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Retrospective X Factor Analysis: Is Your Company Ready?

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The National Association of Insurance Commissioner's Valuation of Life Insurance Policies Model Regulation, commonly referred to as "Regulation XXX," was developed to address the valuation practices of life insurers issuing guaranteed level premium term plans and universal life contracts with secondary guarantees. In addition, the regulation introduced a new table of 19-year select mortality factors and rules for their use with most plans of individual life insurance.

Regulation XXX introduced several new valuation concepts, including the option to use customized sets of anticipated mortality assumptions in the calculation of life insurance deficiency reserves. Customization is achieved through the application of "X factors" to the 1980 CSO valuation mortality tables with new 19-year select factors, resulting in a company — or product-specific sets of anticipated mortality assumptions (or "X factor mortality" assumptions).

The use of X factor mortality assumptions obligates the appointed actuary to annually demonstrate and opine that the company's X factor mortality assumptions meet the requirements specified in Section 5B(3) of Regulation XXX. The required actuarial opinion and supporting report are to be prepared in addition to the actuarial opinion and memorandum required by the NAIC's Actuarial Opinion and Memorandum Regulation.

Prior to December 31, 2000, the Actuarial Standards Board of the American Academy of Actuaries (ASB) is expected to finalize an Actuarial Standard of Practice providing appointed actuaries with guidance in annually assessing whether anticipated mortality (i.e., X factor mortality) meets the requirements of Regulation XXX.

Also, prior to the end of the year, the Academy's Committee on Life Insurance Financial Reporting will publish a

Practice Note summarizing general actuarial practice regarding many aspects of Regulation XXX.

Even with this guidance, a number of practical issues surrounding the demonstration of X factor mortality compliance with Regulation XXX requirements will remain for your company. These practical issues will include:

- Measurement of emerging mortality experience for each X factor class;
- Application of statistical analysis to assess the continued appropriateness of X factor mortality in light of emerging experience;
- Refinement of future X factor mortality (as necessary); and
- Preparation of the X factor mortality actuarial opinion and supporting report.

Collectively, completion of these tasks comprises a process referred to as retrospective X factor analysis.

For many companies, X factor mortality assumptions were developed by someone other than the appointed actuary (perhaps a pricing actuary, consultant, or reinsurer). This lack of familiarity with X factor mortality does not absolve the appointed actuary from evaluating the adequacy of X factor mortality assumptions employed by the company. Larry Gorski, Life Actuary in the Illinois Department of Insurance, has indicated that "hand waiving" arguments justifying X factor mortality compliance with Regulation XXX will not be acceptable to insurance regulators. Is your company prepared to address the practical challenges surrounding retrospective X factor analysis?

Emerging Mortality Experience

AS STRANGE AS IT MAY seem, not all life insurers regularly perform mortality studies on their business in force. Some



companies lack the information system capabilities necessary to gather data on lives exposed and consolidate that data from a number of administrative systems. Even with reliable data, other companies lack the actuarial resources (in terms of time commitment or technical expertise) necessary to develop and analyze a study of their company's emerging mortality experience. And, this analysis must be completed at least annually at the X factor class level and for all life business where the company has elected to use the new table of 19-year select factors.

Hopefully your company has overcome many of these barriers to accurately measuring emerging mortality experience in 2000. If this is not the case, it may make sense for your company to consider outsourcing this step of the process to one of its reinsurers or a consulting actuary.

Statistical Analysis

WITH A COMPLETE PICTURE of your company's emerging mortality experience in hand, the focus shifts to demonstrating the continued appropriateness of all current sets of X factor mortality in light of emerging experience. As discussed in the ASB's Proposed Actuarial Standard of Practice on compliance with Regulation XXX (the "Proposed ASOP"), hypothesis testing is one method available to appointed actuaries for making this demonstration.

In constructing a hypothesis test regarding the appropriateness of X factor mortality, the null hypothesis would be that X factor mortality is consistent with emerging experience in each X factor class. The null hypothesis would be

rejected if statistically significant emerging mortality experience indicated actual experience was worse than that assumed for an X factor mortality class. Hypothesis is discussed in detail in Appendix 1 of the Proposed ASOP.

