

Asset/Liability Management for the Life Insurer: Situation Analysis and Strategy Formulation

Joan Lamm-Tennant

ABSTRACT

Asset portfolios of life insurers support the performance of obligations to customers and contribute to the profitability of insurers. The obvious risks associated with these portfolios are magnified by the instability of financial markets. Insurers should have a heightened awareness of the simultaneous effects of unstable markets and changes in interest rates not only on the assets, but also on liabilities. This study examines the current operational status and planning procedures of seven asset/liability management processes appropriate for life insurers and offers recommendations.

Introduction

The concepts and techniques of asset/liability management (ALM) [see Babbel and Stricker (1987), Babbel and Lamm-Tennant (1987)] are of concern to both industry leaders and academicians. The simultaneous effects of unstable financial markets and changes in interest rates on both the assets and liabilities of insurers have resulted in the recognition of ALM as a necessary part of prudent portfolio management. Before implementing a comprehensive ALM process, a life insurer should complete a strategic planning process which includes three distinct phases: situation analysis, strategy formulation, and implementation. This study analyzes the planning, evaluation and use of ALM techniques appropriate for the life insurance industry. In addition, the advantages and disadvantages of each technique are identified. Guidelines for an investment management strategy are provided based on situation analysis. Further research is necessary for completion of the strategy formulation and implementation phases.

The article proceeds in the following manner: data source and respondents are described; the first phase of a strategic ALM plan—situation analysis—is addressed by analyzing the current operational status of seven ALM processes

Joan Lamm-Tennant is Assistant Professor of Finance at Villanova University. She gratefully acknowledges comments by Tom Brown, Edward Robbins of KPMG Peat Marwick, Daniel R. Gattis of SEI Corporation, as well as the comments and suggestions from the participants in the 1987 American Risk and Insurance meetings.

and the planning/evaluation procedures currently used by the industry regarding ALM; and conclusions and recommendations are given.

Data and Survey Method

A survey of management philosophy and utilization rates of seven ALM techniques was mailed to senior investment officers at a random sample of 250 life insurers, during late 1986 and early 1987. Seven ALM techniques were identified in the survey, nevertheless other techniques or variations may be appropriate for a particular product or circumstance. Respondents were invited to discuss these additional ALM techniques, such as dedication or contingent immunization. Ninety-four insurers responded; 102 were represented because, in some cases, the investment process was centrally performed for a group of insurers. Respondents were invited to submit a partially completed questionnaire whenever data were unavailable. As a result, all questions yielded fewer than 94 responses.

Respondents were profiled by six characteristics: organizational type, location, size, number of state licenses, product mix, and asset mix. The respondents are a fair representation of the industry. Forty-two percent of the firms are mutual insurers and 58 percent are stock insurers. Home offices of the firms are predominantly located in the northeast although all regions of the United States are represented. Seventy percent of the firms report net invested assets of \$4 billion and less, whereas 30 percent report net invested assets greater than \$4 billion. Forty-four percent of the firms are licensed to sell insurance products in 50 states with the remaining 56 percent licensed to sell in fewer states. The product mix of the firms include numerous interest sensitive products and the representation of these products as a percentage of net statutory liabilities is significant. Exposure to interest rate risk is evident among the firms due to a significant percentage of invested assets held in long-term bonds.

The Current Operational Status of ALM Techniques

The current operational status of seven asset/liability techniques is shown in Table 1. Respondents categorized each of the seven ALM techniques as currently operational, operational given economic analysis, considered but deemed undesirable, not considered, or other. Currently operational represents firms with operational ALM processes which are independent of economic analysis. Economic analysis may be useful in designing the specific position, nevertheless operational status is ongoing regardless of economics. The second category, operational contingent upon economic analysis would be the appropriate selection should implementation of the ALM process depend upon certain economic forecasts. Timing and accurate economic forecasting becomes a necessary condition for the ALM process to be successful. Considered by management, but deemed undesirable indicates that management is knowledgeable of the technique and has evaluated its strengths and weaknesses, nevertheless elect not to implement due to cost reasons or

Table 1**Operational Status of Asset/Liability Management Processes**

Process	Number	Currently Operational	Operational Economic	Undesirable	Not Considered	Other
Duration	81	50.6	22.8	5.1	8.9	12.6
Interest Rate Futures	76	15.8	18.4	29.0	25.0	11.8
Stock Index Futures	73	6.8	11.0	24.7	52.0	5.5
Interest Coupon Strip	74	10.8	12.2	21.6	48.6	6.8
Interest Rate Swap	74	21.6	18.9	17.6	31.1	10.8
Segment Asset/ Liability	79	75.9	5.1	5.1	7.6	6.3
Multiple Scenario	77	58.4	13.0	2.6	9.1	16.9

complexities. Not considered represents situations when management elects not to evaluate the technique. The other category is needed to identify specific comments such as the respondent who declared regulatory limitations as their response to the operational status of specific ALM techniques.

