Asset - Liability Management for Insurers
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INTRODUCTION

An ***insurer*** that does [lot coordinate its decisions on assets and liabilities is courting faster. Nissan Mutual Life, Japanese company with 1.2 million policyholders and assets of JPY 2 trillion (USD 17 billion) offers a case in point. The company sold individual annuities paying guaranteed rates of 5 to 5 p ercent without hedging these liabilities. A plunge in government bond yields to record low levels created a large gap between the interest rates Nissan Mutual committed itself to pay and the returns it was earning on its own investments, On 25 April 1997, Japan Finance Minister ordered the company to suspend its business. Nissan Mutual *was* the first Japanese insurer to go bankrupt in five decades. Its losses totaled JPY 300 billion (USD 2.5 billion).

Two years later, a subtler mismatch between assets and liabilities wreaked havoc on General American Life, a 66.year old USD 14 billion St. Louis life insurer among the fifty largest in the United States. On Friday, 30 July 1999, Moody Investors Service reduced the company debt and financial strength ratings by a single notch, from A2 to A3. The downgrade triggered a bank run-like crisis of confidence that, within ten days, led the insurer to be placed under state supervision.

At the heart of the crisis were USD 6.8 billion of debt instruments known as short-term finding agreements that General American had issued. The securities paid a competitive yield and carried the promise that investors could cash them in on seven days notice. In the past, few of the investors, most of who were fund managers, had invoked the redemption clause.

Within hours of the downgrade, several fund managers requested payments of about USD 500 million. General American, which had USD 2.5 billion of liquid assets, met these requests without difficulty. Over the next few days, however, investors sought to redeem another USD 4 billion of the obligations. Unable to sell assets quickly enough to meet these requests without severely impairing its capital, General American asked to be placed under state supervision. On 25 August, the company agreed to be sold to Metlife. In a matter of four weeks, General American had lost its independence.

Description of Asset - Liability Management

Insurers face risks that derive from the assets they hold, their liabilities, and the relationship between the two. Asset-liability management (ALM) provides a framework for assessing and managing these risk exposures systematically and efficiently. Although the term means different things to different practitioners, the Society of Actuaries offers a useful definition:

> ALM is the practice of managing a business so that decisions on assets and liabilities are coordinated; it can be defined as the ongoing process of formulating, implementing, monitoring, and revising strategies related to assets and liabilities in an attempt to achieve financial objectives for a given set of risk tolerances and constraints... ALM is relevant to, and critical for, the sound management of the finances of any institution that invests to meet liabilities.

ALM in the life and non-life industries

There are significant differences in the way that life and non-life companies practice ALM. Life insurers, which developed some of the first ALM models, generally focus on interest rate risk. Their models typically take a single line of business and the assets that support it as their unit of analysis.

There is surprisingly little communication between the life and property/casualty communities with regard to ALM practice. This is unfortunate because each could learn much from the other. For example, many ALM practitioners in the life industry would be surprised to know that property/casualty firms have in recent years developed their own sophisticated approach to ALM known as dynamic financial analysis (DFA). DPA can be defined as:

> The process of examining the entire financial position of an insurance company over time, considering both the interrelationships among the various parts and the stochastic nature of the factors that can affect the results.

Historical Background

Historically, life insurers set premiums based on Static assumptions about interest rates and policyholder behavior. This approach did not work well in the late I 970s, as the run-up in interest rates changed the way policyholders behaved.
Life insurance contracts offer policyholders many choices such as settlement options, policy loan options, over-depositing options, and surrender or renewal privileges. Choices such as these, which provide consumers added flexibility, are known as (embedded options.) Because they benefit policyholders at the expense of insurers, insurers should in principle take these options into account when designing insurance contracts and setting rates. In practice, insurers paid little attention to the options embedded in their policies. This is because the options were not very valuable as long as interest rates remained stable. Policyholders tended to exercise their options based on individual or family circumstances.
As interest rates grew volatile in the late 1970s, policyholders began to exercise the options more frequently and opportunistically. Policy loans as a percentage of assets peaked at 9.3 percent in 1981 one indication of how important the policy loan option had become. According to one estimate, this option alone might be worth between 20 and 45 percent of all future insurance premiums. if exercised optimally. Even if used suboptimally, the option could still cost insurers sonic ten percent of premiums, yet insurers charged nothing for it. More importantly, many insurers failed to adjust their assets and liabilities its a way that would mitigate the risks that embedded options posed. Eventually, volatile interest rates prompted the life insurance industry to improve its methodology for identifying and addressing the risks posed by embedded options. Today, the standard valuation methods used by leading US life insurers explicitly measure these options.

Cash flow testing

Reacting to the risks of underwriting interest-rate sensitive products, the New York State Insurance Supervisor instituted Regulation 126 in 1986. The regulation requires virtually all companies underwriting annuity in New York to perform asset liability analysis known as cash flow testing (CFT).

in 1993, the National Association of Insurance Commissioners adopted a Standard Valuation Law requiring insurers to perform CFT to verify that they hold sufficient reserves. The testing must follow practices established by the Actuarial Standards Board and take into account the manifold effects of interest rates on liabilities (policy surrender rates, additional premium payments) and assets (mortgage-backed security prepayments and calls on corporate bonds).

