



SOCIETY OF ACTUARIES

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Interesting Challenges for Insurers

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Co-Editors' Commentary

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Since the original release of "Interesting Challenges for Insurers" in March 2011, interest rates have acted like an incessant game of low limbo. Just when you thought the bar couldn't get any lower, it does.

According to www.federalreserve.gov, 10-year Treasury constant maturities dropped below 2 percent on Sept. 6, 2011 and have hovered around 2 percent through mid-March 2012. The article's subject matter and helpful tips are even more relevant today than they were a year ago when the article was originally published in the March 2011 issue of Towers Watson's Insights publication. Thus, we thought it would be useful to publish this article again.

Enjoy reading and we hope the article provides insights that you can apply to your business!
Jim, Paul and Kurt

This article first appeared in the March 2011 issue of *Insights*, a Towers Watson publication.

Market interest rates and bond yields dropped in response to the global financial crisis in late 2008, and they have struggled to return to their prior levels, in part because the Federal Reserve has made efforts to spur growth and lending in a sluggish U.S. economy. The yield on 10-year Treasury notes fell in the second half of 2010 to around 2.5% (compared with 3.5% a year ago and more than 4.0% in mid-2008), before recovering to 3.3% at year-end. The recovery occurred even as the Fed announced a second round of quantitative easing (QEII, as markets call it) to buy \$600 billion of U.S. through the second quarter of 2011, a move aimed at keeping bond yields low. Markets, on the other hand, worry about inflationary consequences of such new stimulus and rushed to hedge or eliminate exposures for year-end.

Despite some recent good performance in other market sectors, life insurers continue to be concerned by continuing low interest rates, as well as by the significant uncertainty about their direction. Numerous recent analyst calls have cited lower profitability due to squeezed interest margins. The current economic environment

and associated uncertainties about the future pose a number of challenges for life insurers. Much of the business currently on life insurers' books stands to perform very poorly under either very low or very high interest rate environments. Thus, for many, the ideal situation from an interest rate perspective would be for rates to increase gradually back to more "normal" levels. However, it is not at that this scenario will play out, and insurers need to be prepared for any alternate reality.

In considering these issues, life insurers benefit tremendously by having a robust risk management framework in place. Defining risk appetite is key; companies should have a clearly articulated top-down enterprise risk appetite statement that incorporates clearly defined risk metrics.

While the impact of very low interest rates is easy for many to see, these risk metrics can be used to help identify and evaluate impacts of interest rate risk that are not necessarily intuitive—things such as the relative steepening of the curve and timing of movements, both of which can adversely affect insurers through the interplay of assets and liabilities.

One thing should be clear in the face of the current and uncertain future interest rate environment: Doing nothing and waiting for things to return to "normal" is not a defensible strategy.

Scenarios—The Bad and the Ugly

The last 20 years have seen U.S. interest rates fall steadily (Figure 1). Many economists and market gurus suggest that the future interest rate environment is unlikely to follow a clear secular trend. Fat tail risk seems to have gone up dramatically so that previously extreme scenarios now appear to be more likely to occur. Even in the very short term, the direction of rates is completely uncertain; volatility rather than trend is the order of the day. The most frequently mentioned plausible adverse scenarios for U.S. rates are these two:

- A Japan-type very low rate environment persisting for a long period of time amid a disinflation or possibly even deflation economic prognosis. This is one of the Fed's concerns, which it is trying to address with its quantitative easing program.

- An inflationary environment with a rapid resurgence in the economy (similar to what occurred in the late 1970s), forcing the Fed to reverse course in a hurry as it tries to undo the stimulus now being pumped in. This is what has concerned the market recently.

Either of these might severely test insurance company portfolios (even ignoring, for the purpose of this article, market impact in other sectors, such as credit risk, foreign exchange and equity prices).