Duration is currently operational in 50.6 percent of the insurers; 22.8 percent of the respondents implement duration techniques only when justified by economic analysis whereas 14.0 percent do not employ duration either because it is deemed undesirable or because it has never been considered. The remaining 12.6% identified with some other condition regarding operation status.

Interest rate futures hedges are currently operational by 15.8 percent of the respondents while 6.8 employ stock index futures, yet an additional 18.4 percent employ interest rate future hedges when justified by economic analysis and 11.0 percent employ stock index future hedges contingent on economic analysis. Interest rate futures hedges and stock index futures hedges are not operational in 54.0 and 76.7 percent of the cases, respectively. The other category was the desired selection for the remainder of the respondents.

Interest coupon stripping is operational either currently or upon economic justification in 23.0 percent of the cases, whereas 70.2 percent report interest coupon stripping as not being operational, and 6.8 percent identified with the category defined as other.

Asset-liability interest rate swaps are operational in 21.6 percent of the cases and 18.9 percent utilize swaps based upon economic analysis. An additional 17.6 percent considered swaps but deemed them undesirable, and 31.1 percent have not considered the technique, and 10.8 percent identified with the category defined as other.

Segmentation of assets/liabilities is operational by the majority of the insurers. Specifically, 75.9 percent of respondents currently segment assets/liabilities, 5.1 percent segment contingent upon economic analysis, only 12.7 percent do not provide for segmentation, and 6.3 percent selected other as their response.

The majority also project cash flow surplus under multiple scenarios—58.4 percent currently have an operational process. An additional 13.0 percent

perform scenario analysis contingent upon economic analysis. The remainder either do not perform multiple scenario analysis or identified with the other selection.

The life insurance industry is aware of the ALM techniques addressed in this study, and some firms aggressively pursue operational policies. Nevertheless, the actual implementation of an integrated ALM process does not seem to be widespread.

The preceding assessment must be clarified since events occurred after the data collection which may significantly impact the consideration and/or the use of ALM techniques by insurers. First, the state of New York liberalized its regulations on authorized investments by statute in 1988. This will allow more emphasis on futures and options. Since many states follow New York's lead in insurance regulation, this liberalization can be expected to result in greater use of ALM tools among all insurers. Second, through private letter rulings, five insurance regulators in New York and other states have finally authorized the use of interest rate caps and floors. These investments were not included in this study because they were not authorized at the time of the survey. Nevertheless, it is important to recognize the new status of interest rate caps and floors because they are a superior hedging device for liabilities that feature positive convexity in their market value profiles.

The following subsections will focus sequentially on each of the seven ALM techniques. A discussion, including the advantages and disadvantages of each process, is provided. The current level of sophistication achieved in implementing techniques is discussed and a comparative analysis of the insurers with operational policies to those with non-operational policies is presented.

Duration

Immunization is a set of rules for minimizing the impact of a change in interest rates on an entity's financial wealth. Duration is used to achieve immunization. The classical example involves setting the dollar-weighted average duration of cash inflows equal to the dollar-weighted average duration of cash outflows (i.e., the first order condition), while the elasticity of the duration of the cash inflows is greater than the elasticity of the duration of the cash outflows with respect to interest rate changes (i.e., the second order condition). Through such an immunization process, a manager attempts to insure that at least the rate promised to customers is earned. Nevertheless, according to Fogler (1984) several conditions may be responsible for the earned rate being less than the promised rate: (1) the inability to continuously rebalance assets to insure that asset duration exactly matches the duration of the liabilities, (2) changes in actual interest rates in excess of the prespecified level, (3) changes in the future cash flows of assets due to unanticipated inflation, or (4) changes in the real rate of return. In addition, further complications exist on the liability side if lapse rates, policy loans, or the effect of unanticipated inflation on cash outflows are not recognized.

Aside from the previously mentioned considerations that are critical to the viability of a duration driven model, numerous disadvantages must be recognized. First, duration is frequently calculated erroneously because a single superior discount rate is not known. The calculation is complicated further by the fact that the cash flows affecting an insurer's liabilities as well as some assets are interest sensitive. Traditional duration methods [See Macaulay (1938)] become irrelevant due to these interest sensitive cash flows. Hence an option-adjusted duration which is derived from a market value profile and which reflects changes in the market value of the liabilities for movements in interest rates is the only relevant measure. This measure requires a financial pricing model as opposed to an actuarial pricing model for insurer liabilities. Most insurers have not developed such a model, however, many senior executives have identified a market valuation model for liabilities as a number one priority. Without a proper valuation model for liabilities, it is doubtful that a duration driven ALM model will be of use.

