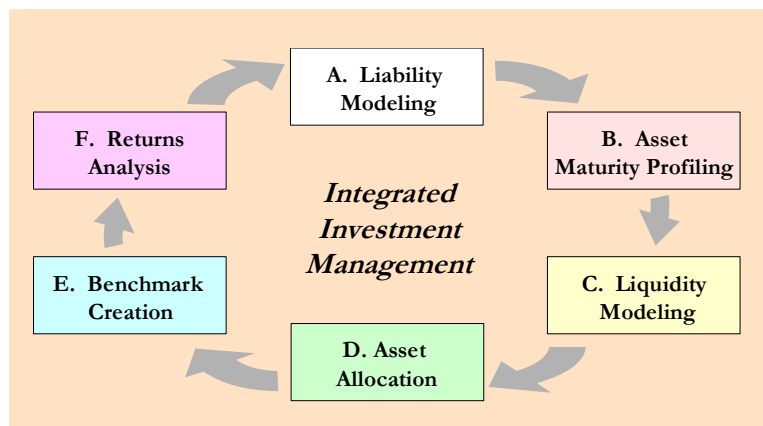
Many mid-sized to small insurers, however, indicated an overall lack of familiarity with both the process and inherent benefits of deploying liability-based benchmarks. To overcome this, a number of firms employ third party resources to implement enhanced liability-based benchmarking.

7. Liability-Driven Guidepost Benchmarking requires a fully integrated investment management approach.

Through profiling the 16 firms actively conducting Liability-Driven Guidepost Benchmarking, six broad components were identified as core to successful implementation.

Life insurers focused their efforts on liability modeling, asset maturity profiling, and asset allocation when developing investment policies and benchmarks due to predictability of liability portfolios. P&C

insurers held a bias toward using liquidity modeling to drive the asset allocation process, as their respective liability portfolios generally lacked the predictability required to set complicated maturity term structures.





8. Optimal investment policies and benchmarks are based upon accurate liability cash flow profiles and liquidity models.

The majority of respondents agreed that Liability-Driven Guidepost Benchmarking requires the modeling and integration of liability characteristics within the investment policy. Half of all insurers indicated that duration alone is an insufficient ALM metric, and that quarter-by-quarter cash flow profiles are needed to develop an effective investment strategy. The liability cash flow profile serves as a foundation of an asset maturity structure that accounts for the nuances in anticipated payments that duration and convexity cannot reflect. This ensures a match between liability payments and asset cash flows, reducing required portfolio liquidations, capital losses, and volatility of earnings.

Additionally, liquidity modeling serves as a primary motivator among P&C insurers. The unpredictability of P&C liability payments due to potential catastrophic events places a limit on the effectiveness of cash flow modeling alone. Through baseline & worst case scenarios, P&C insurers develop effective liquidity targets tailored to corporate risk tolerance.

9. Parallel development of strategic & tactical asset allocations maximizes the effectiveness of benchmarking at most firms.

Insurers with large investment departments with discrete policy & portfolio management teams, as well as firms using third party managers, indicated that dual allocations & benchmarks are critical to ensuring accountability across the investment function. Firms thereby measure the performance of the investment strategy group (i.e. the tactical benchmark measured vs. the strategic benchmark), separately from the portfolio managers (i.e. actual portfolio performance vs. the tactical benchmark).

Each party may then be incented on reaching both appropriate spread targets – to maximize yields within benchmark constraints - and outperforming the total return benchmark – to ensure managers seek out undervalued credits and proactively address emerging risks.

Over 60 % of insurers are now utilizing formal performance attribution solutions to quantify these contributions and identify “out of policy” risks that may be driving outperformance. It is anticipated that factor-based systems will continue to see growth, both as a management tool and to provide more useful compliance/ risk management reports.

10. Multiple technology solutions are required for integrated Liability-Driven Guidepost Benchmarking program.

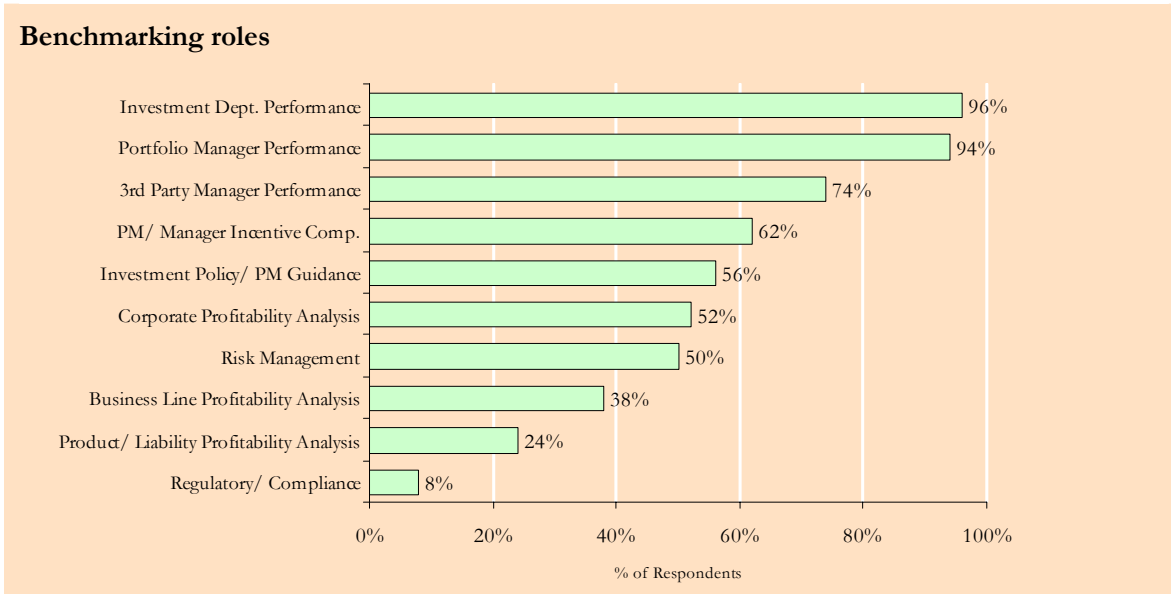
Large leading insurers tend to employ best of breed solutions for liability modeling/ ALM projections, asset cash flow modeling, portfolio optimization, index construction, and performance calculation & attribution. This can include up to 5-6 different technology systems depending on specific strengths within various functionalities and portfolios.

Mid-size to small insurers focus on identifying turn-key solutions addressing a number of functionalities. The majority of these firms employ two technology solutions: one asset-liability management system for liability modeling/ ALM projections (e.g. ALFA, MoSes) and one fixed income analytic system for asset cash flow modeling, portfolio optimization, index construction and performance calculation & attribution (e.g. BondEdge, YieldBook).

Chapter 1: Investment Benchmarking Approach

1.1 What constitutes investment benchmarking at insurers?

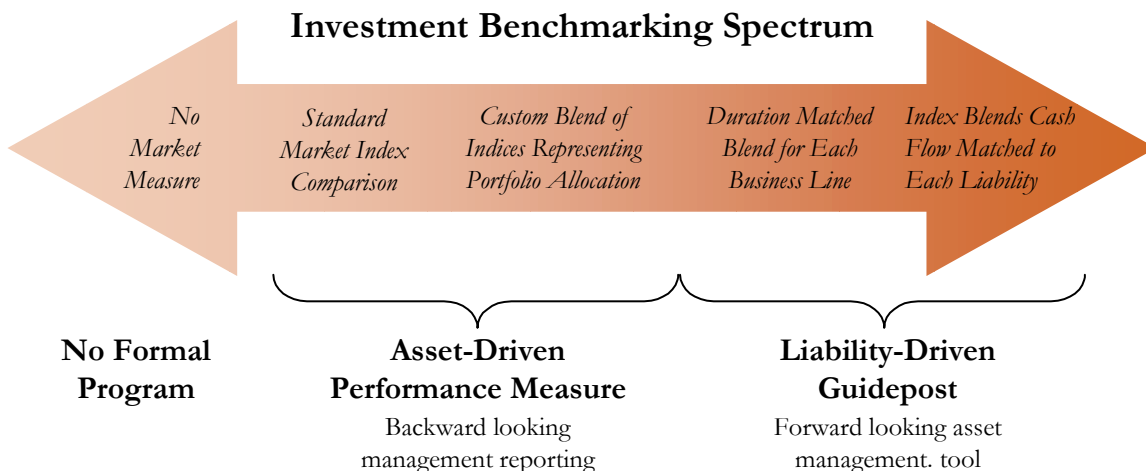
This survey found significant inconsistencies in the functional role of investment benchmarking at insurance companies. There was no single definition of benchmarking across the breadth of insurers. This confusion was clearly reflected by the multitude of benchmarking roles indicated by insurers.



Only at the largest insurers were we able to identify benchmarks able to serve as true “*Liability-Driven Guideposts*” that satisfy all of the following key objectives:

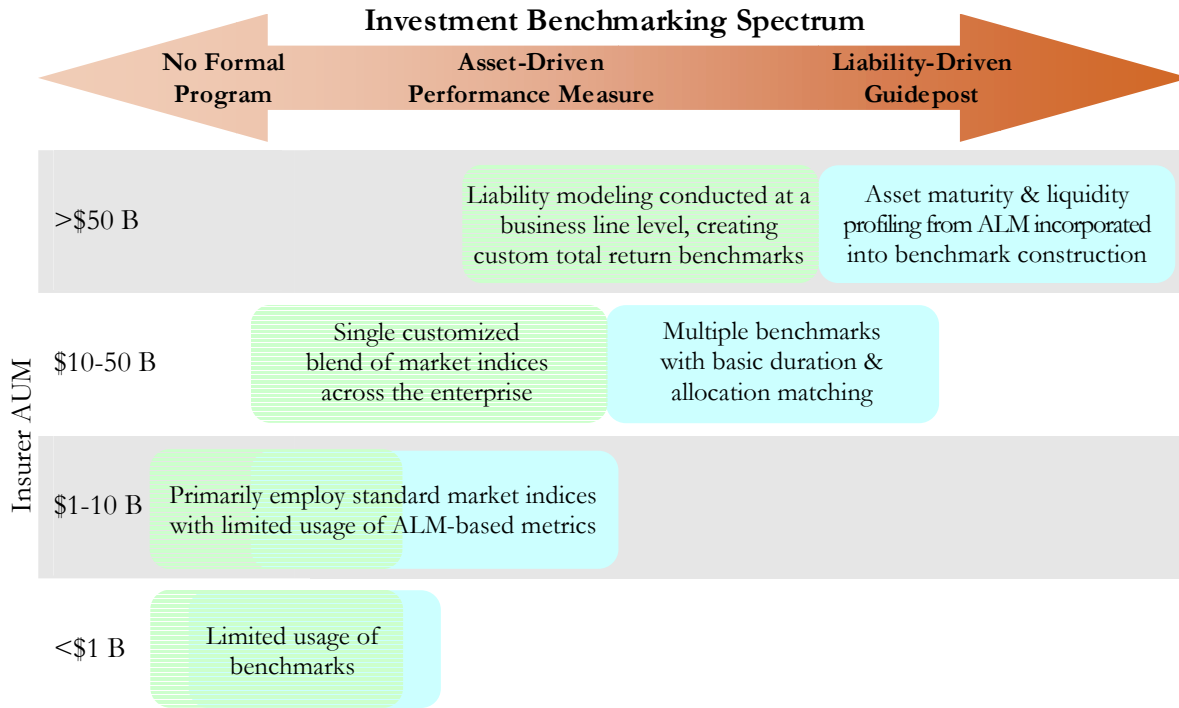
1. Directing portfolio investments for spread and return enhancement
2. Managing ALM risks to mitigate volatility of earnings
3. Measuring portfolio manager performance to encourage income and total return maximization

