AMERICAN ACADEMY of ACTUARIES

Economic Scenario Implementation Work Group
FAQ Document – For 2010 Release
March 1, 2010

The American Academy of Actuaries'[1] Economic Scenario Work Group (ESWG) released an interest rate generator, calibration criteria, and a scenario picking tool in December, 2008. For purposes of this FAQ document, the December 2008 interest rate generator along with any subsequent technical modifications developed by the ESWG is referred to as the Academy Interest Rate Generator (AIRG). The ESWG recommended that for purposes of statutory reserve and capital calculations, companies be allowed to use either scenarios generated from the AIRG or scenarios generated from proprietary generators. If using scenarios generated from a proprietary generator, the ESWG recommended that the scenario set be required to satisfy the Academy's calibration criteria.

This FAQ document was developed by the American Academy of Actuaries' Economic Scenario Implementation Work Group (ESIWG) to provide information relevant to the AIRG, with particular emphasis on use for principle-based reserve and capital calculations.

This FAQ document is current as of March 1, 2010 and the ESIWG expects to update this FAQ document as changes are made to the technical underpinnings of the generator or as the NAIC provides more direction on the use of generators and/or scenarios in statutory stochastic calculations.

1. What is the status of the AIRG? Has it been approved for use in C3P3 and VM20 reserves? Is it approved for use in C3P1 and C3P2?

   The AIRG is under review by the NAIC and is not yet approved for any reserve or capital calculation. The Academy has initiated discussions with the NAIC to establish procedures to update and approve changes to the generator process, including, but not limited to, the parameters and technical enhancements to the generator.

   The ESWG, along with the Academy's Life Capital Adequacy Subcommittee (LCAS), recommends that:

   - The AIRG replace all other interest rate generators currently in use for regulatory purposes, including the generator that develops C3P1 scenarios and the generator that develops the fixed income returns for C3P2 and VACARVM calculations.

[1] The American Academy of Actuaries ("Academy") is a 16,000-member professional association whose mission is to serve the public on behalf of the U.S. actuarial profession. The Academy assists public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.

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- Companies use either the AIRG (or pre-packaged Academy-generated scenarios) or a proprietary generator model that satisfies the Academy's calibration criteria for regulatory reserve and capital calculations.

While the Academy ESWG and LCAS recommend that proprietary generators be allowed, the November 12, 2009 draft of the Requirements for Principle-Based Reserves for Life Products – VM-20 does not permit use of scenarios generated from proprietary generators for purposes of calculating stochastic reserves. Further, the NAIC is considering modifying the mean reversion parameters in the AIRG.

2. What information on the AIRG is available?

Since early 2009, the Academy website (http://www.actuary.org/life/phase3.asp) included the following information with respect to the initial release of the AIRG:

- December 2008 Report from the Academy's ESWG that describes the development of the generator and the calibration criteria.
- Interest rate generator with parameters set to develop interest scenarios based on the September 30, 2008 Treasury curve.
- 10,000 pre-packaged interest scenarios developed as of September 30, 2008 and a subset of 1000 scenarios that meet the calibration criteria.
- Scenario picking tool that can be used to pick a subset of scenarios from the 10,000 pre-packaged interest scenarios using a significance measure method (see additional details below). The actuary will need to confirm that subsets produced from the tool satisfy the calibration criteria.
- 16 Stochastic Exclusion Test Scenarios (including both interest and equity rates for these scenarios) developed as of September 30, 2008

In late 2009, the ESWG updated the AIRG parameters to develop interest scenarios based on the September 30, 2009 US Treasury curve. These scenarios reflect the Academy's recommended mean reversion parameters and do not reflect modifications that the NAIC is considering.

The following information was posted on the Academy website (http://www.actuary.org/life/phase3.asp) in February 2010:

- 10,000 pre-packaged interest scenarios developed as of September 30, 2009 and a subset of 1,000 scenarios that meet the calibration criteria.
- Scenario picking tool that can be used to pick a subset of scenarios from the 10,000 pre-packaged interest scenario using a significance measure method (see additional details below). The actuary will need to confirm that subsets produced from the tool satisfy the calibration criteria.
- 16 Stochastic Exclusion Test Scenarios (including both interest and equity rates for these scenarios) developed as of September 30, 2009.

3. Were there any technical changes to the generator that was used to generate the September 30, 2009 scenarios?

The ESWG made a technical modification to the AIRG. The method of yield curve interpolation was changed from an approach based on historical curves, to one using the Nelson-Siegel formula. The impetus for this change was the occurrence of anomalous results when generated yield curves went outside the range of historical observations. Nelson-Siegel parameters were chosen so as to produce similar results to the historical method across a broad range of observed yield curves. Results outside observed ranges were felt to be reasonable.

4. What methods were used to pick the 1,000 scenario subset from the 10,000 scenario set?
    - The significance measure algorithm is described in the following article: Chueh, Yvonne C. M. "Efficient Stochastic Modeling for Large and Consolidated Insurance Business: Interest Rate Sampling Algorithms," NAAJ, Vol. 6, No. 3, July 2002, pages 88-103 http://www.soa.org/library/journals/north-americanactuarial-journal/2002/july/naaj0207_8.pdf.
    - The algorithm used, called the Significance Method, is described on pages 92-93 of article. The measure used was:

$$s = \sqrt{\sum_{t=1}^{T}\left[\prod_{m=0}^{t-1}\left(1+\frac{i_m}{2}\right)^{-\frac{2}{12}}\right]^2} = \sqrt{\sum_{t=1}^{T}\left[\prod_{m=0}^{t-1}\left(1+\frac{i_m}{2}\right)^{-\frac{1}{3}}\right]}$$

    - Where i_m is the monthly long rate (i.e., twenty year rate), and the measure is calculated over the entire time period of the scenario, which is 50 years.

5. Is the AIRG available with parameters set to September 30, 2009?

    No, the ESWG has not released an update to the generator with parameters set to September 30, 2009. The ESWG is currently working on enhancing the functionality of the generator to make it more user-friendly and is targeting another generator release by the end of the first quarter of 2010. In the meantime, the ESWG has posted the pre-packaged scenarios as of September 30, 2009 for testing purposes.

6. What enhancements are expected in the 2010 release of the AIRG?

    The ESWG expects that the 2010 release will be based on the same methodology and will be updated to be more user-friendly. The ESWG expects that the generator will:
    - Allow the generator to be run with different starting dates.
    - Include a Getting Started Guide that will provide information on using the generator.
    - Produce Stochastic Exclusion Test (SET) scenarios as of a specified valuation date.
    - Include equities and fixed income fund scenarios, using the models developed for C3P2, and integrated with the interest rate scenarios.

7. What generators or scenarios are currently approved by the NAIC for reserve or capital calculations and where can I find them on the Academy website?
    - The NAIC has approved an interest rate generator for C3P1 calculations. The generator is available here: http://www.actuary.org/life/phase2_2.asp. The generator is contained in an Excel file, as referenced in the section on December 2005 scenarios (an enhanced version of the C3 Phase I RBC interest-rate generator, in a zipped Excel file (revised March 2006)).
    - The NAIC has approved a set of interest rate and equity scenarios for C3P2 calculations. The C3P2 equity generator is not available, but the generated scenarios are available here: http://www.actuary.org/life/phase2 2.asp