The testing performed by a qualified actuary, involve assessing the potential impact of seven-interest rate scenario

Scenario 1	Level	No deviation from current rates
Scenario 2	Increasing	Rates rise 0.5% a year for ten years than level
Scenario 3	Cap	Rates rise 1% a year for five years fall 1% a year for five years, then level
Scenario 4	Pop-up	Rates rise 3 % immediately, then level
Scenario 5	Decreasing	Rates fall 0.5% a year for ten years , then level.
Scenario 6	Cup	Rates decline 1% a year for five years, rise 1% a year for five years, then level.
Scenario 7	Pop-down	Rates decline 3% immediately, then level

Cash flaw matching

In principle, an insurer should be able to eliminate the interest rate risk to which it or a block of its assets is exposed, simply by matching the liabilities with assets whose cash flows are identical. This practice is known as (dedication) or (cash flow matching.) An insurer might, for example, purchase *a* portfolio of Treasury securities that mature on exactly the days that its liabilities fall due. Although cash flow matching can eliminate interest rate risk, insurers deem the practice impossible or impractical for several reasons.

Uncertainty of cash flows. A major obstacle to cash flow matching is the uncertainty inherent in the timing of liabilities. In the life insurance industry, policyholders and annuitants have a variety of options whose unpredictable exercise can alter the schedule of future cash flows. Changes in exogenous factors such as mortality rates introduce further uncertainty to the timing and magnitude of future liability payments.
For non-life companies, the uncertainties loom still larger. Changes in underwriting performance, liability law, and health care costs can all have a major impact on cash flows. Catastrophe insurers would find setting aside enough capital to match all their major potential losses prohibitively expensive.

Matching reduces flexibility. Even in situations where cash flow matching is feasible, it might be too constraining. Committing to match the cash flows of assets and liabilities precisely can force an insurer to accept bond yields that are below what it could earn if it allowed itself some slight mismatch.

Consider, for example, an insurer that wishes to purchase 10-year Treasury bonds. it can buy either (on-the-run) securities (bonds that were issued most recently), or (off-the-run) (previously issued) securities. To compensate for their lower liquidity, off-the-run bonds are typically priced to yield a little more than on-the-run bonds. It might therefore make sense for an insurer to buy off-the-run bonds and collect the higher yield (effectively selling liquidity to the market), even if doing so creates a slight asset-liability mismatch. So many things will happen to the insurer over the next decade that neither bond will exactly match its liabilities anyway. Restricting purchases to a specific bond issue will cost an insurer opportunities available to more nimble competitors that prudently mismatch.

Market point of view. Some insurers might prefer not to cash flow snatch because they hold a strong point of view about future interest rates, For example, an insurer that expects interest rates to decline might want to position its bond portfolio accordingly.

No pain, no gain. Despite their best efforts to the contrary, insurers will generally find themselves left with at least some mismatch between assets and liabilities. They must manage this risk judiciously, making sure to earn a faix return for accepting it. it; however, their only role is to pass investors holdings through to financial markets by purchasing assets that exactly match liabilities, they will be outflanked by other institutions that can perform the role more cheaply and efficiently.

Immunisation

A more flexible alternative to cash flow matching is matching the interest rate sensitivities of assets and liabilities, a practice known as (irnmunisation.) The idea is to protect, or (Immunise), against losses caused by a change in

interest rates. This is accomplished by structuring a portfolio so that the impact of a change in interest rates on the value of liabilities offsets the corresponding impact on asset values.
The guiding principle of an immunisation strategy is matching the *duration* of assets and liabilities. The duration of a series of cash flows cats be thought of as the average time it takes for those cash flow to be realized. Thus, an 8-year zero-coupon bond (i.e., a bond that makes a single payment eight years from now) has duration of eight years. So too does a portfolio consisting of a 6-year zero coupon bond and a 1O.year zero coupon bond whose values and yields to maturity are the same.

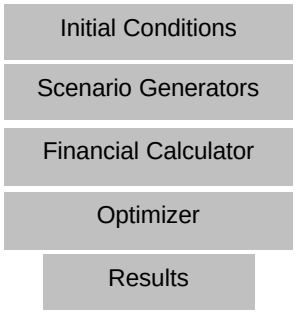
Duration calculations are readily performed on a spreadsheet or other software. Finding the duration of a portfolio of assets or liabilities is conceptually no more difficult than finding the duration of a bond.

The duration of assets and liabilities provides a useful first-order approximation of how sensitive their values are to changes in interest rates.

Once an insurer has computed the duration of its assets and liabilities, it must then make sure that the *two* are equal. 1f for example, the duration of assets and liabilities are both ten years, a 0.1 percent increase in interest rates will cause the value of both assets and liabilities to decline by 1 percent a perfect offset. Conversely, a 0.1 percent decrease in interest rates will cause both assets and liabilities to appreciate by 1 percent.