Instead, benchmarking practices could be categorized to reflect a broad spectrum of approaches:



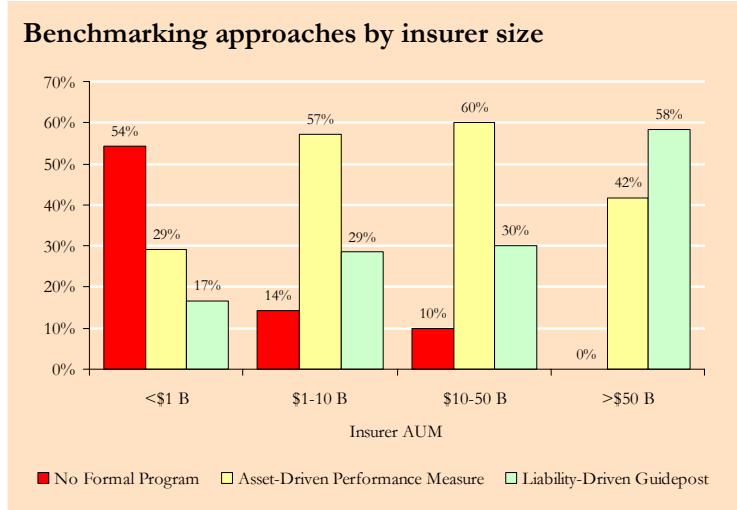
1.2

What investment benchmarking approaches do insurers employ?



Legend: Public (Light Blue) Mutual (Light Green)

Size was one of the key indicators of insurers' approaches to investment benchmarking. Large insurers tend to employ sophisticated Liability-Driven Guideposts to maximize shareholder earnings. The Liability-Driven Guidepost principal has migrated down market to mid-sized insurers as they attempt to mitigate earnings volatility. Smaller insurers indicate that they generally lack the resources to fully employ a liability-driven process.



In general, mutual insurers have not adopted Liability-Driven Guideposts as they have a reduced dependence on quarterly earnings. Most mutual insurers place a limited emphasis on quarterly dividends, preferring a less ALM dependent total return approach. This generates investment losses, impacting capital surplus. Size was less of a determining factor, although a few of the largest mutuals have adopted liability-based benchmarks.

1.3

What are the benefits to insurers from a Liability-Driven Guidepost Benchmarking process?

For the most sophisticated insurers, those who have implemented a Liability-Driven Guidepost Benchmark, this process is a reflection of a truly integrated investment approach – spanning asset-liability management (ALM), investment strategy, portfolio implementation and ongoing oversight.

Leading insurers build asset portfolio structures and allocations based on the unique characteristics of their liabilities, including optionality, credit rates, etc. These insurers have integrated the asset-liability management process into their investment discipline to ensure that appropriate assets are purchased such that policyholder payments may be met:

- Maturities match with projected insurance liability payments
- Asset prepayment behavior to mirror liability product optionality and other interest rate sensitivities
- Liquidity sufficiently covers the downside risk
- Asset allocations maximize income and/ or total return within a risk-constrained environment

These liability-based portfolio structures and allocations allow insurers to provide fair and challenging benchmarks to their respective portfolio managers. This incents the portfolio manager to seek incremental returns while maintaining a reasonable risk exposure.

Perceived benefits of Liability-Based Guideposts	% of Respondents
1. Improved comparability & oversight of PMs/ 3 rd party managers	79%
2. Yield enhancement & loss mitigation	71%
3. Portfolio managers incented to meet demands of individual liabilities	71%
4. Improved stability of earnings with reduced need for unplanned liquidations	64%
5. Quantification of risk limits & policy tolerance range	57%
6. Business line/ product-level performance & profit measures	50%
7. Investment policy independent of PM's preferences/ specialties	36%
8. Reflection of pricing constraints within benchmarks	29%

One mid-sized life insurer recently implemented Liability-Based Guideposts through the integration of their existing ALM function into the investment management process. A member of the ALM team has been placed within the investment department to facilitate communication and ensure that the unique characteristics of individual liability portfolios are appropriately included in the portfolios' investment strategies and benchmarks. The insurer attributes an improvement in effective yields of 15+ bps across all interest sensitive portfolios to this enhanced process.

1.4

What are the factors that prevent insurers from adopting Liability-Driven Guidepost Benchmarking?

Many insurers indicated that they are struggling with the migration toward liability-based solutions. Most large firms clearly understood the importance of liability-based investment management, but few had developed a comprehensive implementation plan that encompassed model development, actuarial assumptions, & analytic technologies.

Mid-sized and small insurers' immediate challenges were limited knowledge of liability-driven benchmarking concepts and competition for resources. A number of these firms are employing 3rd party resources to assist in development of these complex benchmarking processes.

Several life insurers, particularly those focused on traditional life products, indicated that their liabilities tended to be homogeneous & static, and therefore they saw little benefit to liability-driven solutions. However, firms that have deployed such solutions reported introducing an ALM overlay to their total return approach significantly enhanced their enterprise risk management.

Finally, key P&C respondents expressed that they did not model the downside risk of their unpredictable liabilities, although this process should be a fundamental risk management protocol.

Execution complexity is the greatest impediment to the adoption of liability-driven benchmarks.

Primary factor preventing adoption of Liability-Driven Guideposts

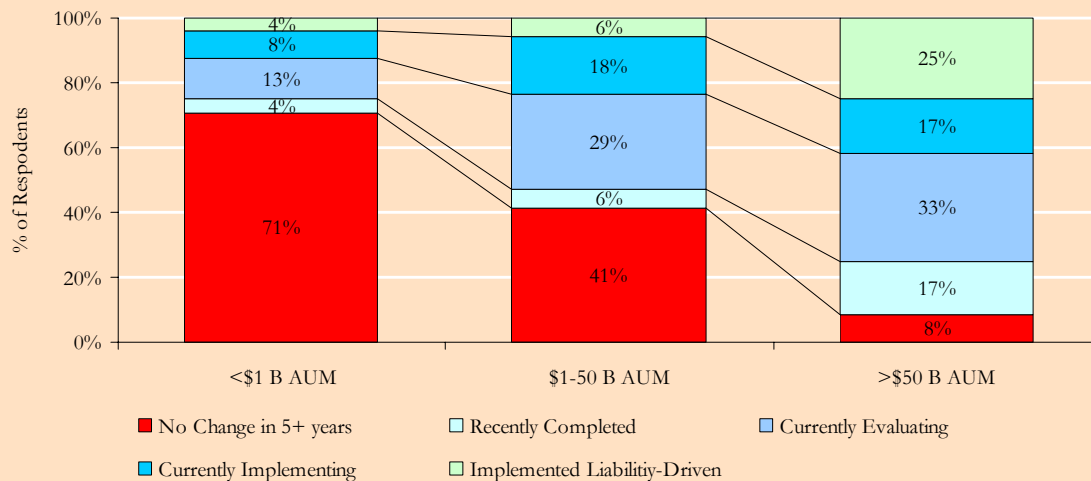
- A. Unfamiliarity with liability-driven approaches 8%
Once deployed with formalized policies & procedures, even small & mid-sized insurers have successfully maintained Liability-Based Benchmarks with little difficulty
- B. Inability to implement complex processes 18%
Insurance portfolios require sophisticated modeling of liability characteristics to avoid unanticipated volatility in asset and liability cash flow match
- C. Lack of management buy-in/ commitment 22%
Limits access to necessary resources and technologies to effectively manage complicated liability portfolios
- D. Limited resource availability 24%
Most firms require dedicated personnel to develop, maintain, and apply appropriate benchmarks across multiple portfolios
- E. Unpredictable liabilities not suitable for modeling 14%
Unpredictable liability types (property & casualty) need modeling to emphasize liquidity & downside risk over maintaining a consistent cash flow match
- F. View an ALM match as unnecessary 6%
Managing assets within total return environment without regard for required cash flows and liquidity, causing inopportune portfolio sales
- G. Static, homogenous liabilities portfolio 8%
Non-interest rate sensitive portfolios require less frequent (once every 1-2 years), but explicit, modeling to ensure investment strategies remain consistent with actuarial experience

1.5

What are insurers currently doing to enhance their benchmarking processes to a Liability-Driven Guidepost?

A majority of insurers surveyed indicated they were evaluating or currently implementing improvements to their investment benchmarking processes. Not surprisingly, large & mid-sized firms were most active in enhancing their benchmarking processes, with a particular emphasis on deploying Liability-Driven Guideposts due to scale of perceived benefits and resource availability.

Current state of benchmarking enhancements

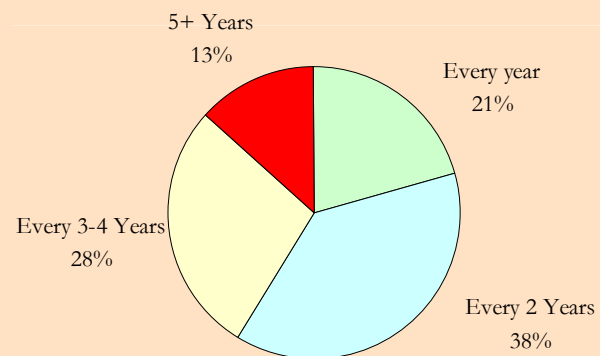


Almost all insurers surveyed expressed the need to evaluate their current investment benchmarking techniques on an on-going basis. On average across all insurers, benchmarking programs are reviewed every two years.