Second, the convexity or duration drift is extremely fast for certain instruments. Also, the unequal duration drift for assets versus liabilities can be dangerous. Third, the derivation of a portfolio duration is complex since duration across assets or liabilities is not additive. For example, a portfolio consisting of two assets each with a duration of 20 years will not necessarily have a portfolio duration of 20. The additivity is lost since the yields generated by the individual assets in the portfolio do not move in tandem. Consequently, a portfolio comprised of numerous assets must derive a duration relative to some common factor such as a Treasury bill rate.

Although numerous complications accompany a duration driven model, some merits exist. Approximately 98 percent of government bond returns can be explained by three factors: the level of interest rates, the steepness of the yield curve, and the volatility of interest rates. A three factor model which attempts to derive a net zero position in all three factors is ideal. Although duration addresses only the level of interest rates, one must recognize that it accounts for approximately 88 percent of government bond returns. Hence, although duration focuses on only one of the three relevant factors, its strength in accounting for returns generated by debt is substantial. Finally, should a duration driven model be implemented, an implied duration model which evaluates price movements under different scenarios would be reasonable in accommodating many of the associated weaknesses.

According to the survey, 50.6 percent of the firms use an operational duration technique routinely and an additional 22.8 percent implement the duration technique when justified by economic analysis. Among the 73.4 percent of the firms that have relied on duration for immunization, some adjust the traditional process for one or more of its limitations. Nevertheless, 37.9 percent of the insurers with an operational duration process fail to recognize the effect of changes in the expected rate of inflation; 36.2 percent do not recognize changes in the real rate of return; 25.0 percent fail to recognize changes in market yields; 27.5 percent fail to recognize lapse rates;

and 39.1 percent do not consider policy loans. Hence, a representative number of insurers could benefit from a more sophisticated duration process.

An interesting hypothesis is whether the sophistication of the duration process is dependent upon the insurer characteristics. In an attempt to explore this hypothesis, those insurers failing to implement a sophisticated duration process were identified and a test of independence on measures of size, location, asset mix, and product mix was performed. It appears that the non-use and misuse of duration is disbursed throughout the industry and is not dependent on the tested characteristics.

Interest Rate Futures

Interest rate financial futures are marketable forward contracts written against debt assets, stock indices and foreign currencies. Little (1986) discusses the implications of an investor using financial futures in an immunization context where immunization is a strategy designed to hedge against unanticipated changes in interest rates. Specifically, an asset portfolio immunizes a liability stream if portfolio value cannot fall short of the value of liabilities as they come due. Yawitz and Marshall (1985) consider using futures to lengthen or shorten portfolio duration and to rebalance portfolios when necessary to maintain immunization over time. Chance (1983) suggests using futures to hedge the investment of future cash inflows and to immunize portfolios that contain floating rate notes. Koppenhauer (1983) constructs future hedges for managing the gap in the maturities of financial institutions' assets. Carroll (1982) and Lamm-Tennant (1987) address specific uses of financial futures by life insurers.

Although numerous uses of interest rate futures contracts exist for life insurers, this analysis will be limited to three: portfolio management, future cash flow management and life policy management. In portfolio management, a short position in futures may be used to immunize a long term bond portfolio. More specifically, given a cash position in long term bonds, either Treasury or corporate, a manager would sell a short position in Treasury bond futures contracts. The number of futures contracts necessary to immunize the holdings in the cash market may be derived by using a weighted hedge ratio as opposed to a naive hedge so as to improve the immunization. This is especially important in the case of a cross hedge between corporate bonds and Treasury bond futures.

Future cash flow management using interest rate futures contracts may provide, in advance, for the needed investment income to offset an underwriting loss. More specifically, a long hedge with futures can provide for adequate investment income before the solicitation of the insurance and receipt of investment funds.

Life policy management using interest rate futures contracts is attributed to the advent of the universal life policy which has an underlying liability of relatively short maturity. Due to competitive pressures, however, insurers are often tempted to place the assets into longer maturity investments for performance reasons. The resulting mismatched asset/liability position creates

exposure to interest rate risk. A simultaneous short position in the futures market can transform the longer maturity asset into a maturity to match that of the liability.

Although the interest rate future contract offers the advantage of flexibility as well as low transaction costs, its major disadvantage is the introduction of basis risk to the portfolio. Basis risk is introduced when the prices of the future contract and the hedged asset do not move in tandem. This basis risk which becomes a trade-off for interest rate risk should not be underestimated because the hedge often consists of a cross-hedge between government and corporate debt.