Regardless of the forecasts (and there are probably as many forecasts out in the market as there are forecasters), it has become increasingly necessary for insurers to look at these types of extreme scenarios and to plan their portfolios for optimization under either case. To reiterate, these are:

- Interest rates stay at their relatively low level—and we may see another drop if the economic recovery falters—and remain low for a long period of time.
- Interest rates spike up suddenly across the board in line with rampant inflationary expectations.

In either of these scenarios, we may also see the shape/slope of the U.S. yield curves become dramatically tilted/bent (i.e., nonparallel shifts).

Low interest rates

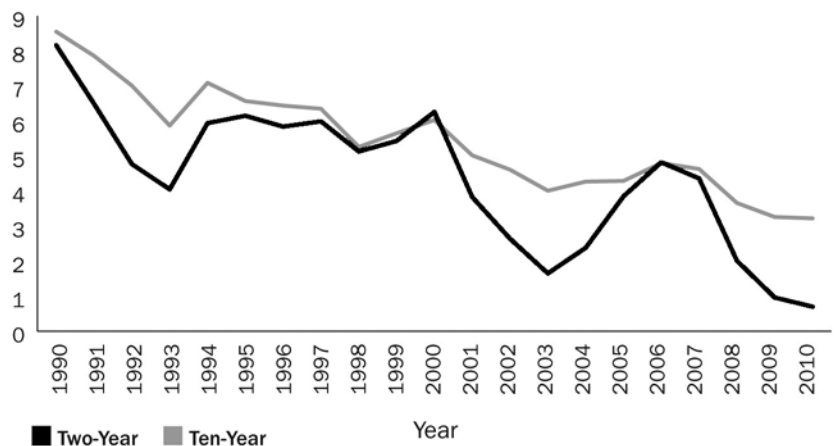
Low interest rates hit insurance companies at several levels.

- They reduce the returns from the bonds that insurers buy and significantly curtail their ability to earn attractive rates, with associated impact on profitability. This is of particular concern for products where the liabilities are “locked in,” either explicitly—such as on nonparticipating whole life, universal life with secondary guarantees and long-term care—or implicitly, such as universal life and fixed deferred annuity products where the credited rates are currently at the minimum guaranteed rate. Even on fixed products where credited rates are still above the minimum, a low sustained interest rate environment will likely lead to credited rates hitting the minimum guarantee rate in the not-too-distant future. (These issues are mitigated somewhat on existing business if assets have been closely matched with liabilities.)

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- They increase the cost of hedging equity exposures, including that of living benefit guarantees on variable annuities (VAs). Pricing of products with such guarantees generally makes provision for the cost of hedging, which fluctuates with interest rate levels. However, since these living benefit features are effectively locked in, many writers don’t have a good mechanism in place to vary prices/features with the cost of hedging. The drop in interest rates means that the fees charged for offering guarantees may be inadequate for a number of companies, leading to subpar profitability.

Figure 1. Historical Two-Year and 10-Year Treasury Rates



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The first point above relates to the fact that, at a fundamental level, a life insurance company (or at least many of the products that they commonly sell) is an extremely leveraged investment vehicle. Funds are borrowed from policyholders at rates explicitly or implicitly baked into product premium and benefit guarantees; these funds are then invested in a portfolio of assets with the aim of earning a return for shareholders that exceeds the cost of borrowing. The lower returns implied by a sustained period of low interest rates mean that, unless insurers are able to reduce their cost of borrowing, profit margins will decrease or erode completely, resulting in significant losses.

With the very real possibility of sustained low rates and bond yields, the choice that companies face on the sale of new products under this scenario is either to accept lower profits or redesign products. Insurers have, of course, dealt with low bond yields in previous economic cycles, and some have financial hedges in place at a macro level to compensate somewhat.