Because duration varies with movements in interest rates, duration matching manages the basic interest rate risk problem, but is not a complete solution. Thus, even if assets and liabilities initially have the same duration, their duration might drift apart once interest rates shift. To address this problem, an insurer can also manage the *convexity* of its assets and liabilities. Convexity is a measure of how rapidly duration changes in response to a change in interest rates. By matching the convexity as well as duration of its assets and liabilities, an insurer hedges its interest rate risk to a second degree of precision.

Dynamic financial analysis
Dynamic financial analysis (DPA) is a form of ALM that has started to gain acceptance in the property/casualty industry. It enables an insurer to assess how it would fare under a range of scenarios and how its prospects would change in response to different strategic moves. DFA models consist of five main components



Simplicity versus complexity
The four ALM techniques described above, representative of a broader range of techniques employed in the life and property/casualty areas, vary widely in complexity. Practitioners disagree about whether it is preferable to use simple models or more complex ones, for each has its advantages. Simple models entail lower costs, offer greater transparency, and have less room for computational error. It is easier to communicate the assumptions and results of a simple model to clients, especially those who are not technically inclined.

Characterization of ALM Technique

Technique	Cash Flow testing	Cash flow matching	Immunisation	DFA
Risk Focus	Interest Rate	Interest Rate	Interest Rate	Multiple
Computational Complexity	Moderate	Moderate	Low	High
Insurance Industry of Organization	Life	Life	Life	Property & Casualty
Typical Scope of Application	Line of Business	Line of Business	Line of Business	Institution

Although the question of how complex a model to use is largely a matter of style and approach, cost also figures itt the decision. Complex models have become more affordable because of advances in methodology, declines in the cost of computing, and the growing sophistication of users. Accordingly, the trend in recent years has been toward snore complex systems.

Despite this trend and the methodological advances of recent years, some remain skeptical about the value of complex models and favor using simple techniques.
As with arty new technology, it will take years for the most effective approach to emerge.

Why use Asset - Liability Management?

Given its complexity and lack of a uniform approach, some might wonder why ALM is worth the effort. Two important reasons, previously noted, are that ALM helps control interest rate risk and prevents some major blunders. This section discusses how ALM, in addition, helps insurers steer decision-making and clarifies their risk landscapes in ways that other modes of analysis cannot.

Improved decision-making

Asset-liability management, by measuring the impact of each decision on insurer financial results, shows how these decisions are interrelated. This enables managers to make better strategic choices, such as:

- Can the company reallocate its investments to boost returns, reduce risk, or both?
- How much reinsurance should the company purchase? What type?
- Are the company rates high enough to permit a satisfactory return on capital? Are they too high to be competitive?
- How fast should the company aim to grow?
- Should the company exit certain lines of business and enter others?
- Will the acquisition it is considering add value to the firm?
- Does the firm have enough capital to assure its continued solvency? Should its capital be financed differently?
- Does the firm have excess capital it might re-deploy or distribute to shareholders?

For most insurers, independent groups snake these choices, an approach that leads to suboptimal decisions. Suppose, for example, that one committee determines how to price policies while a second chooses which assets to invest in and a third decides how much reinsurance to purchase. Each of these decisions pricing, asset allocation, and reinsurance may be perfectly correct, *taking the other decisions as given.* The company can achieve a better result, however; by taking into account the relationship between these decisions.

ALM also helps an insurer clarify its priorities. Firm wide objectives should take into account the interests of several constituencies policyholders, employees, and (if the insurer is a stock company) shareholders each with different concerns. Given these distinct perspectives, it is difficult for management to decide exactly which objectives

matter most. Doing so is worth the effort because it clarifies and focuses strategic thinking, it also provides a means by which department heads can work together, fostering improved communication and cooperation.

By translating different objectives into a unified framework, an ALM model clarifies the firm wide consequences of the actions that top managers take. This facilitates more meaningful information sharing and discussions across functions. Sometimes an opportunity requiring immediate action p erhaps a potential acquisition or strategic alliance arises suddenly. To get all the key decision-makers to agree is a challenge. By fostering a common language and integrated decision making, ALM facilitates a logical assessment of alternatives.

Limitations

Observers wary of the pitfalls of information systems have coined the term (GIGO,) an acronym for (garbage in, garbage out) The expression serves as a reminder that the quality of conclusions one can draw from any model is no better than the quality of data the model employs. Flawed input leads to flawed conclusions.

ALM allows insurers to determine the overall risk exposures due to their various activities, but does not assess sources of risk. ALM can say neither how likely an earthquake is nor how much interest rates might move. Rather, it offers a framework for collecting this kind of information about risk exposures and assessing these exposures on a consistent basis, Similarly, ALM cannot help with risks that are not identified, Sometimes these are the most dangerous.

No model, however good, offers a perfect representation of reality. ALM models are part art, part science. Users should not allow model outputs that seem precise to lull them into a false sense of security. The best antidote is a healthy awareness of a model strengths and weaknesses. ALM models are meant to bolster strategic thinking, not replace it.