According to the survey, only 34.2 percent of the respondents indicate experience with interest rate futures. All but two of these have declared policies which provide for the derivation of weighted hedge ratios as opposed to a naive hedge ratio. Hedge effectiveness is consistently measured by achieving a zero net position. Although relatively few insurers actually implement hedge strategies with interest rate futures contracts, the strategies used by these few are fairly sophisticated. Much could be gained by a more widespread use of interest rate futures, especially since role models within the industry exist.

Of further interest is that most firms who use interest rate futures contracts do so only when justified by their economic analysis. The insurer is inclined to hedge long positions in bonds when interest rates are expected to rise. This implies an aggressive use of futures as opposed to a true hedge, although this assessment is contradicted by the fact that the hedge effectiveness is measured by a zero net position.

According to the survey, 48.6 percent of the firms use the portfolio management strategy, 60.0 percent use the future cash flow management strategy and 24.2 percent use the life policy management strategy. Insurers who did not use interest rate futures hesitated because of regulatory issues, legal and accounting snags, top management unfamiliarity with the asset, and the tainted reputation of the commodity market in general. These barriers would need to be removed prior to a widespread acceptance of this ALM technique.

Stock Index Futures

The economic justification for the stock index future is to transfer the risk, both systematic and unsystematic, associated with a portfolio of common stocks. Many strategies can hedge the price risk associated with common stock, as discussed by Figlewski and Kon (1982). While reducing price risk these strategies can limit potential profits in an underlying securities portfolio. For example, shorting the stock index future may offset losses attributed to a long position in stocks during a declining market. Nevertheless, this position will limit net gains should the stock market rise. Hence the insurer must evaluate the trade-off between reduced risk and the higher potential profit in rising markets.

The stock index future offers the advantage of temporarily offsetting exposure to stock market risk without incurring significant transaction costs. Furthermore, the stock index future allows for timely implementation. In essence, the stock index future allows the opportunity to strip excess returns generated by stock selection without assuming market risk. Stated differently, rewards come from selectivity as opposed to timing. The disadvantage with utilizing stock index futures, is that risk is not eliminated. Instead, market risk is replaced with basis risk although basis risk may be managed with more accuracy.

The survey shows that only 6.8 percent of the firms held an open position in stock index futures, however, an additional 11.0 percent would do so contingent upon their economic analysis. Although the stock index hedge has gained considerable attention, the life insurance industry is hesitant to enter this market. One reason is that their asset portfolios are primarily debt as opposed to equity investments. This portfolio structure is partly due to regulation and partly due to management decree. Nevertheless, the absolute dollar value of the 9.4 percent of total assets in equities justifies paying attention to stock index futures.

Aside from the stock index hedge, another means of controlling price risk associated with equities is the use of the principles underlying modern portfolio theory (MPT). This theory's application to the insurance industry has been well developed in previous research and summarized by D'Arcy and Doherty (1988). Nevertheless, the majority of the respondents indicate that they are totally unaware of MPT or have had limited experience with its use. Furthermore, 30.4 percent declared MPT not useful, and only 16.0 percent actually employed a mean-variance approach or geometric mean approach to MPT.

A recent extension of MPT, arbitrage pricing theory (APT), offers many advantages and fewer restrictions when compared to MPT. Although APT has gained recognition among numerous professional groups, the insurers fail to recognize its merits. With the widespread absence of an equity-based risk management process, the insurance industry may be unnecessarily exposed to the price risk of common stock assets.

Internal Coupon Stripping

Internal coupon stripping is derived from a technique used by investment banks in 1982 when creating Treasury investment growth receipts (TIGRS) and certificates of accrual on Treasury securities (CATS). To back TIGRS, Merrill Lynch bought 30-year Treasury bonds and placed them in a trust. Merrill Lynch literally strips the coupons that mature every six months and applies them to the payment of the maturing TIGRS which also are on a six-month interval. Hence a fabricated zero-coupon bond is created but without default risk.

In the life insurance industry, the advantage of a coupon stripping allocation over a traditional investment generation allocation is the flexibility to tailor asset cash flow characteristics to liability cash flow requirements.

