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First Principles Modeling for LTC: A Series Summary

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Over the past year, a group of Milliman consultants—Al Schmitz, Andrew Dalton, Dan Nitz, and David Weizeorick—published a series of articles on first principles modeling for long-term care (LTC) insurance. The series of articles covered a broad and diverse set of topics, beginning with an introductory case study published in March 2016, continuing with separate installments on modeling of mortality and lapses later in 2016, and concluding earlier this year with a capstone article addressing the advantages and enhancements associated with first principles modeling. This article summarizes the key topics from that series.

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The first article in the series, “Case study: Long-term care insurance first principles modeling,” discusses some specific challenges that LTC insurers have faced as they migrate from legacy models to a first principles basis, and offers perspective on how those challenges can be overcome. Legacy models were most commonly based on a total lives approach and used claim costs. Challenges associated with moving to a first principles basis include the development of more granular assumptions—e.g., splitting claim costs into separate claim incidence rates and claim termination rates; and splitting mortality into active life and disabled life components, often in the absence of fully credible data. Depending upon the desired complexity of the first principles model, additional challenges may exist with respect to modeling transfers between sites of care, splitting claim termination rates into separate assumptions for recovery and death, etc. The first article ends on an optimistic note, observing that companies have



been successful in overcoming these challenges while being able to preserve general consistency of the first principles model with the legacy model. Companies have also experienced significant benefits from their first principles models with respect to managing blocks of business—for example, an enhanced ability to benchmark experience relative to expectations at a more detailed level that is consistent with the mechanics of how the business operates, such as tracking new claim counts.

The next article in the series, “Long-term care first principles modeling: Mortality assumptions,” discusses the modeling of mortality in a first principles setting, which was noted as a particular challenge in the first article. First principles models generally require that mortality assumptions be split into separate active life and disabled life components, whereas most legacy models may have expressed mortality only on a total life basis. The article discusses three approaches that can be used for modeling mortality. These approaches vary with respect to which two of the three components of the mortality assumption are explicitly defined (active life, disabled life, and/or total life), and which component will be implied or defined by the other two. The article discusses advantages and disadvantages of each approach, focusing on data limitations that may exist and the extent to which consistency with a previously used mortality assumption is desirable. This installment of the series concludes with some observations concerning mortality improvement, including that mortality improvement has both a different interpretation and a different financial impact

THE INDIVIDUAL ARTICLES IN THIS SERIES CAN BE FOUND HERE:

Case study: Long-term care insurance first principles modeling

(<http://us.milliman.com/insight/2016/Case-study-Long-term-care-insurance-first-principles-modeling/>)

Long-term care first principles modeling: Mortality assumptions

(<http://us.milliman.com/insight/2016/Long-term-care-first-principles-modeling-Mortality-assumptions/>)

Long-term care first principles modeling: Lapse assumptions

(<http://us.milliman.com/insight/2016/Long-term-care-first-principles-modeling-Lapse-assumptions/>)

Long-term care first principles modeling: Advantages and enhancements in modeling

(<http://us.milliman.com/insight/2017/Long-term-care-first-principles-modeling-Advantages-and-enhancements-in-modeling/>)

depending upon whether it is applied to active lives, disabled lives or total lives.

The series continues with a discussion of modeling lapses in a first principles setting, “Long-term care first principles modeling: Lapse assumptions.” As in the discussion of modeling mortality, this article presents different possible approaches to modeling lapses. Using a series of examples, the article highlights some specific challenges that actuaries encounter. One example discusses the notion of an “ultimate” lapse rate, and explores the differing interpretation it can have on an “ultimate” lapse rate based on healthy lives versus an “ultimate” lapse rate based on total lives. Another example emphasizes how mortality and lapse are related, using an example to show how a suboptimal mortality assumption can produce misleading implied lapse rates.

The series concludes with a practical discussion of the advantages and disadvantages of first principles models, “Long-term care first principles modeling: Advantages and enhancements in modeling.” This article focuses on the transparency of first principles models and the simplification that first principles models can bring to actuarial projections. While first principles models are often considered to be “more complicated” than claim cost models, the article points out that such a characterization is misleading in several important ways. It is certainly true that first principles models can be more complex with respect to developing the required assumptions. However, once developed, those first principles model assumptions can be more easily adjusted and understood than is generally possible in a total life model. The article uses a simple example of a 5 percent load to disabled deaths—such an adjustment is easy and transparent in a first principles model, while making it to a claim cost model would require significant effort to restate the claim costs.

This final article in the series also includes discussion on a general cost/benefit analysis of first principles models. While the challenges identified early in the article series should not be ignored, those challenges can be overcome and are minor compared with the benefits of first principles modeling, including transparency/ease of adjustment and the improved understanding of, and ability to manage, the business. ■



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