The proposed ASOP makes no suggestion as to choice of significance level, and ultimately the chosen significance level must satisfy your company's regulators. In the absence of explicit guidance, a 95% significance level is often mentioned as an appropriate choice.

To perform a statistical analysis of the appropriateness of X factor mortality, the aggregate distribution of claims (both dollar amount of claims and number of claims), by X factor class and for all X factor classes combined, must be determined using X factor mortality. Several methods are available to the appointed actuary to determine the aggregate distribution of claims, including Convolution Methods, the Panjer (Recursive Definition) Method, and Monte Carlo Simulations

Convolution methods arise from the principles of risk theory and are based on convolutions of the distribution of claim amounts, given a certain number of claims. While an exact distribution of aggregate claims is determined, the number of computations necessary to achieve this result is daunting.

Harry Panjer derives a recursive method for generating the aggregate distribution of claims in his article "The Aggregate Claims Distribution and Stop-Loss Reinsurance" published in the *Transactions of the Society of Actuaries*, Volume XXXII, 1980, pages 523-545. Like convolution methods, the Panjer Method also provides a complete description of the aggregate distribution of claims, but with far fewer calculations.

Monte Carlo simulations represent the most common method used by actuaries to estimate unknown distributions, such as the aggregate distribution of claims. How many simulations, or trials, are usually necessary to suitably approximate the actual aggregate distribution of claims? The appointed actuary may

decide that as few as 1,000 or as many as 10,000 or more trials may be necessary to develop an accurate approximation.

Once the aggregate distribution of claims is either calculated or approximated for each X factor class and for all X factor classes combined, the dollar amount or number of claims at the appointed actuary's chosen significance level (e.g., the 95th percentile of the distribution) can be determined. If the actual dollar amount or number of claims for a particular X factor class exceeds this amount, the X factor mortality assumption for that class is rejected.

With any method, the appointed actuary may decide that a cap on the maximum claim amount is necessary to limit distortions in the aggregate distribution of dollar amount of claims that may be produced by very large, individual claims.

Refinement of X Factor Mortality

IF THE STATISTICAL ANALYSIS leads the appointed actuary to reject the current X factor mortality assumption for certain X factor classes, then X factor mortality must be increased. How much should X factor mortality for this class increase? At a minimum, mortality should be increased to the point that the revised assumption, when substituted as the new null hypothesis, would not be rejected. If emerging mortality experience for an X factor class is dramatically higher than originally assumed when developing X factor mortality, then the appointed actuary should consider including an explicit margin for conservatism.

As discussed in Section 3.5 of the Proposed ASOP, once the demonstration of the continued appropriateness of X factor mortality assumptions has been completed for all X factor classes (individually and in aggregate), the remaining requirements of Regulation XXX, Section 5B(3) must be met (X not less than 20%, etc.).

A few years of statistical analysis may convince the appointed actuary that emerging experience is more favorable

than initially assumed when constructing X factor mortality sets. Section 5B(3)(g) of Regulation XXX permits the appointed actuary to lower X factor mortality at any valuation date, subject to the general requirements of Section 5B(3).

Actuarial Opinion and Report

ONCE THE APPOINTED ACTUARY is satisfied that the refined sets of X factor mortality meet the requirements of Regulation XXX, an actuarial opinion and supporting report must be prepared annually. Section 4 (Communications and Disclosures) of the Proposed ASOP outlines the contents of the actuarial opinion and report, as well as documentation requirements. Unlike the NAIC's Actuarial Opinion and Memorandum Regulation, however, sample wording for the opinion is not specified. Lincoln Re has prepared a draft version of an actuarial certification and report that we will provide our clients that make use of X factor mortality prepared by the Lincoln Mortality System™. I would be happy to forward these documents to interested appointed actuaries as they consider drafting their own wording for year-end 2000. Simply send an e-mail request to LSpencer@LNC.com.

The regulatory community will likely be interested in reviewing each company's X factor actuarial opinion and report, as will your reinsurers. Be prepared to distribute these documents confidentially outside your company. It is important that appointed actuaries fully document their work supporting their conclusions regarding X factor mortality, as this work will be revisited and expanded each year-end.

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