Coupon stripping cannot be carried out effectively unless multiple life products of varying maturities (i.e., universal life, deferred annuities, and guaranteed investment contracts) are needed to produce sufficient investable cash flow and, when the yield curve is positive, to pass yield down the curve to the shorter term liability products. This is necessary when the shorter term products demand investment guarantees higher than those implied by the term structure of interest rates, as is often the case for GICS and individual universal life products. Products with longer-term liabilities willingly participate in the coupon strip because they get an asset (the strip) effectively tailored to their liabilities. In fact the strip provides cash flows that parallel the cash flows of the insurers' liabilities more effectively than any asset available in the external marketplace. Hence reinvestment risk for the longer term liability products is reduced and pricing margins for the asset/liability mismatch can be lowered. Specifically, a higher interest rate assumption can be used by actuaries in pricing these products.

Among the firms surveyed 10.8 percent currently hold stripped assets with an additional 12.2 percent doing so contingent upon economic analysis. Insurers with an operational internal coupon stripping process tend to have well-segmented portfolios. Segmentation implies that a specific asset manager is solely responsible for fulfilling the investment needs for each particular line of business without constraints imposed by other lines of business. Although initially segmentation may seem to preclude internal coupon stripping, it is important to note that these processes can be compatible. All that is needed is a cooperative effort on the part of the individual asset managers and the result will be a tool that more effectively achieves each manager's objective.

If an insurer implements an internal coupon stripping process, other issues must be managed or planned for but do not preclude the usefulness of the tool. These issues include allotments for asset default, asset sale before maturity, taxes, and prepayment of principal. These issues are frequently cited unnecessarily as reasons for not implementing an internal coupon strip. Instead, these issues should prompt enhancements to a naive stripping process. The only legitimate reason for not using an internal coupon strip process is the absence of multiple lines with varying maturities.

Interest Rate Swaps

Interest rate swaps are based upon the principle that one participant exchanges an advantage in one credit market for an advantage available to another participant in a different credit market. Hence, swaps enable borrowers to tap markets where they can obtain the best relative terms and then swap obligations to obtain the desired interest rate structure. The swap is just an agreement between two companies to exchange interest payments on a notional principal over a set period of time. No principal changes hands. The swap may be attractive to a life insurer with mismatched interest obligations on assets compared to liabilities. For example, a specific life insurer may have a relative advantage in purchasing fixed income assets yet simultaneously offer a variable rate on its liabilities. Hence, the insurer may purchase the fixed

Income asset and then swap the interest rate payments for an income stream that closely matches the obligations on its liabilities. Another example of an interest rate swap is the basis swap, whereby an insurer eliminates the exposure caused by disparities between the variable rate on the assets and the variable rate on the liabilities when the rates are tied to different indices. Interest rate swaps expose the participants to the credit risk associated with the counterparty.

The fundamental advantage of the interest rate swap is that it allows a firm to operate in the market where the firm possesses a comparative advantage while providing flexibility in servicing the obligations of the instrument. Furthermore, the market for interest rate swaps is highly liquid, having both depth and breadth. The disadvantage lies with the credit risk associated with the participants, although some intermediaries may provide guarantees.

Interest rate swaps are utilized by 40.5 percent of the respondents, however, 18.9 percent use the technique only when justified by economic analysis. The swap market is very active, yet the majority of the insurance industry remain uninvolved.

Segmentation of Assets/Liabilities

Attwood and Ohman (1984) define segmentation as the subdivision of an insurer's general account operations into segments, each with an identifiable portfolio of investments tailored to meet the needs of the products included in the segment. All investment results of a segment's portfolio are allocated to the segment. The traditional investment year method is still used for allocations among statutory lines of business included within a segment.

The following issues must be considered in selecting the number and type of segments: (1) the liability cash flow structure of insurance and pension products (2) the ability of a product or group of products to maintain sufficient funds to support the cost of maintaining a separate portfolio of investments and to permit an appropriate degree of diversity in the investment portfolio and (3) the organization and management structure of the respective insurance and pension product areas.

Segmentation offers the advantage of improved overall management since product lines are related to the capital market. Products and their marketability are influenced by capital markets. The disadvantages of segmentation are the numerous concerns associated with disaggregating the asset portfolio. For example, each segment of the portfolio must remain large enough to allow for diversification, as well as economies of scale.

The survey indicates that 75.9 percent of insurers currently segment asset/liabilities. Among the respondents with an operational segmentation policy, the average number of segments was three, but as many as seven segments were declared in two cases.

Cash Flow Projection Under Multiple Economic Scenarios

Johnson, Houle, Dixon and Hicks (1982) identify two dimensions to forecasting investment cash flows and insurance product cash flows. The first

is the liquidity dimension—the period by period projection of net cash flows over the future lifetime of a policy. The liquidity dimension is needed to reinvest positive cash flows and to reduce the variability of future cash flows by restructuring assets. The second dimension is the solvency dimension which is the discount of future net cash flows back to the present to determine whether the assets held by the company, together with anticipated investment and insurance cash flows, are sufficient to meet the company's obligations under its insurance contracts and to place a value on any sufficiency or deficiency.

