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Investment Management In a Risk Management Context[1]

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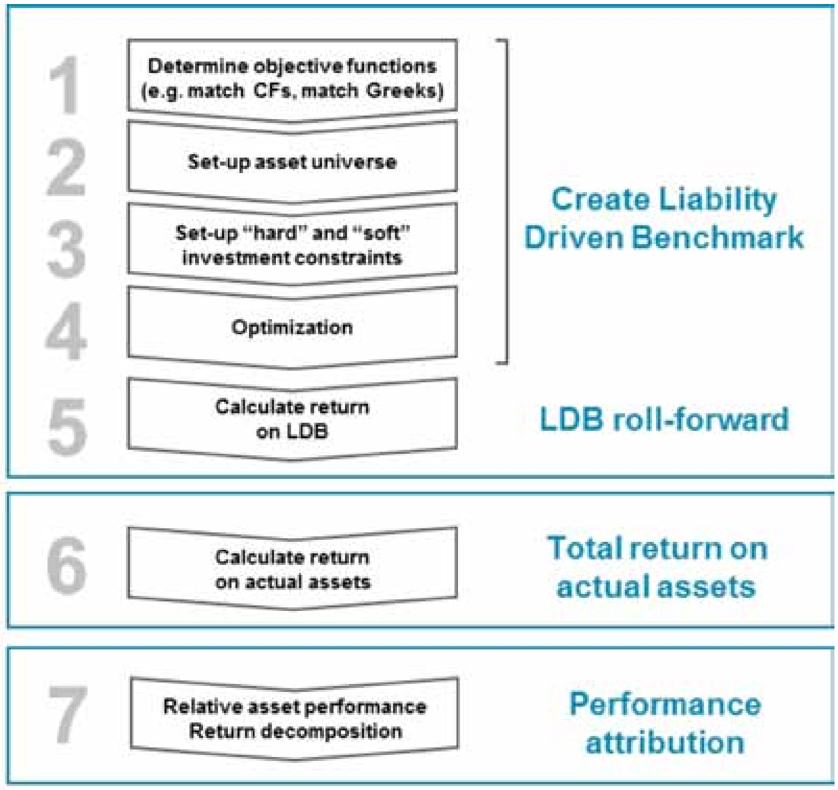
INSURANCE COMPANIES TYPICALLY FUND FUTURE LIABILITY OBLIGATIONS BY TAKING AN ACTIVE INVESTING APPROACH WHICH IS EXPECTED TO EARN EXCESS RETURNS OVER A PASSIVE INVESTING STRATEGY. From the insurer's perspective, the ability to match liability cash flows with a diversified pool of assets generates positive economic value. Although it is clear that active investing is a key element of insurance companies' business models, there is significant debate between the risk management function and the investment management function on whether it is appropriate to take on additional risks in exchange for the opportunity of obtaining a higher return. Specifically, there seems to be great uncertainty and subjectivity involved in discussing investment performance under the current low interest rate and high volatility economic environment.

From a risk management perspective, is there a way to measure and evaluate the risk-adjusted investment performance given the characteristics of the insurance liability? This article proposes a comprehensive framework (Figure 1), which consists of the following three components:

- Liability Driven Benchmark (LDB)
- Total return on actual assets
- Relative asset performance and return decomposition

FIGURE 1



LIABILITY DRIVEN BENCHMARK (LDB)

Large insurance companies generally employ thoroughly integrated benchmarking approaches to manage and evaluate their investment function. These approaches typically incorporate asset maturity, liquidity profiling and cash flow analysis, as well as customization of market indices in line with portfolio allocation and constraints. However, such a benchmarking process faces certain shortcomings; in particular, it does not provide guidance on how to invest the assets, nor does it consider risk management. In contrast, LDBs would require insurance companies to integrate asset liability management with investment policy development. This includes matching asset maturity structures to required liability payments, modeling asset prepayment behavior based on asset optionalities, analyzing liquidity to cover downside risk, and setting asset allocations which optimize the risk-adjusted return. Through LDBs, internal portfolio managers and third party investment managers would receive explicit investment guidance for each product or business line based on the liability characteristics.

So, how would one develop such benchmarks that are liability-driven? One way is to construct LDBs using the asset-based liability replication portfolio (RP). The idea is to develop a proxy portfolio which consists of a basket of capital market instruments that in aggregate

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mimic certain liability characteristics within a pre-specified tolerance and often over a range of parameter outcomes, usually market risk factors. In addition to providing the advantage of reducing computing time for valuing the liability, an asset-based liability RP translates a liability into an investible set of assets which represent the best possible real world capital markets match from an ALM perspective.

The construction of an asset-based liability RP boils down to solving an optimization problem whose goal is to find the "best possible value" that a function can take subject to a number of constraints. Typically, three factors need to be considered in an optimization problem: (1) the objective function, (2) decision variables, and (3) constraints.