Some of the recent enhancements observed within the marketplace have included:

- Developed formal process for quarterly asset-liability modeling for interest sensitive portfolios
- Implemented asset maturity profiling on year-by-year segments
- Created economic scenarios to model downside risk in order to set appropriate liquidity tolerances
- Instituted solutions to automate index customization for sector and issuer weight limits
- Executed new portfolio manager incentives based on spread and relative total return performance

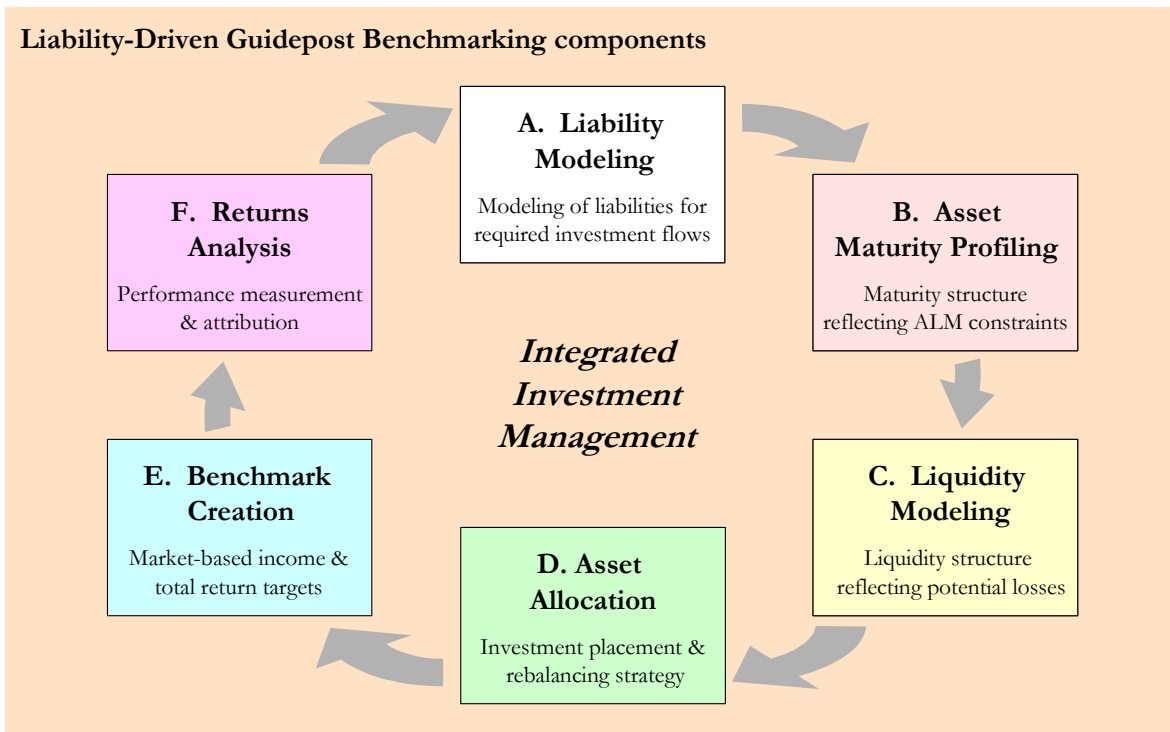
Frequency of benchmarking process review



Chapter 2: Investment Benchmarking Components

2.1 What components encompass a Liability-Driven Guidepost Benchmarking program?

Leading insurers conducting Liability-Driven Guidepost Benchmarking described a multitude of key functions. Across their disparate approaches, six broad components may be characterized that collectively encompass fully integrated, liability-based investment management.



Liability modeling forms the foundation of all liability-based benchmarks, reflecting insurance product structure, actuarial assumptions, & consumer behavior. Key outputs, including duration, convexity quarter-by-quarter cash flow projections, & liquidity metrics, factor directly into investment policy and benchmark formulation.

The asset maturity profiling, liquidity modeling, and asset allocation functions formalize the establishment of strategic investment policy and benchmarks, based on product requirements, not portfolio manager preference or transient market opportunities. Asset maturity profiling entails the development of optimal asset maturity/ average life structure to correspond with likely cash flow requirements. Liquidity modeling is focused on downside risk sensitivity testing to identify appropriate tolerances for liquid/ illiquid securities. Asset allocation builds off of the asset maturity & liquidity structures to set the specific investment program to maximize returns within risk-constraints.

Benchmark creation represents the mechanical customization & blending of market indices based on the specific guidelines set forth in the investment policy statement. Leading firms emphasize formal attribution processes to provide insight into sources of income and returns and identify “out of policy” risks.

2.2 How did perceptions of the components of Liability-Driven Guideposts vary among insurers?

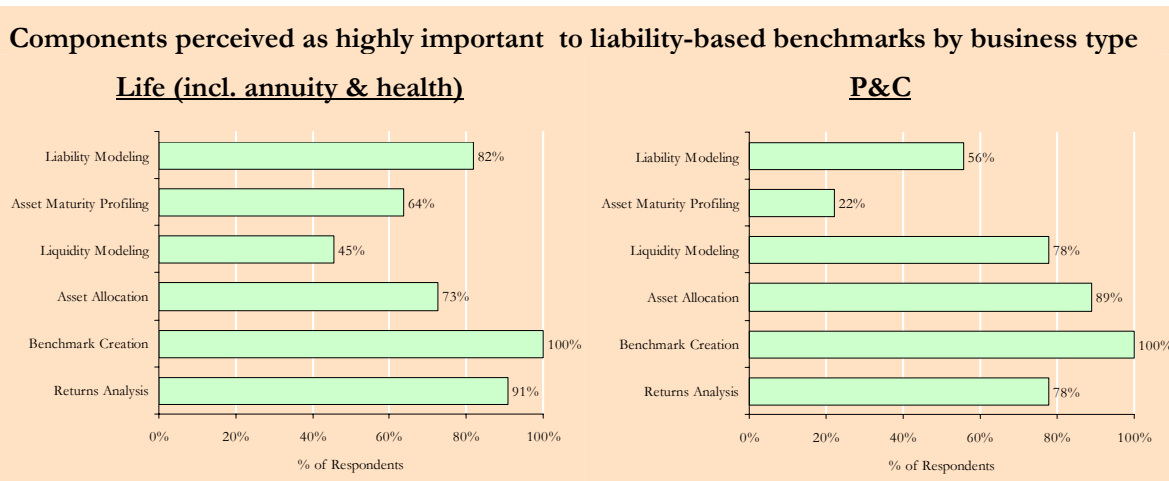
Even among insurers that have broadly adopted liability-based benchmarks, firms have placed varying degrees of focus on each of the different elements. While certain elements (e.g. benchmark creation, returns analysis) were nearly universal, significant variance was seen in the perceived relevance of maturity, liquidity, and asset allocation structuring.

Across respondents, business type and ownership structure were the leading determinants that set insurers' priorities and resource allocations.

Type of Insurer:

Life insurers indicated placing significant importance on liability modeling and asset maturity profiling due to their efficacy in predicting their required liability payments. From these required payments, life insurers saw the value in structuring the expected maturities/ average lives of their portfolio investments & corresponding benchmarks, and then allocating portfolio assets for income maximization accordingly.

Unsurprisingly, P&C insurers oriented their liability-based approaches toward liquidity, in lieu of maturity structure. With greater event-risk in cash flow requirements, total return investment was the norm, with portfolio constraints dominated by ensuring sufficient participation in liquid asset classes to cover potential claims.



Ownership Structure:

In addition to business line, ownership (public vs. mutual) significantly affected the importance of various components within the Liability-Driven Guidepost Benchmarking process. Public insurers tend to employ more sophisticated processes in an effort to maximize returns and minimize the impact of investments on shareholder earnings volatility. Eighty-eight percent of public life insurers indicated that asset maturity structuring was a key function within their benchmarking processes.

Mutual insurers indicated that the liability modeling and asset maturity profiling process had less importance within their benchmark process due to reduced concern with earnings volatility.

Chapter 2-A: Liability Modeling

2.A.1

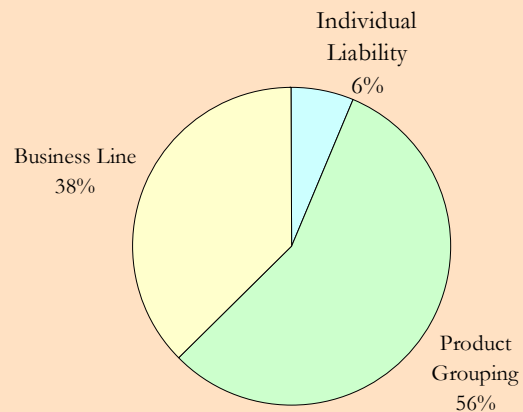
How specific is the liability modeling – individual product liability, product group, or business line?

Most of the insurers that had implemented or were in the process of deploying liability-based benchmarks possessed 100-150 discrete liability portfolios. However, the majority of respondents conduct liability modeling at the product group and business line level, rather than for each individual portfolio.

A couple of factors lead insurance companies to model liabilities at the product group or business line level:

- 1) Related products (i.e. different blocks of annuities) possess similar characteristics – product options, client behavior, actuarial experience
- 2) Operationally inefficient and resource intensive to create liability models for each portfolio

Level of liability modeling



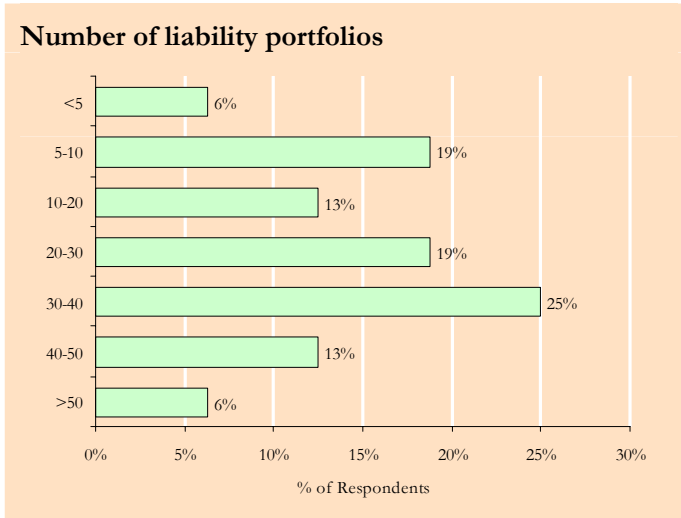
A large mutual insurer noted that a significant portion of its business includes traditional life, with fairly homogenous characteristics across its liability portfolios. These open block businesses generally have similar actuarial models and evolve slowly, requiring minimal changes to their projections over time, supporting benchmark creation at the business line level. This allows the firm to concentrate its resources on the most interest rate sensitive portions of its portfolio (i.e. single premium deferred annuities) for which product level modeling is reserved.

