SOA Pandemic Model

Spreadsheet Documentation

Jim Toole, FSA, MAAA
MBA Actuaries, Inc.
(336) 768 – 8217
jim.toole@mbaactuaries.com

May 2007

TABLE OF CONTENTS

SOA Pandemic Model
Spreadsheet Documentation

1. INTRODUCTION

The attached spreadsheet reproduces the results of the exhibits contained in the report "The Potential Impact of Pandemic Influenza on the U.S. Life Insurance Industry" dated May 2007. It is not the same as the spreadsheet used to create the report; the web version has been modified to better suit the needs of individual companies to estimate the potential impact of pandemic influenza on their own inforce portfolios.

This research has been prepared to assist in understanding the potential implications of a pandemic on the U.S. life insurance industry. The SOA does not endorse the use of this work to predict the impact of a pandemic on a particular company or group. Parties interested in applying this research to individual companies should engage actuaries experienced in modeling blocks of business to ensure the reasonableness of the results. Actuaries employing the spreadsheet tool as a part of their analysis should closely examine the characteristics of their unique situation and use professional judgment in developing and applying assumptions regarding pandemic scenarios and company specific assumptions.

Documentation of the spreadsheet and additional information to support the appropriate use of the tool is outlined in the attached document. This documentation is supplementary to the writeup in Section Three of the report, which contains full documentation of the development of the assumptions used. In order to properly utilize this tool, any user of the spreadsheet must carefully read the accompanying report.

Individuals with questions, concerns, suggestions or corrections should contact the author at Jim.Toole@MBAActuaries.com.

---

2.   GENERAL INFORMATION

Items in BLUE are inputs. All other items are calculations, comments, or footnotes.

The variables are input in three front sheets (Format Vars, Scenario Inputs and Company Data), the calculations are performed in the back nine. The calculations flow from back to front.

The spreadsheet has been saved with the same scenario assumptions used in preparing the report. The data required to define an individual company insurance portfolio has been omitted. If one were to input the industry data in the report, the report exhibits would be reproduced.

It is a very simple matter to change scenario assumptions provided to reflect a company's view or generate sensitivities on matters such as the mortality curve by age, deaths per thousand, reinsurance credit percent, or the ratio of insured versus general population mortality during a pandemic. Due to the flexibility inherent in spreadsheet design, it would be a straightforward matter to include additional parameters of a company's own devising.

The calculations for each line of business are contained in three sheets: Gross, Reinsurance, and Net. The analysis is presented on a high level due to limitations on the availability of public information by product type. Intermediate steps could be added to support the needs of particular product types. The line of business results are consolidated into the "Total" sheets with the same names.

The tool has been built to support the analysis of two lines of business. The three sheets by line of business could be grouped and copied to support multiple product types or additional lines of business. This might be appropriate for companies that have concentrations in individual cash value and non-cash value multi-year term products.

Likewise, reinsurance distributions and programs may differ materially by line of business and product type, warranting additional degrees of refinement.

3.   VARIABLES AND INPUTS

The first page is a comment page. It is a blank sheet to keep track of questions, comments, and documentation as you move through the sheet. Think of it as a handy piece of scratch paper.

3.1   Formatting Sheets

The formal spreadsheet starts with three sheets of input variables. The "Format Vars" sheet contains the labeling and scaling parameters for output. The labels by scenario are input here and will display based on the scenario selected. Scale should be input as appropriate.

3.2   Scenario Inputs

The "Scenario Inputs" sheet contains all the information needed to produce the pandemic scenario. Input items are described in more detail below.

3.2.1   Scenario

The first input item is simply a variable used to select scenario based parameters (including label choices). The sheet has been set up to support two scenarios, but it would be straightforward to modify the sheet to support additional scenarios.

3.2.2   Distribution of Excess Deaths by Age

The sheet currently supports four different distributions of excess deaths by age. The "U" and "V\"[i] curves were used in the report. The flat extra death curve is a common approximation used when the distribution of inforce by age is not available. This

---

[i] Note: The "V\" is constructed from two keystrokes, capital "V" and backslash "\".

assumption might be selected to tie to other reports or to demonstrate the appropriateness of "back of the envelope calculations" versus other types of estimates.

A hypothetical "W" curve has been included which shows excess deaths at the older ages as well as increases at ages 20-40. Curves of this nature have been discussed in the literature but the hypothetical curve does not represent the experience of any particular historic pandemic.

3.2.3 Population Excess Deaths per Thousand

Users should input their assumptions for population excess deaths under the selected scenarios.

3.2.4 Reinsurance Credit Percent

Users should input their assumptions for the reinsurance credit percent under the selected scenarios. Users should refer to the published report for both an explanation of how the variable impacts the results as well as details regarding how the assumption was developed. A direct writer's reinsurance program is tailored for its individual needs and risk tolerances. The default assumptions provided in the spreadsheet were developed for the purpose of this report. They are neither indicative of the potential experience of individual reinsurers nor appropriate for use with specific insurance portfolios.

3.2.5 Ratio of Insured vs. General Population Mortality

Input the company view on the relative impact of a pandemic on their insured population versus general population mortality. The default assumptions in the spreadsheet are based on the "SOA Pandemic Delphi Mortality Study" from 2007.

3.3 Company Data

The "Company Data" sheet contains the information needed to model a company's exposure to a given pandemic scenario. The first input is the corporate tax rate which is

the assumed effective tax rate of the company. The next two items are control items and are spreadsheet sums, not input items.

The data required to define the individual line of business are contained in columns 4-7 (as labeled in the spreadsheet). Data requirements include reserve per thousand by age, the number of individual policyholders by age, the average total face amount for each individual policyholder, and the reinsurance ceded by age.

Individuals may hold multiple policies in a modeled block of business. The assumptions and calculations used in this research are assumed to tie to individuals, although it would be possible to tie assumptions and calculations to policies. It is important to tie assumptions consistently to either individuals or policies, or the results will be incorrectly stated. Depending on the mix of business, this may or may not be material.

Similarly, for the group data or any other line of business, one needs reserve per thousand, individual certificate holders, the average total face per certificate holder, and the reinsurance ceded by age.

4. CALCULATIONS

The calculation sheets are documented through footnotes. The spreadsheet calculations flow entirely from the scenario assumptions and individual company data.