An important principle of cash flow forecasting is that different life-health insurance products may have very different cash flow patterns and may be affected differently by changing economic conditions. Furthermore, the size of the cash flows, both investment and insurance, are affected by changes in the economic environment. Hence, the projection of cash flows coupled with segmentation is critical in advising management of the solvency and liquidity of each product.

Cash flow projection under multiple economic scenarios offers several advantages. First, it is necessary for compliance with recent regulatory changes. Second, it provides an environment for performing stress tests on new and existing product lines. Third, it is relatively affordable to implement since all costs are internal. The major disadvantage lies in the fact that often only seven scenarios are evaluated because the New York law specifies the evaluation of at least seven scenarios. Limiting the analysis to seven scenarios is unnecessarily restrictive and provides limited real informational value.

Cash flows are currently projected over multiple economic scenarios by 58.4 percent of the insurers. An additional 13.0 percent provide projections contingent upon economic justification. An example of economic justification would be when interest rates are changing in a volatile manner. This large percentage suggests that the industry is aware of the advantages provided by cash flow projections under multiple scenarios. Given the widespread use of segmentation, this management tool offers the potential for refinement. Hence, much remains to be done in refining the accuracy of the projection process.

Analysis of ALM Planning and Evaluation Procedures

In order to analyze planning and evaluation procedures a series of questions were posed. The questions and responses are summarized in the following subsections.

Should the Insurer Plan for an ALM Process?

Flannery and James (1984) presented evidence indicating that the effect on the common stock value given a change in market rates of interest, can be materially greater when assets and liabilities are mismatched. The research proved the importance of ALM. ALM reduces the riskiness of the insurer as perceived by the market, which in turn increases the firm's own stock value.

The current study surveys the industry's awareness and attitude towards the Flannery and James research. Specifically, 40.8 percent of the respondents are aware of the research and agree with the findings; 2.6 percent are aware of the research but disagree with the findings; and 55.3 percent are not aware of the research, and 1.3 percent provided other comments.

Almost all of the insurers who are aware of the relationship between ALM and firm value tend to agree, and consequently, most tend to aggressively pursue the ALM process. The 55.3 percent that are unaware of the impact of ALM on firm value would be expected to reconsider their policy (or lack of policy) if convinced of its relationship to firm value.

Do Outside Professionals Assist in Implementing the Asset/Liability Management Process?

The survey participants were asked which outside professionals they employ for advice when evaluating the feasibility of the ALM techniques or when planning an integrated ALM process. The most popular response (36.7 percent) was the employment of investment advisory houses. In-house staff, public accountants, and actuaries were the next most popular response. Law firms and the academic community were seldom consulted. Interestingly, a third of the firms use two or more sources for advice.

Is the Insurer Confident of the Actuary's Cash Flow Estimators?

The survey participants were asked to measure their confidence in the cash flow estimates provided by actuaries. The validity of these estimates are critical to the success of ALM. Furthermore, if the insurer places little confidence in these estimates, then ALM becomes counter-productive. Only 21.6 percent of the respondents place a high degree of confidence in the actuarial estimates; 51.3 percent are moderately confident; 6.8 percent are not confident; 20.3 percent are not routinely supplied such estimates.

The frequency of the cash flow estimates provided by the actuaries was also surveyed. Although annually was the most popular response, monthly was nearly as popular.

Who Makes the Final Decision Regarding the Implementation of an Asset/Liability Management Process?

The questionnaire asked what level of management or board is responsible for the final decision to implement the ALM process. The most popular response (29.5 percent) was the senior vice president of finance. The management staff was responsible in 24.6 percent of the cases, whereas the chief executive officer was the responsible party in 18.0 percent of the cases. The remaining 27.9 percent identified various other firm members as the responsible party.

Respondents were asked to prioritize a set of investment objectives as being most important, moderately important, and less important. The set consisted of the following objectives: maximization of return, minimization of risk exposure, matching assets/liabilities, liquidity, and effect on current statutory surplus. Separate rankings were requested for debt and equity. Results are summarized in Table 2.