One large multi-line insurer models each of its 180 liability portfolios independently and described the need to change this process to modeling product groupings. This firm anticipates developing around 30-40 product groupings based on the characteristics of the liability portfolios. By reducing the number of models, the insurer plans to increase the diligence invested in developing key assumptions and the amount of sensitivity testing applied.

Insurers conducting product group or business line level aggregated portfolios based on the following criteria:

- Size – most insurers group small portfolios (generally <\$100 MM) within capital accounts for management on an unrestricted total return basis due the limited downside impact on corporate results to incorrect cash flow matches
- Legal jurisdictions – similar products within different regulatory structures typically were maintained in separate benchmark groups due to differing investment restrictions
- Liability characteristics (e.g. policy type, optionalities, credit rates) – highly interest rate sensitive portfolios with unique characteristics are managed individually

2.A.2 How many liability models do insurers typically employ?



Across the full breadth of insurers surveyed, the average number of unique liability models was 20-25. The number of liability models differed significantly based on the specificity of liability modeling – individual portfolio, product group, or business line levels.

- Individual portfolio – 100+ liability models
- Product group – 25-30 liability models
- Business line – 5-10 liability models

Business mix – life vs. annuity, commercial vs. personal – also influenced the number of unique liability models, as some business lines products are highly homogeneous, while others vary significantly.

- Life business – *respondents typically grouped into whole, universal, & multiple terms*
- Annuity business – *many insurers maintained a large number of unique annuity product groups due to varying surrender periods, crediting rates, & other optionalities*
- Commercial business – *discrete product groups were generally maintained for each discrete product line (e.g. fire, earthquake, worker’s compensation, general liability)*
- Personal business – *respondents grouped into auto (collision & liability) vs. several types of property insurance (homeowners, renters, miscellaneous)*

Average number of liability portfolios by business at a product group level

<u>Life</u>		<u>P&C</u>	
Life	4-6	Commercial	15-20
Annuity	12-15	Personal	6-10
Multi-Line	18-25	Multi-Line	25-30

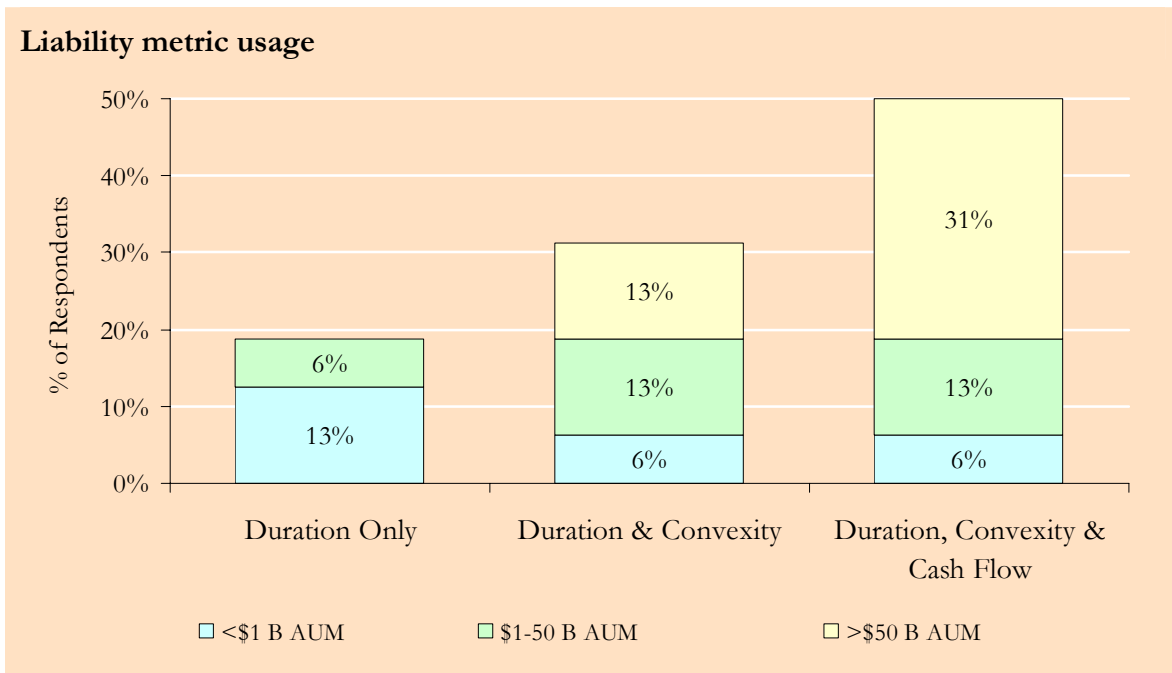
A number of firms have business in both life and P&C, but manage each type (life and P&C) through disparate investment strategy groups.

2.A.3

What liability metrics do insurers model in the ALM process – duration, convexity, cash flow profile?

Three primary liability metrics – duration, convexity, and cash flow profile – are key in developing Liability-Driven Guidepost Benchmarks. These liability metrics are a direct result of the liability modeling process conducted by the ALM function. Various insurers utilize different combinations of these liability metrics to develop their investment policies and benchmarks.

- All insurers utilize a duration metric at a minimum as it provides an estimation of the liabilities’ cash flow sensitivities. However, due to the approximate nature of duration, firms who rely on it exclusively frequently have significant cash flow mismatches
- Those that employ all three metrics are typically larger firms with multiple professionals supporting a sophisticated liability modeling & investment strategy process



Leading life insurers indicated that all three metrics were critical to the production of an effective benchmark. They stressed that multi-scenario, quarter-by-quarter cash flow profiles capture nuances in interest rate sensitivity that duration or convexity metrics alone cannot reflect.

Mutual insurers with Liability-Driven Guidepost Benchmarks typically utilize duration or duration and convexity, as they do not regard precise cash flow matching as a high priority because of limited policyholder pressures to maintain stable earnings.

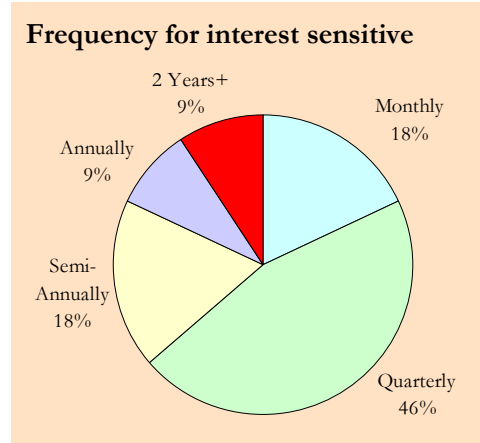
Only 43% of all P&C insurers surveyed (nearly half of which also conduct life business) employ Liability-Driven Guidepost Benchmarks. These were generally deployed for business lines such as worker’s compensation, where claims, predictability, are greater.

2.A.4 How frequently do insurers conduct liability modeling?

The frequency of liability modeling depended primarily on the product features of the particular liabilities. Highly interest sensitive liabilities – annuities, equity indexed life – were modeled on a more frequent basis. Less interested sensitive liabilities – traditional life, worker’s compensation – were modeled on a limited basis.

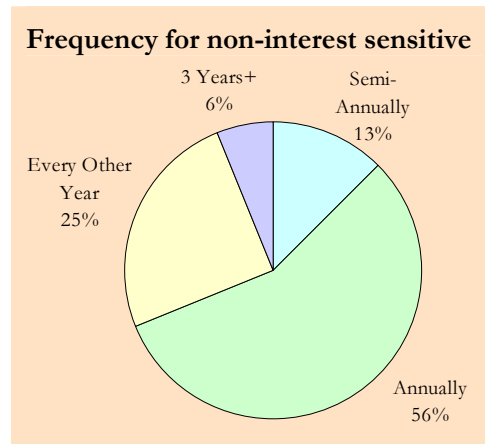
Insures agreed that interest sensitive liabilities should be modeled on a quarterly basis at a minimum to account for evolving customer behavior & actuarial experience. Additionally, a few select insurers indicated that event-driven modeling – outlier interest rate scenarios, sudden change in lapse rates – would trigger additional liability modeling to ensure a continued optimal match of asset and liability cash flows.

- All large insurer participants model portfolios on at least a quarterly basis
- A large life and annuity insurer models select indexed annuity portfolios on a weekly basis due to aggressive income and death benefit guarantees (interest and capital market sensitive)
- Mid-sized to small insurers model predominantly on a quarterly basis, while some firms model on a semi-annual and annual basis due to limited resources and availability of actuarial models



For non-interest sensitive portfolios, insurers were in agreement that yearly modeling is sufficient. Due to the static nature of the liability characteristics, yearly modeling would capture the potential changes in market and liability assumptions that might otherwise generate portfolio volatility.

- All large insurer respondents model portfolios on an annual basis
- Most mid-sized to small insurers model portfolios on an annual basis, while some model every 2-3 years due to static liabilities
- P&C insurers indicated that liability modeling was conducted every 2-3 years on portfolios with a degree of cash flow predictability; portfolios with limited cash flow predictability were modeled on an annual basis to determine the total liquidity requirement based on downside risk

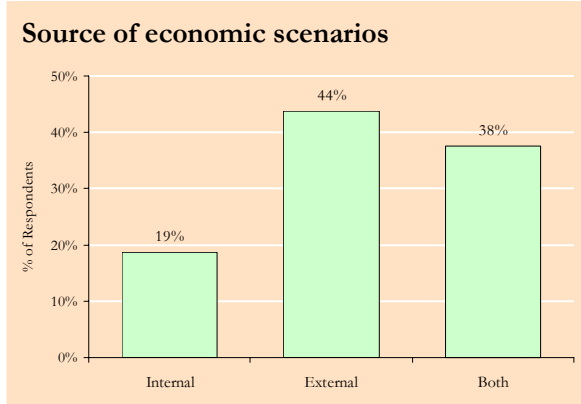


Across both interest sensitive and non-interest sensitive portfolios, mutual insurers tend to model less frequently than public insurers, consistent with their views on the criticality of cash flow matching. Interest sensitive portfolios tend to be modeled on a bi-annual or annual basis by mutuals, while non-interest sensitive portfolios are modeled every 2-3 years.