It is true that falling interest rates have also benefited insurers in some ways. Since yields and bond prices move in opposite directions, bond investments in

insurers' portfolios have risen in value, strengthening companies' balance sheets on a market-value basis. However, this is usually of minor consolation, if at all. In most instances, the corresponding market values of liabilities would have increased by at least as much as any increase of the assets. In the broad financial competitive landscape, it is also true that insurers are not the only ones that lose from persistently low interest rates. With short-term rates hovering near zero, low-risk money market mutual funds have trouble generating adequate returns to cover their own fees and expenses. Banks are earning low or no returns on their cash holdings. Pension funds with shortfalls between their assets and future liabilities may be in a huge hole in a few years if bond yields stay low.

High interest rates

Sharp upward spikes in interest rates can be equally damaging to life insurers. Faced with a large increase in interest rates, writers of fixed products using a credited rate concept must often increase their credited rates or face having their business fly off the books. Increasing the credited rate leads to lower interest spreads (because earned rates typically do not move up as quickly unless the duration of assets has been kept unusually short). The alternative often leads to negative cash flows, with the potential for market value losses on sale of assets. Companies that are more closely duration matched are less vulnerable to interest rate increases, although convexity risk changes the matching position (i.e., as interest rates change, the prices of assets and liabilities don't move in a linear manner), leaving companies exposed to these risks.

Even for product lines where the liabilities are locked in, the presence of negative cash flows can have an equally adverse impact; companies will have to sell assets at depressed market prices to meet cashflow needs.

Scenario Analysis Is an Important Tool Establish Risk Management Framework

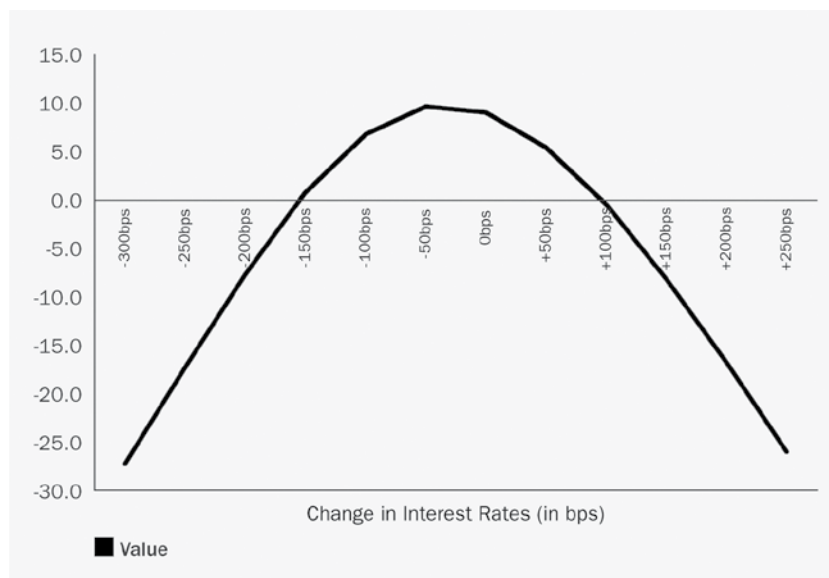
Companies that have an established robust enterprise risk management framework are better placed to assess the impact of interest rate movements and examine strategies they can undertake. There are some important considerations in developing such a framework:

- The company needs an enterprise-wide view on risk. This encompasses both how risk is interpreted (e.g., which metrics are the most important in driving decisions) and how the company's risk appetite is defined.
- For many insurers, interest rate risk limit decisions at the top of the house should include both value at risk (driving the economic value perspective) and earnings at risk (driving the accounting, book value or earnings perspective). These can then be suballocated in the form of interest rate economic risk on metrics such as duration, and interest rate earnings limits such as sensitivity to parallel shifts, nonparallel shifts, spreads and convexity. Increasingly, companies are beginning to realize that the top-level limits should be expressed not just at the high-confidence levels such as 99th or 99.95th percentiles but also at the, say, one-in-10-year earnings (90% confidence) and one-in-100-year earnings (99.9% confidence).
- Companies should determine acceptable levels of credit risk. Although not technically part of interest rate risk, credit risk is often directly linked to it. North American life insurers have historically taken on credit risk via investments in corporate bonds and commercial mortgages, supplementing this with other credit-risky asset classes, such as nonagency mortgage-backed securities. Once the real cost of credit risk is factored in, including increased risk capital levels, the risk-adjusted returns of these credit-risky asset classes may not be as high as originally anticipated.
- Determine risk capital on an aggregated and allocated basis. Examine the role that interest rate risk plays in setting capital levels. It is important to understand both how interest rate risk affects the insurer on a stand-alone basis and how it interacts with other risks, typically including credit, currency, equity and insurance risks.
- Insurers need the ability to measure and report on actual and potential risk exposures in a manner consistent with how risk is viewed and risk appetite expressed within the organization.
- Insurers should establish, equip and empower a robust risk management organization that stands independently of pricing actuaries and portfolio managers to test the compatibility of the risks they assume.

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Life insurance as a short straddle?

Because of the guarantees and policyholder optionality inherent in many of the products they sell, life insurers are adversely affected by very low and very high interest rates (or at least a sharp spike in rates). Fixed products that use a credited rate concept, in particular, have been designed so that, for moderate movements in interest rates, management can take action to maintain a reasonable level of profitability, but for sustained very low or very high interest rates, losses will result. In this sense, shareholders are in a short straddle position—having sold both a call and a put on the level of interest rates. In summary, life insurers have taken a bet that interest rates might move by a little, but not by a lot.



Need for Scenario Analysis

Virtually all life insurers perform some basic scenario analysis on interest rates through their asset-liability management (ALM) analyses and cash-flow testing. However, we suggest they extend their scenario analysis to include a wider range of possible interest rate scenarios and to examine the resultant potential impact on earnings as well as value.

- For many life insurers, earnings volatility is a significant concern, yet their risk analytics (whether on the asset or liability side) tend to be focused more on balance sheet measures such as economic value (with risk to this value being measured by required economic capital or value at risk). In these cases, there is a need to expand current analysis to measure earnings risk. One good method for this purpose is repricing gap analysis, focused on “rate maturities” of assets and liabilities, and the resultant exposures revealed as positive gaps (asset sensitive) or negative gaps (liability sensitive). At its simplest, the analysis will spread out cumulative asset liability maturity repricing gaps, adjusted for behavioral considerations and for embedded optionality, and varying credit quality in the products and hedges. These gaps must then be stressed with various scenarios for interest rates and the consequent impact on current and future period income. Specifically, analysis must be done of the “cost to close” asset-liability maturity gaps against limits on the same.
- When companies perform interest rate stress and scenario analysis, they often examine only parallel movements in curves, leaving them unaware of significant aspects of their interest rate risk exposure. Interest rate risk analysis should also look at nonparallel rate shifts that arise through tilts and bends in the yield curve, basis or spread risks that arise due to mismatches in the credit curve references across, say, Treasury, London Bank Offered Rate (LIBOR) and corporate bond curves, and convexity in the portfolios due to embedded option features.

For economic value purposes, a detailed perspective on these risks can be obtained by extending duration measures to include key rate duration and spread duration analysis. For earnings risk, this implies using the rate maturity gap modeling metric noted above to include parallel, nonparallel, spread and options analysis under different scenarios of rising and falling rates.