Table 2
Investment Objectives

Objective	Most Important	Moderately Important	Less Important
Debt:			
Maximize Return	66.7	20.8	12.5
Minimize Risk	55.4	24.3	20.3
Match Assets/Liabilities	65.3	18.1	16.6
Maintain Liquidity	32.4	23.0	44.6
Manage Surplus	18.3	18.3	63.4
Equity:			
Maximize Return	89.7	3.4	6.9
Minimize Risk	42.1	31.6	26.3
Match Assets/Liabilities	13.5	19.2	67.3
Maintain Liquidity	20.4	24.1	55.5
Manage Surplus	52.7	14.6	32.7

The resulting rankings were distinctively different for equity assets and debt assets. Equity assets are held primarily to maximize return with less emphasis on minimizing risk. This may account for the lack of interest among insurers in stock index hedges. Debt assets, however, are held with equal importance placed upon matching assets/liabilities, maximizing return, and minimizing risk exposure. With such an emphasis on matching assets/liabilities and minimizing risk, one may question the adequacy of the ALM process for some insurers.

Conclusions and Recommendations

Conclusions

Several conclusions can be drawn from the survey results. Three of the seven ALM techniques are currently operational by the majority of the respondents: duration, segmentation of assets/liabilities, and cash flow surplus projections under multiple scenarios. All seven ALM techniques are currently operational by at least five respondents. A few role models exist within the industry. The level of sophistication with which each ALM technique is used varies among insurers. Few respondents indicate extensive use of ALM techniques and a highly integrated ALM process. Instead, most respondents indicate limited use of ALM techniques with a fragmented ALM process. The use and/or misuse

of specific ALM techniques are disbursed throughout the industry and do not necessarily depend upon an insurer's size, location, product mix or asset mix. The only exception is internal coupon stripping, which does require a diversified product line.

Most life insurers rely on the expertise of outside professionals when either implementing a specific ALM technique or when designing an integrated ALM process. These professionals include investment advisory houses, public accounting firms, and actuaries. To a lesser degree, law firms and the academic community are called upon for advice.

An effective ALM process is contingent upon reliable cash flow estimates on the liability side. The insurers declare a moderate to high degree of confidence in the liability cash flow estimates provided by the actuarial staff. Furthermore, in most cases the liability cash flow estimates are available monthly and/or quarterly. The availability of reliable cash flow estimates and the frequency of such data prepare the industry to embark upon an effective ALM process. The next step requires the design and implementation of a strategic ALM plan. The ultimate decision regarding the implementation of an ALM process usually rests with the senior vice president of finance, although the chief executive officer or management staff has this authority in many companies.

The insurance industry declares that matching assets with liabilities is a "most important" objective for its debt portfolio. Nevertheless, very little has been done to achieve this objective. The insurance industry also declares that maximizing return while minimizing risk is a "most important" investment objective for its debt portfolio. A suboptimization of these objectives must be attained. Nevertheless, through perfect matching of assets with liabilities, minimizing risk is feasible. Planned/controlled mismatching of assets with liabilities can result in maximizing return. Since neither investment philosophy has been implemented, the commitment to these objectives is questionable. Maximizing equity returns was declared as a "most important" investment objective by 89.7 percent of the respondents. Portfolio theories and ALM techniques can assist insurers in achieving this objective while allowing them to be cognizant of the risk exposure. This allows an insurer to plan/control risk and places the insurer in a preferred position as compared to haphazardly accepting equity-based risk for maximum return. The industry is currently accepting risk in its equities and at the same time failing to utilize state-of-the-art strategies for controlling/planning this risk. This is certainly unacceptable during volatile markets when much can be gained from controlled/planned risk assumptions.

Recommendations

Four modes for integrating the ALM process into the investment strategy differ in necessary resources and investment philosophies. Insurers may select a mode or a combination of modes based upon their commitment to an ALM process and their attitude towards risk. A combination of modes may be feasible if a true separation exists between an insurer's objectives regarding

debt asset and equity assets. Mode I involves ALM process with general segmentation designed to provide solvency. Mode II involves ALM process with detailed segmentation designed to provide solvency. An ALM process with detailed segmentation designed to balance the objectives of solvency with maximum return is classified as Mode III. Mode IV represents an ALM process designed to provide maximum return.

Mode I: Mode I provides for a general segmentation of accounts with the more commonplace ALM techniques applied within and among the segments, such as duration. Since solvency is the objective, the insurer would maintain a near perfect match between assets and liabilities. Through careful management only a narrow deviation between this match would be tolerated. This acceptable band would be based upon the objectives for each segment as well as the total portfolio. Hence, integration would be necessary but to a lesser extent when compared to Modes II and III. This is an active management style. Continued advancement would be ongoing in an attempt to improve the sophistication of the operational ALM techniques.

Mode II: Mode II would involve a detailed segmentation of accounts and specification of cash flows within each. Given the detail provided by segmentation, all ALM techniques could be operational within a highly integrated framework. The integration would be established in the design of the ALM process. For example, an ALM process utilizing internal coupon stripping would require close integration between segments with delayed and immediate cash outflows. A near perfect match would be maintained to achieve solvency. Again, integration would be necessary in deriving an acceptable range of matching.