2.A.5 How do insurers create economic scenarios?

Insurers develop economic scenarios through either internal research or external consultants:

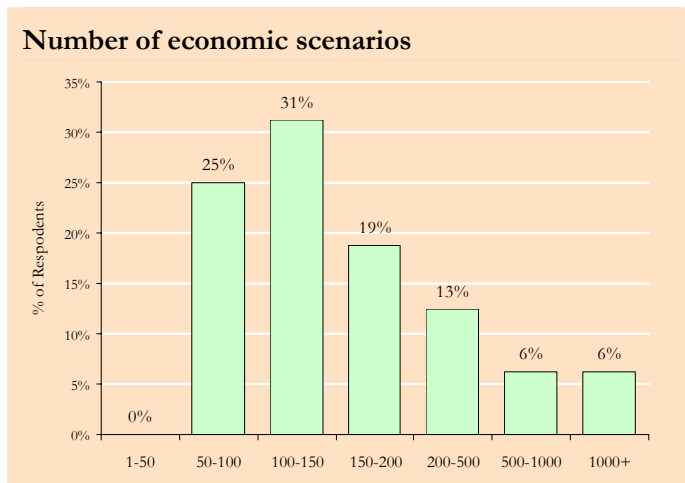
- Nearly half of large insurers surveyed utilize a combination of both internal and external resources for economic scenarios
- A few select mid-sized insurers developed economic scenarios internally, while most others utilized a combination of internal and third party sources
- All small insurers completely out-sourced economic scenario development to a third party consultant due to limited internal resources, typically leveraging a relationship with their ALM system vendor



2.A.6 How many economic scenarios do insurers employ in the liability modeling process?

Insurers generally utilize 100-200 economic scenarios depending on the size and sophistication of the insurer. Number of scenarios also varied based on the type of liability portfolio being modeled.

- The typical approach identified by insurers:
 - 200+ scenarios for interest sensitive portfolios
 - 100 scenarios for non-interest sensitive portfolios
- One large multi-line insurer executes 1,000+ economic scenarios for select product groups to accurately project downside risk
 - less sensitive portfolios utilize a core subset of 200 scenarios for efficiency



- Small insurers on average employ around 50-100 economic scenarios due to the significant time and resources required to process large numbers of scenarios

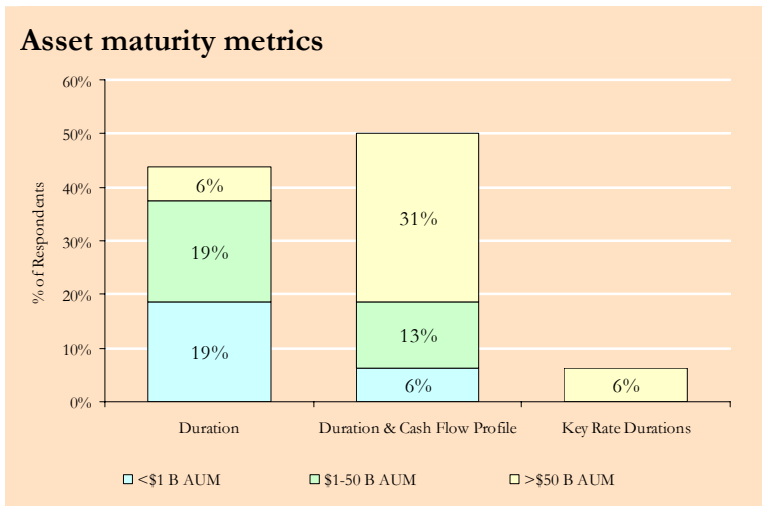
Additionally, leading insurers employ extensive sensitivity testing of key liability assumptions to ensure the efficacy of the liability modeling process. Over half of the firms ran multiple tests on select assumptions (e.g. lapse/ surrender rates) to further quantify potential downside risk.

Chapter 2-B: Asset Maturity Profiling

2.B.1

What metrics do insurers utilize in creating asset maturity profiles – duration, cash flow profile, key rate durations?

Varying metrics were employed to develop target maturity structures among insurers with Liability-Driven Guidepost Benchmarks.



- Almost all insurers agreed that, ideally, target asset maturity profiles should be built using liability duration, convexity, and period by period cash flow
- Several insurers expressed that analysis of key rate durations would be optimal; however, only one company indicated firm plans to implement the required complexities (*see below*)

- Mutual insurers use a less sophisticated approach – duration match
- Similarly, P&C insurers focus on creating a duration match even when they have specific maturity targets

Small and select mid-sized insurers principally utilize duration, or duration complemented by convexity, to develop asset maturity profiles. Most insurers indicated that this presented a potential risk of cash flow mismatch, however, it requires significantly fewer ALM resources than development of a full maturity structure iteratively tested to maximize free cash flows.

- Five of these insurers are evaluating methodologies to integrate cash flow profiles into the asset maturity development process over the next couple of years.

Large insurers typically employ the full cash flow match, in conjunction with duration and convexity, to develop their asset maturity profiles. Properly implemented, this reduces portfolio volatility because security payments may be better positioned to correlate with anticipated liability payments across multiple scenarios.

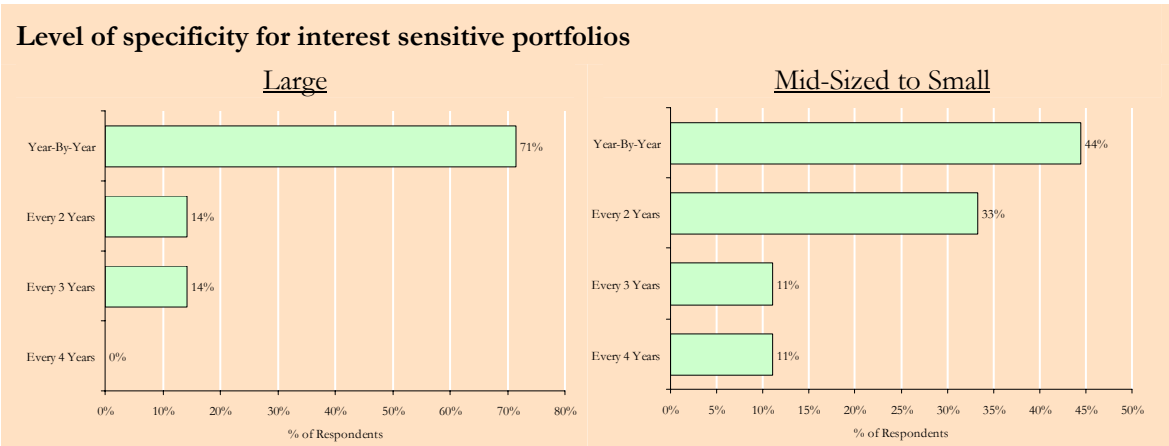
Adoption of key rate durations has been largely held back by the challenges of accurately modeling liabilities under different environments and building matching index portfolios. This is presently only being implemented by one firm among those surveyed, although two other large insurers are evaluating it.

2.B.2

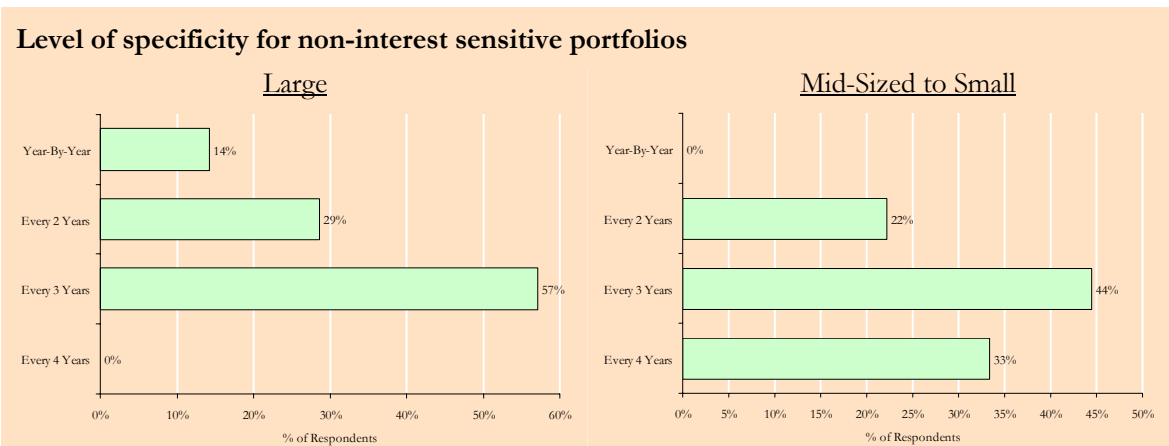
At what level of specificity are asset maturity structures created?

In general, efficiency was a significant motivating factor in generating and testing asset maturity structures, leading firms to adopt less granular structures (e.g. <3 years, 3-5, 5-7, 7-10, 10-15, >15 vs. year-by-year). However, insurers did tend to vary the granularity depending upon the interest rate sensitivity of the targeted liabilities.

Asset maturity profiles for the interest rate sensitive portfolios of most large insurers were generated on a year-by-year basis to more accurately represent product optionalities. Mid-sized to small insurers typically employed 3-year groupings (e.g. <3 years, 3-5 years, 5-7 years, 7-10 years, 10+ years) for operational efficiency.



Non-interest sensitive portfolios were almost universally developed on an aggregate basis.



Consistent with their decreased emphasis on cash flow matching overall, mutual insurers were less likely to model cash flows on a year-by-year basis.

2.B.3 How frequently do insurers develop their asset maturity profiles?

Most insurers revise their asset maturity profiles on at least a yearly basis to ensure an appropriate cash flow match between projected liability payments and asset cash flows. The frequency of this process depends primarily on the type of liability portfolio for which the asset maturity is developed, the sophistication of the insurer, and the availability of updated liability models.

Frequency for interest sensitive



Asset maturity profiles for interest sensitive portfolios were created or reviewed on a semi-annual basis across the full spectrum of insurers.

