AAA Update
C3 Phase 3 Project

Standards for Stochastic Methods Work Group
Economic Scenario Work Group
Life Capital Work Group

July 19, 2006 Presentation to LHATF

Nancy Bennett, FSA, MAAA

Chair, Standards for Stochastic Methods Work Group (SSMWG)

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Agenda

- **Update from the Standards for Stochastic Methods Work Group**
- **Update from the Economic Scenario Work Group**
- **Update from the Life Capital Work Group on the C3 Phase 3 Project**

AAA Standards for Stochastic Methods Work Group Status Report

Nancy Bennett, FSA, MAAA

July 19, 2006

SSMWG Charge

Recommend the most efficient method for supporting the use of stochastic interest rate and equity generators for the purpose of calculating capital charges (C3 Phases 1 - 4) and reserves using a stochastic methodology (i.e. principles-based life and annuity reserves.)

The operating principle of the SSMWG is that a consistent stochastic methodology should be used for the purpose of calculating RBC and reserves.

SSMWG Issues

- **Should the AAA provide predetermined scenarios or calibration criteria for the purpose of calculating RBC and reserves?**
- **How should consistency be applied when using stochastic methods to calculate reserves and capital?**
- **Should the AAA be vested with responsibility for updating the prepackaged scenarios or the calibration criteria on an on-going basis?**

Background

C3 Phase 1 Scenarios

- Predetermined scenario sets (12 or 50 scenarios) were provided to calculate the C3 capital charge for those products within the C3 Phase 1 scope.
- The scenario sets were selected from a larger set and are a biased sample in order to calculate required capital.
- The scenario sets were not selected by a random sample of 200 stochastically generated scenarios.
- The C3P1 scenario sets were provided to assist the industry in calculating RBC.
- An Enhanced C3P1 generator was released in January, 2006. The enhanced generator will produce a set of interest rate scenarios based on a specified yield curve and the same model parameters underlying the original C3PI generator.

Background

C3 Phase 2 Scenarios

- 10,000 prepackaged scenarios were provided to calculate the C3 capital charge for those products within the C3 Phase 2 scope.
- The scenarios are a representative sample generated from an equity return generator parameterized for various fund types.

SSMWG Process

- **Work Group with representatives from AAA groups (Life Reserves Work Group (LRWG), Annuity Reserves Work Group (ARWG), Variable Annuity Reserves Work Group (VARWG), Life Capital Adequacy Subcommittee (LCAS), and State Long Term Care Principles-based Work Group) and regulators meets weekly**
- **SSMWG gathered input from AAA groups, regulators, and industry for input on desired approach (i.e. does constituency prefer calibration criteria or pre-determined scenarios?)**
- **Discuss possible resources to develop and update the calibration criteria and/or pre-packaged scenarios**
  - AAA volunteers
  - Outsourcing to vendors
- **Discuss recommendations with AAA Life Practice Council, LHATF, LRBC Working Group**
- **Provide direction to Economic Scenario Work Group and other AAA Work groups.**

SSMWG Principles

- **LRWG, ARWG, Life Capital Work Group (LCWG) and Annuity Capital Work Group (ACWG) want to provide users with a number of alternative methods for generating stochastic scenarios rather than requiring one method.**
- **The SSMWG recommendations have been made in the spirit of principles-based approaches for the determination of reserves and capital.**
- **Each stochastic method has positive and negative implications, depending on the frame of reference:**
  - Level of reserves and capital
  - Flexibility for the company user
  - Ease (or difficulty) of implementation for a company user
  - Ease (or difficulty) of implementation for the LRWG, ARWG, LCWG and ACWG
  - Consequences for aggregation across lines of business
  - Implications for the future (e.g. maintaining and updating the stochastic methods)

SSMWG Recommendations

- **Alternative methods for generating stochastic scenarios**
- **Choice of risk measure**
- **Use of Scenarios**

SSMWG Working Construct: Alternative Methods for Developing Stochastic Scenarios

- **Prescribed generator, where the AAA's Economic Scenario Work Group would select the generator and specify the model parameters. It is anticipated that a company would use this generator to develop a large number of scenarios and as appropriate, would use appropriate sampling reduction techniques to reduce the number of scenarios used. Note that it would be the responsibility of the actuary to determine that the reduction techniques were appropriate.**

- **Pre-packaged scenarios, such as C3P2, where the AAA's Economic Scenario Work Group would provide a large number of scenarios and a scenario-picking tool.**

- **Proprietary generator, where the generator meets the calibration criteria developed by the AAA's Economic Scenario Work Group.**

SSMWG Working Construct: Alternative Methods for Developing Stochastic Scenarios (cont.)

- Each of these methods will produce equivalent results.
- A company could choose to use different methods for different products, since the underlying methodology produces equivalent results.
- The AAA's Economic Scenario Work Group will be responsible for providing the technical guidance for the implementation of these three methods.

SSMWG Working Construct: Pre-selected scenario sets

- **The SSMWG is not recommending the use of pre-selected scenarios (e.g. the current C3P1 approach.)**
  - Previously done for ease of implementation
  - Pre-selected scenarios are based on representative asset and liability portfolios; therefore, use of pre-selected scenarios is inconsistent with PBA.
  - Pre-selected scenarios are very time consuming to develop and maintain, requiring a significant resource commitment from the AAA.