Mode III: Mode III would require a detailed segmentation with a highly integrated ALM process. Mode III differs from Mode II by matching only a portion of the assets with the liabilities. This portion would be the amount needed to insure solvency and would differ among segments as well as among insurers. The residual cash flows would be mismatched, but the mismatching would be planned and controlled.

Mode IV: Mode IV would design an ALM process with the intent to mismatch assets and liabilities for the purpose of generating return. This mode may be most appropriate for managing equity assets as opposed to the total portfolio, assuming the primary objective for equities is maximum return. Solvency may be provided via the debt portfolio being managed by Modes I, II, or III.

Overall Recommendation

The life insurance industry must not delay efforts to integrate an ALM process into its investment management strategy. With new products, unstable financial markets, and the competitive nature of the industry, an ALM process is critical to the profitability, and more importantly, the solvency of life insurers. The competitive nature of the industry enhances the importance of investment operations to overall profitability. Consequently, planning and managing investment income must be a high priority.

With the exception of a few insurers, the life insurance industry is currently at an elementary stage in the development of an integrated ALM process. Most insurers recognize the advantages of ALM and many utilize two or three of the ALM techniques. Nevertheless, they lack a strategic plan for integrating an ALM process into the investment management strategy. Furthermore, the level of sophistication with which ALM techniques are implemented can be improved among most insurers.

Insurers should formulate a strategy which integrates an ALM process. The process should be integrated using the modes suggested above. In all cases, risk assumption and return would be planned, managed, and controlled. If an insurer assumes a total portfolio approach, Mode III may be most desirable, but more costly when compared to Modes I and II. Mode IV stands alone and can be applied to a portion of the portfolio such as equities. This recommendation is not intended to discount Modes I and II since resources and company philosophy may necessitate their implementation.

The important aspect of the recommendation is not which mode to select—this is a matter of management discretion and resources. Instead the pressing issue is that all insurers embark upon a plan which provides for an integrated ALM process.

REFERENCES

1. Attwood, James and Carl Ohman, 1984, *Segmentation of Insurance Company General Accounts*, (Georgia Life Office Management Association, Inc.).
2. Babbel, David F., and Joan Lamm-Tennant, 1987, *Life Insurance Industry Trends in Asset/Liability Management*, (New York: Goldman Sachs & Co.).
3. Babbel, David F., and Robert Stricker, 1987, *Asset/Liability Management for Insurers*, (New York: Goldman Sachs & Co.).
4. Carroll, Charles, 1982, *Uses of Financial Futures Contracts by Life Insurance Companies*, (Georgia Life Office Management Association, Inc.).
5. Chance, D. M., 1983, "Floating Rate Notes and Immunization," *Journal of Financial and Quantitative Analysis*, 18: 365-80.
6. D'Arcy, Stephen P. and Neil A. Doherty, 1988, *The Financial Theory of Pricing Property-Liability Insurance Contracts*, S. Huebner Foundation Monograph No. 15, (Philadelphia: University of Pennsylvania).
7. Figlewski, Stephen, and Stanley Kon, 1982, "Portfolio Management with Stock Index Futures," *Financial Analysis Journal*, 38: 52-60.
8. Flannery, Mark J., and Christopher M. James, 1984, "The Effect of Interest Rate Changes on the Common Stock Returns of Financial Institutions," *The Journal of Finance*, 39: 1141-53.
9. Fogler, H. Russell, 1984, "Bond Portfolio Immunization, Inflation, and the Fisher Equation," *The Journal of Risk and Insurance*, 51: 244-64.

10. Johnston, D. R., R. H. Houle, D. B. Dixon, and W. G. Hicks, 1982, *Asset and Liability Projections*, (Georgia Life Office Management Association, Inc.).
11. Koppenhaver, G. D., 1983, "A T-Bill Futures Hedging Strategy for Banks," *Economic Review*, Dallas Federal Reserve Bank.
12. Lamm-Tennant, Joan, 1987, "Hedge Effectiveness of Positions in U. S. Treasury Bond Futures: An Alternative Focal Point for Insurance Regulation," *Journal of Insurance Regulation*, 6: 20-34.
13. Little, Patricia K., 1986, "Financial Futures and Immunization," *The Journal of Financial Research*, 9: 1-11.
14. Macaulay, Frederick R., 1983, *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields, and Stock Prices in the United States Since 1856*, (New York: National Bureau of Economic Research).
15. Yawitz, Jess B., and William J. Marshall, 1985, "The Use of Future in Immunized Portfolios," *Journal of Portfolio Management*, 11: 51-58.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.