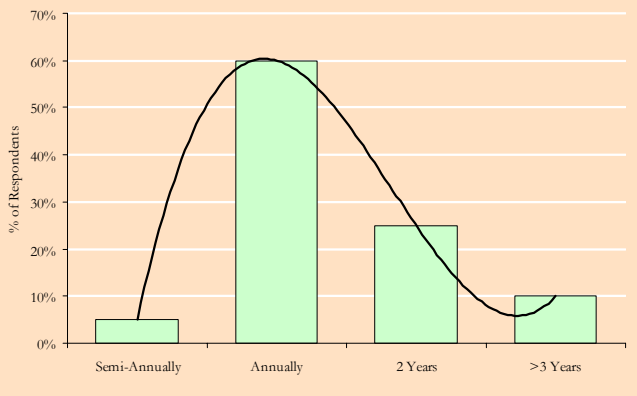
- Large insurers principally model on quarterly basis
- One prominent life insurer indicated that it models the asset maturity structure on select annuity portfolios with aggressive terms on a monthly basis

- Small to mid-sized insurers, however, generally limit their reviews to a yearly basis due to limited resources, both to create updated liability models and conduct maturity structure optimization

For non-interest sensitive portfolios, insurers widely agreed that annual modeling of portfolios is sufficient due to relatively static liability characteristics.

- Large insurers primarily model on an annual basis
- Select small and mid-sized insurers update every 2 years, again due to limited resources

Frequency for non-interest sensitive



As with other elements, mutual insurers typically placed less focus on the asset maturity structuring process, updating less frequently than public insurers. Across the full spectrum of mutual insurers surveyed, asset maturity structures were developed yearly for interest sensitive portfolios. Non-interest sensitive portfolios were typically reviewed on a 2-3 year basis.

2.B.4

What processes do insurers employ in creating asset maturity profiles?

Several different processes are employed for creating asset maturity profiling, these differ primarily based on the liability metrics utilized for the process. The most sophisticated firms employ a formal optimization process to develop an ideal asset maturity structure balancing period by period cash flow requirements against the maximization of expected economic returns.

Three representative processes utilized by specific respondents in developing asset maturity profiles, based on different liability-based metrics, are outlined:

1. Duration Alone	2. Duration & Cash Flow Profile	3. Key Rate Durations
<ul style="list-style-type: none"> • Develop 10 trial asset maturity structures <ul style="list-style-type: none"> – Leverage current investment structure, portfolio managers’ experience, 3rd party money manager input, & investment consultants – Create multiple duration matching structures (e.g. barbell, bullet) • Create proxy asset portfolios within Derivative Solutions to calculate duration • Select maturity structure with closest duration match (within 0.5 years) to liability portfolio <p><i>Requires personnel & modeling resources – bears risk of potential cash flow mismatch</i></p>	<ul style="list-style-type: none"> • Stratify projected liability payments from ALM by cash flow segments (e.g. 1-3 yr., 3-5 yr., 5-7 yr.) for a base economic scenario • Develop multiple maturity structure trials based on cash flow profile • Model maturity structures portfolio via YieldBook to determine cash flows & asset values under 100-200 economic scenarios • Similarly project liability cash flows through ALFA across scenarios • Measure period by period match & aggregate free cash flow under each trial • Plot in Excel – select highest economic return with acceptable volatility & downside risk <p><i>Compromise between the inaccuracies of duration alone & the complexity of using key rate durations</i></p>	<ul style="list-style-type: none"> • Project cash flows for each liability portfolio across economic scenarios – segment into key rate durations • Leverage internal database of securities with asset maturity/ average life & key rate durations (BondEdge & YieldBook) • Construct multiple asset portfolios to match key rate durations in each maturity structure • Project cash flows for each asset portfolio structure • Model net cash flows within ALM system to determine cash flow match • Select portfolio for each key rate segment with best duration match and aggregate into overall target portfolio <p><i>Highly complex & resource intensive</i></p>
<p>Note: The above archetypes reflect the specific vendor systems employed by three particular respondents; however, other similar systems might be substituted – the vendors mentioned above do not reflect a consensus across surveyed insurers (see Chapter 3: Technology)</p>		



Chapter 2-C: Liquidity Modeling

2.C.1 What processes do insurers employ to model required liquidity needs?

Insurers identified two primary methodologies for liquidity modeling, with differences primarily due to an insurer's business type (life vs. P&C).

Life insurers tend to utilize an informal liquidity modeling process due to the greater predictability of their liabilities. Liquidity modeling is oriented at worst-case scenarios and applying modeling to manage them within enterprise risk limits. Most respondents determine their total downside risk, particularly in case their liability assumptions – mortality rates, lapse rates – prove to be inaccurate or if an “outlying” economic situation comes to pass. They assess the resulting cash flow mismatches to determine potential “unanticipated” asset sales.

Representative life insurer liquidity modeling approach

1. Develop 40-50 outlier interest rate scenarios for ALM modeling
2. Conduct ALM modeling with outlier interest rate scenarios as well as sensitivity testing for liability assumptions
3. Plot cash flow mismatch for various economic scenarios and sensitivity tests
4. Establish downside risk tolerance based on reasonable acceptable cash flow mismatch
5. Quantify “excess” mismatch and set liquid asset requirements accordingly

P&C insurers employ liquidity modeling as the primary liability-driven metric for constructing asset portfolios because of the unpredictable nature of many P&C liabilities. P&C insurers model catastrophic market events and assess likely, as well as worst-case, payment demands. Through this, P&C insurers set their tolerances for different degrees of illiquid investments (e.g. CDOs, private placement bonds, private equity, real estate) within their overall investment policies.

Representative P&C insurer liquidity modeling approach

1. Determine outstanding value of insurance contracts for a given liability or product group
2. Define multiple scenarios for event-driven experiences (e.g. fire, earthquake, hurricane)
3. Estimate total losses from occurrences of events leveraging past portfolio and industry experiences
4. Establish risk tolerances for overall downside risk based on reasonable worse case scenarios
5. Set allocation limits based on expected liquidity of varying asset classes

Chapter 2-D: Asset Allocation

2.D.1

Do insurers utilize both strategic and tactical asset allocations?

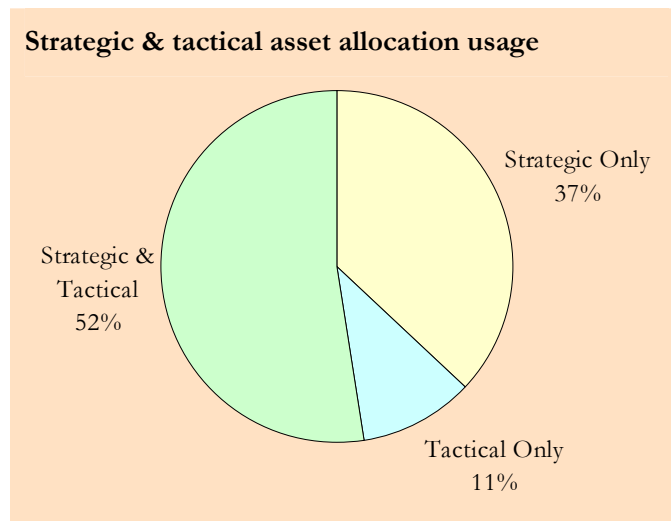
All insurers deployed a formal asset allocation process, even those not deploying liability-based benchmarks. However, not all programs were equally encompassing. Many integrated only a strategic allocation into their investment policy & benchmarking processes, while others included both strategic and tactical components.

Strategic Asset Allocation:

- Long-term ideal positioning based on historical behavior of asset classes – market neutral
- Tolerance range & optimal target
- Infrequent updates

Tactical Asset Allocation:

- Current investment directives exploiting short-term market opportunities
- Explicit allocation within ranges
- Periodic reviews



A slim majority of insurers develop both a strategic and tactical allocation, and create accompanying benchmarks.

Firms who manage their assets through external money managers (predominantly small or mid-sized firms) expressed the greatest value in dual allocations. By creating strategic and tactical allocations, firms were best able to benchmark the performance contribution of the investment departments' strategy groups (i.e. the tactical benchmark measured vs. the strategic benchmark) separately from the money managers (i.e. actual portfolio performance vs. the tactical benchmark). Each party may then be compensated accordingly.

Larger firms, with dedicated investment policy groups who are responsible for tactical allocation decisions independent from their asset class specific portfolio management teams, have indicated receiving similar benefits.

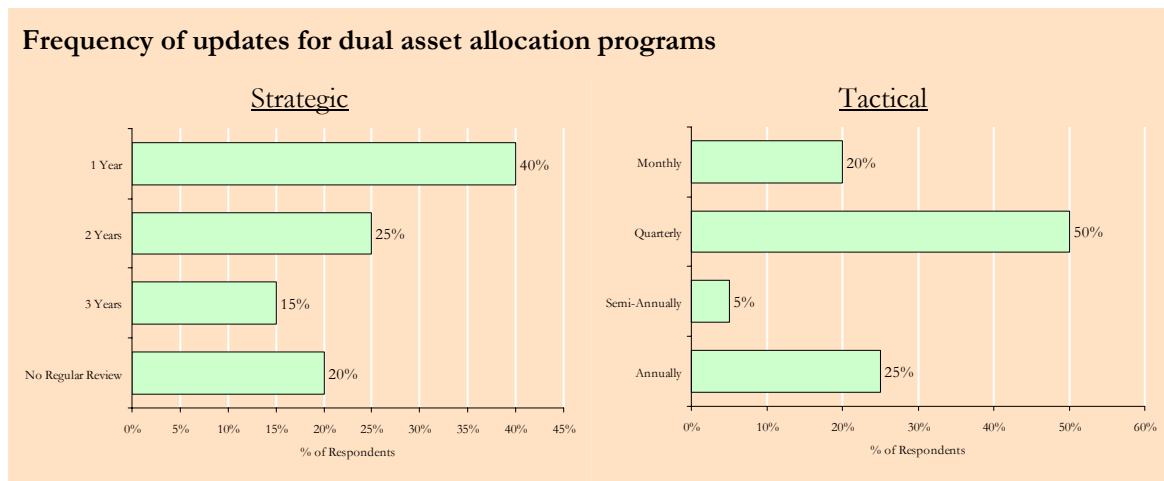
Among mid-tier respondents, with a small number of portfolio managers who are responsible for investment strategy and individual security decisions, only strategic allocations are formalized. Respondents perceived little explicit benefit from defining a tactical allocation, as they undertake such decisions in parallel with specific security purchases.

2.D.2 How frequent are asset allocations updated for each portfolio?