1 Objective function: Referring back to the RP context, the objective function could be minimizing Greeks[2] mismatch, minimizing cash flows mismatch, or a combination of the two. Each approach has its advantages and disadvantages. For example, cash flow replication provides more information about the underlying structure of the liability but constructing the RP would take longer and would require more resources. On the other hand, Greek matching can be used for financial risk management but frequent rebalancing may be required.

2 Decision variables: The decision variables would be the amount of each asset in the RP, where assets are selected from a specified asset universe. Depending on the type of liabilities, the asset universe can be limited to only plain vanilla instruments such as zero-coupon bonds and par bonds or can expand into derivative instruments, such as caps, floors and swaptions, to capture optionality. More exotic derivatives such as range accrual notes or look-back options could also be used but are often excluded because they lack the liquidity desired for portfolios that require frequent rebalancing. Thus, when trying to match a liability with significant optionality, the selection of the asset universe becomes an art rather than an exact science. A pragmatic approach is to keep the asset types simple and the number of assets as small as practical to avoid overfitting and to maintain stability. *Simplicity is the ultimate sophistication.*

3 Constraints: Investment constraints would need to be reflected. There are "hard" constraints that cannot be breached due to regulatory requirements. For example, there could be limitations on short positions or maximum positions in options. "Soft" constraints may also be introduced to reflect company-specific requirements or risk appetite. For example, a company whose objective function is to minimize differences in cash flows but that also has a key focus on duration matching would constrain the duration of the RP to be equal to the duration of the liability.

Note that the decision process on the objective function, decision variables and constraints would ideally involve professional input from the investment, risk management, pricing and product development, and valuation areas. Best practice would be to facilitate such interactions before constructing the LDBs rather than imposing them afterward.

4 Once the decisions are made, commercial software is available to run the optimization. Care should be taken to ensure the optimization routine is robust and is capable of finding the globally optimal solution, rather than one that is only locally optimal.

5 The return on the LDB can then be calculated by holding the RP static throughout the period and taking the ratio of the gains or losses on the RP to the market value of the RP at the beginning of the period. This calculation is quite straightforward since the values of those assets are readily available in the market.

TOTAL RETURN ON ACTUAL ASSETS

6 To calculate the total return (i.e., income plus realized and unrealized capital gains/losses) on actual assets, the recognized industry standard for calculating and presenting investment performance is the Global Investment Performance Standards (GIPS®) developed by CFA Institute. It provides a framework to compare investment management performance in a fair and consistent manner. According to industry surveys, approximately 70-90 percent of investment managers worldwide are either GIPS compliant or plan to achieve so.

> "this type of analysis... helps determine if pursuing an active investment strategy adds or destroys economic value."

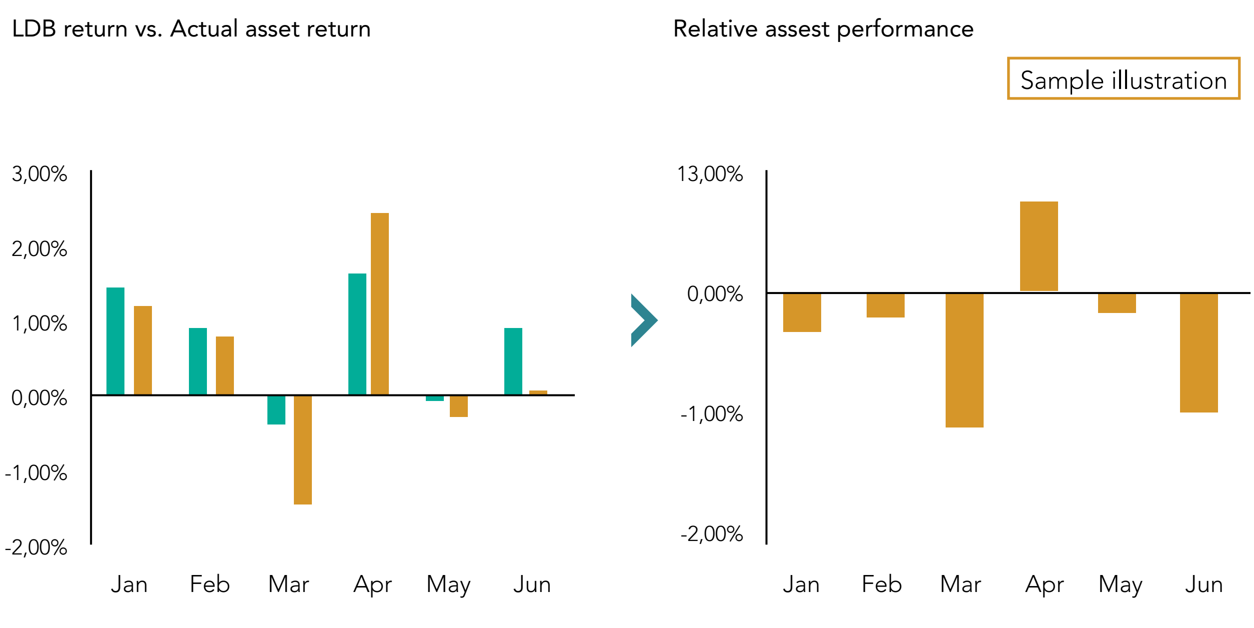
The investment arms of many insurance companies are not GIPS compliant and lack the resources and IT infrastructure to achieve compliance in the near future. For example, the 2010 GIPS requires firms to value portfolios on the date of all large cash flows and calculate time-weighted rates of return adjusted for external cash flows. This is not an easy task and can be costly. Therefore, as an alternative, an approximation using the Modified Dietz method to approximate time-weighted rates of return adjusted for daily-weighted external cash flows can be used.