For earnings risk purposes, repricing gap analysis using rate maturities offers a complete, but arguably cumbersome, solution. Rate maturity gaps are different from liquidity-based maturity gaps. As a simple example of differences in maturity, consider a five-year floating rate bond tied to six months LIBOR; for purposes of liquidity analysis, this bond has a five-year maturity. However, for considerations of interest rate repricing/risk, the maturity is six months. The purpose of repricing gap analysis is first to capture an instantaneous view of where asset-liability maturity gaps exist in the future, and second to consider the earnings impact of interest rate shocks given such gaps. Four key scenario considerations need to be incorporated into such interest rate shocks:

- Parallel shifts in rates, up and down, representing one-in-10-year, one-in-100-year and five-in-10,000-year risks (i.e., corresponding to 90%, 99% and 99.95% confidence levels, and allowing for systematic comparison with economic value analysis at the same levels of confidence), as opposed to simply picking 100 bp and 200 bp.
- Nonparallel shifts in rates, of similar sizes as above, due to tilts and bends in the yield curve(s) such that asset-liability gaps at various maturities (spread out, say, quarterly for the early years and annually thereafter to full life) may be exposed to different shocks and “risk concentrations” may be exposed.
- Basis or spread risks due to different yield curves (e.g., Treasury, corporate or swap/money market) moving differently or by different amounts across maturities. The size of such shocks may be standardized to, say, 50 basis points divergence or convergence.
- Optionality/convexity effects both on the liability side (e.g., minimum interest rate guarantees) and on the asset side (e.g., mortgage-backed securities [MBS] or callable bonds). Minimum scenarios here would include the embedded options being exercised or not. Also, convexity effects may be captured

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through a direct earnings impact or in other cases through an adjustment to the effective interest rate.

Benefits of, and Actions Pursuant to, Scenario Analysis

A disciplined, systematic scenario stress-testing regime will reveal a possible range of decisions/actions. At the least, the following can be easily established:

- Exposures across the time horizon ideally can be compared with limits both on size of gaps and on potential earnings impact.
- The cost of hedging away interest rate risks can be easily established, both in future earnings and in present-value terms.
- Optimal hedging and product gap tactics can be established by taking into account all considerations.

Taking Strategic Business Action

The degree to which management can take steps to manage interest rate risk varies by type of business, depending, for example, on the extent to which policyholders share in the risk through nonguaranteed premiums or adjustable credited rates. At a fundamental level, life insurers have only a few levers available to them to manage the risks and rewards associated with interest rates. The first is in product design and new business strategy (i.e., managing the risk before it is even on the books). Once the business has been sold, the main levers available to management are the investment strategy as well as—where possible—sharing risk with policyholders through the crediting strategy. All of these should be evaluated under a coherent, well-defined risk management framework.

Product design strategies. The industry should consider making the following revisions to product design:

- Reduce the minimum guaranteed rates on fixed products, particularly on universal life contracts currently at 3% per annum or higher.
- While products with a higher minimum guaranteed rate can offer competitive advantages, the risk of a sustained period of low interest rates means that companies that do not take this step are opening themselves up to significant exposure to squeezed interest rate margins. Companies will still retain flexibility via the current credited rate mechanism to offer higher

rates if interest rates rise. Also, if assessed appropriately, the lower cost of interest rate risk could be passed on to policyholders via enhancement of other features.

- Move products that contain locked-in features to a design that allows them to change product features based on movements in interest rates (and/or other factors).
- Examples of this include products with living benefit features. These features could link or index certain aspects of design (such as the roll-up rate or the percentage payout) to the level of interest rates, changing on a periodic basis, either annually or quarterly. Even if rates stay at their slightly higher recent levels relative to near-term lows, insurers should consider moving to a linked/indexed feature; arguably a good time to introduce this is when interest rates have risen a bit and the resulting benefit level is more attractive.
- Revising other products with features not as closely connected to interest rates may be more challenging. Products with interest rate risk in the form of future renewal premiums (e.g., long-term care, nonparticipating whole life and universal life) may be better addressed via asset-based strategies, such as locking in interest rates on future cash flows via derivative contracts. For universal life products with secondary guarantees, this would likely necessitate significant revisions to guaranteed premium levels, making them less attractive. On other products, creativity will be required (perhaps leveraging off the linkage seen in participating whole life products).
- Fixed immediate annuities also have locked in designs. Here, typical industry practice is to match assets fairly closely with liabilities, although finding assets with sufficiently long maturities can be an issue. Thus the issue of low interest rates arises more on the consumer side, where purchase rates can be viewed as unattractive. Consumers may be better served in this case by using a dollar-cost-averaging approach for their purchases (i.e., buying over time).
- Consider emphasizing products that offer a greater potential for consumer return in a low interest rate environment. For example, a company could focus on indexed annuities over pure fixed annuity products.
- Current credited rates on fixed annuities are not much in excess of the guaranteed minimum rates on indexed annuities. With the potential for upside participation