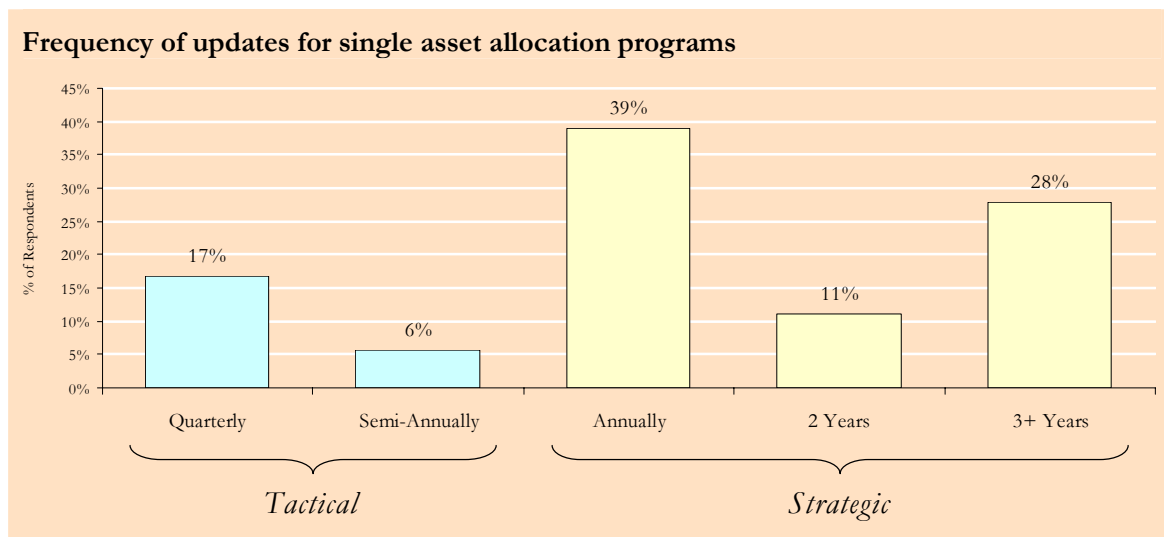
Frequency of updates to asset allocations, via highly constrained mean variance optimization or intuitive, experience-based methodologies, varies by the asset allocation approach employed by each insurer.

Respondents with both strategic and tactical asset allocations implicitly review each on a different basis. Strategic asset allocations were typically reviewed every 1-2 years with changes arising only from significant changes in liability models (i.e. new maturity structures) or capital market assumptions (i.e. fundamental, long-term outlook on CDOs).

Tactical asset allocations, naturally, were undertaken significantly more frequently. No clear drivers were identified for the periodicity of tactical reviews, although larger firms, with dedicated strategy and ALM personnel, are more likely to review them frequently.



Across the full spectrum of insurers with one asset allocation, reviews and updates were typically conducted on an annual basis.



Chapter 2-E: Benchmark Creation

2.E.1

What types of benchmarks are employed by insurers – spread targets, total return, book income?

The type of business undertaken dictates benchmark methodologies. Life companies primarily focus on maximizing income and utilize a combination of spread targets, total return, and book income benchmarks, with significant variety across the spectrum of firms. All P&C companies surveyed used total return benchmarks exclusively, in line with their investments that deemphasize predictable income in favor of long-term returns.

Large leading life insurers either employ spread targets and total return benchmarks, with only a few select insurers employing highly customized book income indices. Mid-sized to small insurers are primarily utilizing total return benchmarks only, while a few firms have no current benchmarking practices.

A number of firms indicated that spread targets and total return benchmarks in parallel are optimal:

- Spread targets dictate the purchase of bonds which maximize profit and risk-adjusted income
- Total return indices encourage the selection of bonds which are expected to retain their value

In particular, among life insurers conducting Liability-Based Guidepost Benchmarking, 66% of the insurers are utilizing spread targets and total return benchmarks together.

Most life insurers indicated that, conceptually, book income indices would be optimal. Customized to the timing of insurers' investments, they would most accurately reflect the constraints placed upon the investment department. However, most insurers also stated that in practice, challenges remain with deploying the only vendor solution presently available (e.g. Merrill Lynch):

- Limited historical market data on bonds beyond 10-15 years or on select asset classes (e.g. privates)
- Long implementation time – one firm required 4 months to deploy on a single portfolio
- High costs – both to license the service and dedicate resources set up & maintain the index

It is clear from respondents that when such issues are mitigated, these solutions may achieve extensive traction.

Income Spread Targets

Investment department sets required income spreads for each asset class

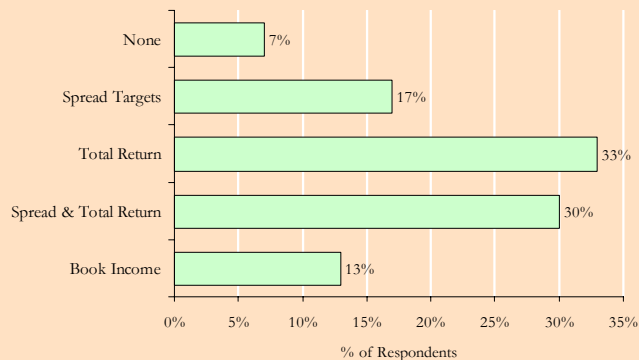
Total Return Indices

Vendor-driven index measuring the change in the value of securities

Book Income Indices

Vendor-created index reflecting the actual income arising from the timing of security purchases

Type of life insurer benchmark usage





2.E.2

What vendor indices do insurers employ to assemble total return benchmarks for each asset class?

Insurers with total return benchmarks utilize multiple index vendors – Lehman Brothers, Merrill Lynch, Citigroup, Credit Suisse, Morgan Stanley, Standard & Poor’s, Venture Economics, Russell, and Dow Jones Wilshire. Most insurers tend to utilize multiple indices from a single provider to capitalize on cost efficiencies, with Lehman Brothers having the largest presence among firms. However, several of the largest insurers utilized best of breed indices employing as many as five vendors. Additionally, some insurers generate their own custom indices on specialty asset classes.

Usage of vendor indices	
Treasuries	61% Lehman Bros; 18% Merrill Lynch; 21% Citigroup
Municipals	53% Lehman Bros.; 47% Merrill Lynch
Corporates	53% Lehman Bros; 29% Merrill Lynch; 18% Citigroup
Preferreds	100% Merrill Lynch
High Yield	43% Lehman Bros.; 39% Citigroup; 18% Merrill Lynch
MBS/ CMO	53% Lehman Bros.; 39% Citigroup; 8% Merrill Lynch
CMBS	58%Lehman Bros.; 21% Merrill Lynch; 21% internally developed
ABS	40% Lehman Bros.; 44% Merrill Lynch; 16% Citigroup
CDOs	No benchmark – measured as a relative value to corporates
Commercial Mort.	63% LifeComps; 24% Gilberto-Levy; 13% internally developed
Private Placements	No benchmark – relative value to corporates; 10% internally developed
Bank Loans	78% CSFB; 22% Standard & Poor’s
EMD	44% Citigroup; 31% Lehman Bros.; 25% Merrill Lynch
Mezzanine Fin.	75% Venture Economics; 25% internally developed
RE Equity	86% NCRIEF; 14% internally developed
REITs	67% Wilshire; 33% Morgan Stanley
Equities	47% Russell; 35% DJ Wilshire; 18% Morgan Stanley
Private Equity	79% Venture Economics; 21% DJ Wilshire
Hedge Funds	80% Hedge Fund Research; 20% internally developed

Note: The above percentages are based on the total number of respondents for each asset class. Not all insurers invested in all classes or indicated a vendor preference.

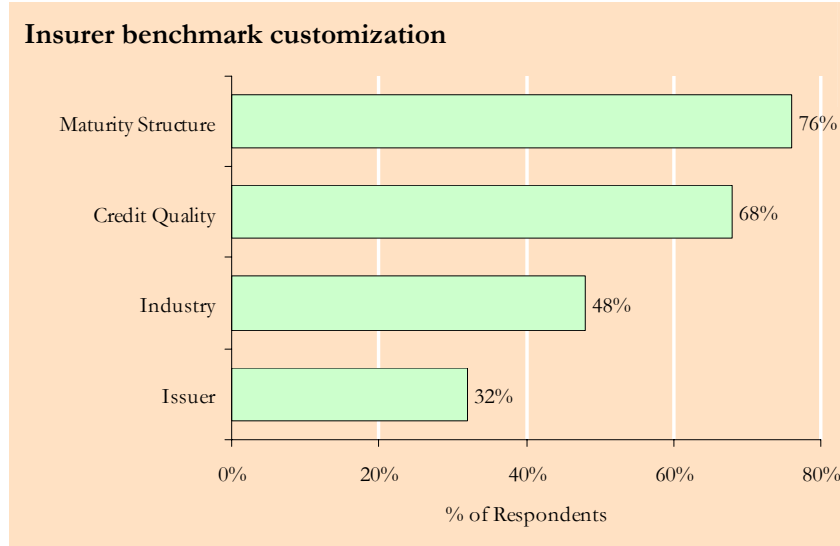
2.E.3

What level of customization do insurers use in total return benchmarks – e.g. sector weights, issuer concentrations?

Almost all insurers surveyed that utilized total return benchmarks customized the vendor indices to some extent to match their respective investment policy guidelines. This includes omitting various elements of the standard indices: credit quality ratings, industries, callable vs. non-callable, maturity/average life. Additionally, some insurers reweight these customized indices to account for industry/issuer concentration limits.

Over 80% of insurers indicated that they customized total return vendor indices prior to use on performance calculations and comparisons. Insurers placed a high importance on customizing the maturity or average life structures and credit qualities of the indices. Other customizations such as industries and issuer weights were viewed as secondary focuses, with the largest firms primarily adopting these practices.

Many insurers employed fixed income analytic solutions – BondEdge, Lehman POINT, YieldBook – to automate the creation of these customized indices on an on-going basis. Insurers indicated that the initial integration of multiple vendor index data with the fixed income analytic solution required significant resources and customization for each portfolio.



Alternatively, a few respondents employed their index vendor or a third party vendor to custom tailor the indices for them. Generally only the largest firms were sizeable enough to receive reweights directly from the index purveyor.

Respondents indicated that issuer reweights were one of the most difficult customizations to implement.