The main advantage of the Modified Dietz method is that it is not necessary to know the value of a portfolio on every day that a cash flow occurs. The disadvantage is that the method does not provide an accurate estimate of the true time-weighted rate of return. The inaccuracy is at its worst when one or more large cash flows occur and the markets are highly volatile.

RELATIVE ASSET PERFORMANCE &RETURN DECOMPOSITION

7 Having calculated the return on the LDB and the one on the actual assets, we can now compare the returns. For this comparison to be fair and have any meaning, the returns should be compared over a sufficiently long period, or over several shorter periods, the latter providing additional information about the volatility of the actual returns versus the benchmark. This type of analysis provides insights into whether actual assets over-perform or under-perform the LDB, which, in turn, helps determine if pursuing an active investment strategy adds or destroys economic value. Figure 2 illustrates a sample output.

FIGURE 2
RELATIVE ASSET PERFORMANCE



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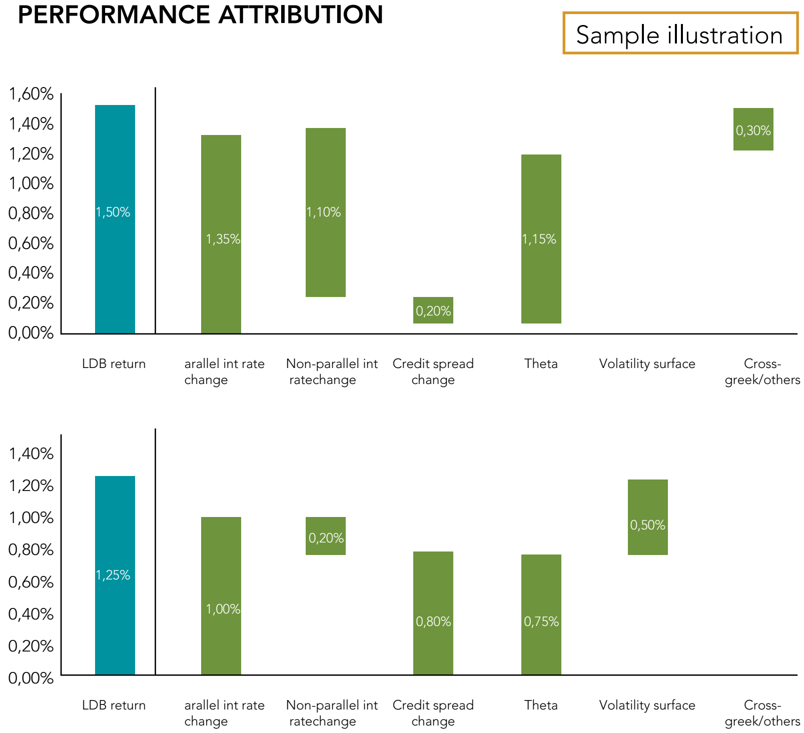
A more detailed comparison can be performed by decomposing the return attributed into different market risk factors. For example, the LDB can be rolled forward under a series of step-wise changes in market risk factors (e.g., interest rate shifts, bond credit spread changes, Vega, etc.) to demonstrate the impact of the risk factors on the LDB. A similar decomposition can be done for the actual asset return. Such comparison could provide further insights into the return and its attribution on a risk-adjusted basis. Figure 3 illustrates a sample output.

FIGURE 3
PERFORMANCE ATTRIBUTION



CONCLUDING REMARKS

Insurers typically receive premiums upfront and pay claims later. This "collect-now, pay-later" business model that leaves insurers holding large sums of money, which Warren Buffett called "float," is essential to the way the insurance industry works. The cost of the float depends on the insurer's underwriting practice whereas the benefit of the float can be largely realized by the insurer's investment management. Therefore, a comprehensive approach which integrates the ALM and investment strategy process into an overall risk management framework such as proposed herein can provide significant value to the long-term soundness and success of an insurance company. ■

END NOTES

1. The views in this article only represent the authors' personal opinions. This article does not represent any statements from the organization where the authors are employed.
2. The Greeks are the quantities measuring the sensitivity of the value of a financial instrument to a small change in a given underlying parameter on which the value of the instrument is dependent.