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via the equity markets, indexed annuities arguably offer a better return to consumers in the current interest rate environment (particularly if both contain the same level of distribution cost—an emerging trend).

Crediting strategies. Companies will need to maintain flexibility with their crediting strategies on in-force business so they can react to various interest rate environments. In a low or falling interest rate environment, companies will naturally look to reduce their current credited rates. This is subject to the floors imposed by the minimum guaranteed rate (hence the suggestion to lower these guarantees).

The situation in a rising interest rate environment is more nuanced because companies walk a fine line between losing their earned interest spread and having their business move off the books (with the resulting potential of negative cash flows). Consequently, it's very important to understand the impacts of changes in interest rates. A rising interest rate environment makes it even more critical to understand what drives policyholder behavior and puts pressure on insurers' ability to capture this accurately through dynamic models. We have found that (with some notable exceptions) dynamic lapse formulas employed by the industry on fixed products tend to be relatively simplistic; many don't capture available industry experience and knowledge on how policyholders will likely react in varying interest rate environments. Given the current uncertainties about the interest rate environment, we believe more attention needs to be paid to these models on the fixed product side.

Asset Strategies

Insurers commonly mismatch their asset and liability repricing maturities, implicitly or explicitly. In effect they are betting on rates, although they are less ready to acknowledge such bets compared with credit, where bets seem somehow more "respectable" and easier to acknowledge, and where many insurers claim credit expertise. It is not easy to understand why insurers would be more proactive on the interest rate side as well. Be that as it may, the repricing gap analysis described earlier can at least help to pinpoint the concentration of these bets so a company can establish limits and boundaries to reconcile them to the company's overall risk appetite.

Another possible asset strategy would be to specifically seek structured assets that hedge the liability profile. More interestingly, insurers could look for pools of assets that directly reduce the gaps exposed in the repricing gap analysis so that earnings risk can be specifically hedged.

As noted earlier, insurers need to consider not only the impact of interest rate risk in isolation, but also how it interacts with other risks. To see how this can affect an insurer's asset strategy, let's consider an insurer with a sizable block of immediate annuity business. If the insurer minimizes interest rate risk by investing to match its best-estimate liability payments, it could still face an adverse balance sheet impact if interest rates change. This is due to the required capital, which — due to the adverse mortality improvements assumed in the capital calculation — usually has a longer duration than the best-estimate liabilities. Consequently, in practice we find a number of insurers lengthening the duration of their assets so that they are mismatched from their best-estimate liabilities, but the overall balance sheet impact (i.e., solvency ratio) is neutral. This highlights how important it is that insurers think carefully about the objectives for their hedging and ALM, and consider the impact of the interaction of different risks.

The Bottom Line

History may suggest that interest rates will not stay low forever, but the speed at which rates rise and how far they climb is difficult to predict. Markets are clearly uncertain about the direction of rates, especially in the near term.

In summary, to more fully protect themselves against interest rate risk, insurance companies have to do one or more of the following:

- Revise product designs to link benefits/fees/premiums (i.e., income and outgo) more directly with capital market conditions.
- Better understand the nature of the interest rate risks they are taking (including having a better handle on their policyholder behavior formulas) and be prepared to take action to bring their asset and liability portfolios in line with acceptable tolerances.
- Pursue asset strategies that are more explicitly linked to hedging interest rate risks exposed in their repricing gap analysis. □



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