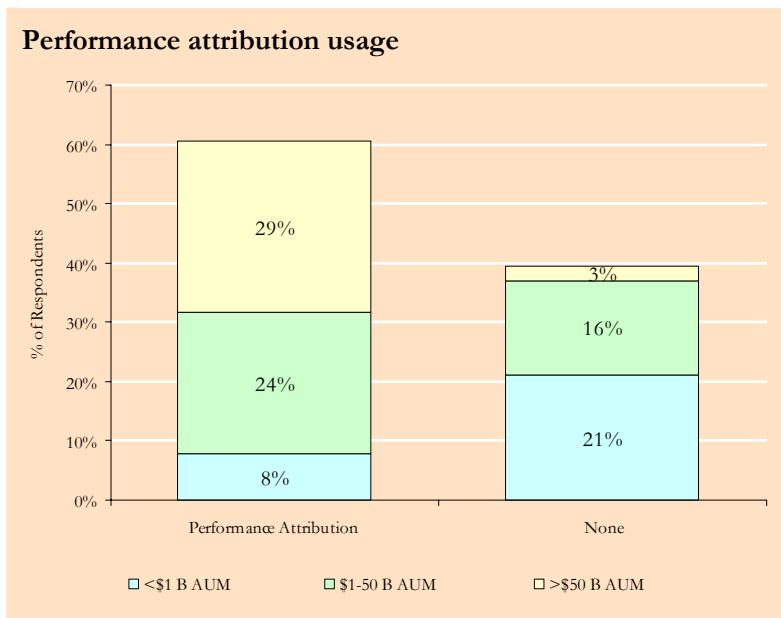
- A number of firms utilize a manual process of both omitting various sectors and reweighting each individual issue – significantly time consuming
- A few vendors – e.g. BondEdge, Lehman POINT – are willing to reweight indices to cap issuer concentrations on a service bureau basis

Chapter 2-F: Returns Analysis

2.F.1 Do insurers conduct performance attribution?

The majority of insurers surveyed indicated that they conduct performance attribution on each portfolio to better identify returns drivers. Using factor-based processes, this analysis determines whether returns were generated by coupon interest, shifts in the yield curve, movements in currencies, sector weightings, or security selection.

- Insurers indicated the importance of attribution to separate sources of return – market factors from investment department/ portfolio manager value-add
- Additionally, attribution allows insurers to determine “out of policy” risks taken by portfolio managers to achieve additional yields or returns



Mid-sized to small insurers dominated those firm not conducting performance attribution, with an overall lack of resources being the primary rationale.

Insurers who managed assets via third party managers expressed the increased need for performance attribution for comparison of each manager’s contribution to returns. Without formal attribution (and Liability-Based Guidepost Benchmarks) insurers indicated that they were not able to fairly judge relative outperformance across different managers with different liability portfolios.

Insurers utilize both internally developed and external performance attribution systems. Select large insurers developed attribution systems; however, the resources required to internally develop the sophisticated elements of factor-based attribution analysis is prohibitive for most. With a number of viable vendor solutions, insurers typically leverage multi-functional fixed income analytic systems – BondEdge, Yieldbook, BlackRock Solutions – to automate the creation of benchmarks as well as conduct performance calculation and attribution.

Firms that developed both strategic and tactical benchmarks are able to attribute returns to either the investment department and portfolio manager respectively to determine the overall value-added. These firms expressed the ability to more accurately compensate both the investment department and portfolio managers based on their investment decisions.



2.F.2 How do insurers determine appropriate incentive compensation for portfolio managers?

Approaches for incentive compensation vary significantly by the insurer's business type and benchmarks.

Life companies generally seek to incorporate both income and total return targets to incent portfolio managers. Only a limited number of insurers utilize a true book income benchmark, which would encompass all of the life insurer's specific constraints. As a result, the insurers surveyed have attempted to develop a number of practices to provide the appropriate incentive compensation to portfolio managers.

Representative life insurer incentive compensation programs:

1. All investment professionals receive performance based compensation based on overall investment department performance, not a specific department
 - This firm does not employ individually-driven incentives to foster a team approach
 - Corporate performance evaluated by actual income performance relative to the firm's aggregate strategic benchmark – an asset weighted combination of each Liability-Driven Guidepost Benchmark
2. Incentive compensation driven by out-performance of income targets and total return benchmarks – 50% weighting to each
 - Income targets set annually by investment department management based on anticipated market conditions
 - Total return measured against customized vendor benchmarks
3. Incentive compensation driven by total return comparison against customized total return benchmark and representative peer group yields – 50% weighting to each
 - Relative peer group selected for similarity of business mix (i.e. little exposure to annuities)
 - Benchmark composed of a blend of performance results gleaned from public filings
4. Compensation of each asset class team based on outperformance of customized total return benchmarks
 - Tailor benchmarks for insurance company constraints – buy/ sell limitations, minimum income requirements

Property and casualty insurers almost exclusively rely on out-performance of customized total return indices when providing incentive compensation for investment professionals. This is highly correlated with their typical investment approaches, and therefore was subject to less variation across firms.

Chapter 3: Technology

3.1 How do insurers deploy technology?



Asset-Liability Management System(s)
Liability Modeling/ ALM Projections

Fixed Income Analytic System(s)

<i>Asset Cash Flow Modeling</i>	<i>Index Cust. & Constr.</i>
	<i>Portfolio Optimizer</i>
	<i>Perf. Calc. & Attr.</i>

Insurers utilize a number of technology solutions across the investment management process to streamline and automate a number of functions. After surveying a number of insurers, these functions fall under broad categorizations.

Asset-liability management systems are primarily responsible for generating liability characteristics – duration, convexity, cash flow profiles – as well as to project the match between asset and liability cash flows. This process includes processing 100-200 economic scenarios to determine the overall volatility of cash flow match. Insurers also execute sensitivity testing on liability assumptions to determine potential elements – lapse rates, surrender periods – where potential inaccuracies may significantly affect the cash flow match.

Most fixed income analytic systems typically have capabilities to support multiple functions across the entire investment management process. The asset cash flow modeling function is a standard input into ALM projections; however, firms are increasingly conducting this outside of their ALM systems, due to limitations in most ALM vendors systems. Insurers will often employ a third party solution to project asset cash flows, and then import them into the ALM system for liability projections and cash flow matching.

In the development of asset allocations, insurers also employ fixed income analytic solutions’ portfolio optimization capabilities. These systems generate multiple return and risk combinations based on different prospective asset allocations and assemble these return and risk combinations into an efficient frontier for the identification of an the optimal asset allocation to maximize returns within a risk-constrained environment.

Finally, fixed income analytic solutions provide the ability to automate customization and construction of total return benchmarks for liability portfolios. Performance calculation and attribution is then undertaken for each portfolio, usually with the same solution.



3.2 What technology solutions do insurers utilize?

Technology usage significantly varies by the size of insurers and the accompanying availability of resources. Large insurers may develop customized internal solutions or employ as many as five or six discrete “best of breed” third party technologies, sometimes even employing several systems for a single function. In contrast, the mid-sized and small insurer respondents typically utilize one asset-liability management platform and a separate fixed income analytic system, sacrificing functionality to capitalize on available efficiencies.

Two primary providers dominated asset-liability management systems: Tillinghast’s MoSes and Milliman’s ALFA. Over 90% of insurers surveyed utilized either platform, with the remainder developing internal asset-liability modeling systems. A select few insurers employed more than one system to provide specialized ALM projections for different liability types – annuity, whole life.

- A number of insurers indicated that the available third party systems had very limited capabilities for modeling asset portfolios, requiring external projections of asset portfolios via a fixed income analytic solutions

Insurers expressed the desire for improved integration of fixed income analytics platforms with ALM solutions, similar to BondEdge’s interface with ALFA

There are a number of fixed income analytic solutions that provide capabilities across the investment management process including CMS BondEdge, Citigroup’s YieldBook, Derivative Solutions, BlackRock Solutions, Lehman POINT, and Wilshire Analytics. Large insurers tend to employ 2-3 fixed income analytic vendors for best of breed asset cash flow modeling, portfolio optimization, and performance attribution.

- One large insurer employs BondEdge & YieldBook for asset cash flow modeling and BlackRock Solutions for performance calculation and attribution
- Across respondents, Citigroup’s YieldBook was considered the strongest overall analytical platform with specific strengths in structured securities, although cost generally limited it to larger firms using primarily Citigroup indices
- Lehman POINT is leveraged by insurers using Lehman indices for benchmark creation & customization, although many firms export the results into external attribution solutions to support 3rd party indices for specialty asset classes

Mid-sized to small insurers tend to use BondEdge or Derivative Solutions as turnkey solutions across the entire investment management process.

- BondEdge is generally considered the most user-friendly system across all fixed income analytics solutions, trading depth of customization and functionality for overall breadth of applicability & simplicity

Additionally, CreditSights’ BondScore, Risk Metric’s CreditGrade and Moody’s KMV are used by many larger insurers to actively measure and quantify credit risk exposures.



Patpatia & Associates' Insurance Asset Management Consulting Practice:

Strategic Evaluation

- *Organizational assessment*
- *Competitive benchmarking*
- *Profitability & transfer pricing*
- *Investment, actuarial, and product integration*

Investment Strategy

- *Liability-driven investment implementation*
- *Asset allocation optimization*
- *Asset diversification*
- *Derivatives Strategy*

Portfolio Implementation

- *PM assembly & 3rd party manager review*
- *Performance*
- *Compensation strategy*
- *Synthetic portfolio structuring*

Risk Management

- *Risk budgeting & economic capital modeling*
- *Risk modeling & hedging*
- *Reinsurance strategies*
- *Compliance*

Representative Clients

- | | | |
|------------------------|------------------------|--------------------------|
| ▪ Allianz Life | ▪ Lehman Brothers | ▪ Scottish Re |
| ▪ Ameriprise Financial | ▪ Mackay Shields | ▪ The Dreyfus Corp. |
| ▪ American Int'l Group | ▪ Manulife Financial | ▪ UBS Financial Services |
| ▪ Fidelity Investments | ▪ Payden & Rygel | ▪ Wells Fargo |
| ▪ ING Investment Mgmt | ▪ Prudential Financial | ▪ Zurich Financial |

Our Recent Publications:

- *Portfolio Management Strategies for Insurers* – outsourced & internal approaches to liability-driven general account investments
- *Asset Diversification for Insurers* – incorporation of specialty fixed income allocations & alternative investments for return enhancement, risk diversification, & additional capacity
- *Derivative Strategies for Insurers* – maximization & protection of value through derivatives & structured notes
- *Investment Benchmarking Survey* – a comprehensive analysis of over 50 insurers' general account investment best practices, spanning investment policy development, asset-liability strategies, asset allocation, performance benchmarking, reporting, the role of third parties, and required technologies



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Insurance Practice

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