- **The SSMWG is open to allowing the use of pre-selected scenarios, where the scenarios are developed by an individual company.**
  - Accommodation to companies who do not want to expend the effort needed to run stochastic scenarios
  - The pre-selected option could likely result in reserves and/or capital greater than the level required in the previous three alternatives.
  - Each AAA work group could be responsible for defining how such proprietary pre-selected scenarios would be developed and used.

SSMWG Working Construct: Choice of Risk Measure

- A CTE risk measure should be prescribed in the development of stochastically calculated reserves and/or capital.
- For capital calculations, a CTE 90 level has precedence and should be used in stochastically calculated capital.
- For reserve calculations, the risk measure should be defined in terms of CTE, but the level may vary (e.g. CTE 65, CTE 75)
- If an AAA work group allows the use of proprietary pre-selected scenarios, the basis for the risk measure will be CTE. However, the implementation of these pre-selected scenarios will involve the selection of biased scenarios, with appropriate weights assigned to each scenario. The selection of scenarios and weights will equate to the selected risk measure (e.g. CTE 90).

SSMWG Working Construct: Use of Scenarios

- **Each AAA work group is responsible for defining how the scenarios will be used in calculating reserves/capital.**
  - Level of user flexibility
  - Aggregation of results
  - Applicability of certification or peer review process

- **Each AAA work group is responsible for preparing a list of implementation considerations.**

SSMWG Outstanding Issues

- **Use of proprietary pre-selected scenario sets**
- **Resources available to update scenarios/generators**
- **AAA work group & company responses to implementation**
- **Regulator responses to implementation**

AAA Economic Scenario Work Group Status Report

Larry M Gorski, FSA, MAAA

July 19, 2006

Charge

- The AAA LCAS Economic Scenario Work Group (ESWG) was formed to ensure consistency between the interest rate/scenario generators endorsed by the various line of business groups. This will be accomplished by:
  - Reviewing the current parameterization of the C-3 Phase I Interest Rate/Scenario Generator
  - Modifying, if appropriate, structural features of the interest rate/scenario generator.
  - Developing Calibration Criteria for insurers choosing to develop an internal interest rate model.

C-3 Phase I Interest Rate Model

- **3 processes**
  - Monthly Log volatility of the change in the log of the 20 year UST rate (long rate)
  - Excess of the short rate (1 year rate) over the long rate (Dif)
  - Log of the long rate
- **11 parameters define the processes**
- **Processes describe the change of the variable over time**
- **Each process is stochastic, i.e., includes a random shock**

Parameter Estimation

- Analyzing historical data (Maximum Likelihood Estimation techniques)
- Understanding the forces that affect some of the parameters (prospective, perspective)
- Reviewing results (generated scenarios) from a common-sense perspective

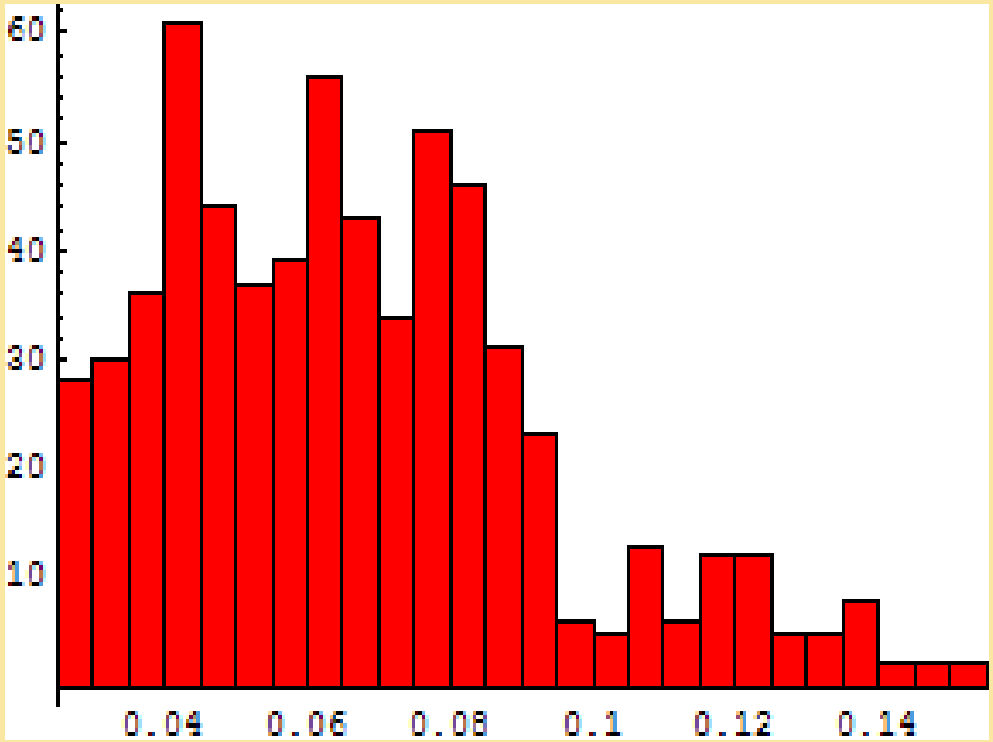
Progress Report (Parameters)

- **Retain the structure of the current C-3 Phase 1 interest rate/scenario generator.**
- **Change the long rate (20 year US Treasury) Mean Reversion Point from 6.55% to 5.4%**
- **Determine remaining parameters using Maximum Likelihood Estimation techniques adjusted to satisfy conditions concerning the dispersion of interests rates at the 20 and 30 year time horizons, frequency of yield curve inversions, and steepness of the tail of the distribution.**

Change in Long Rate Mean Reversion Point

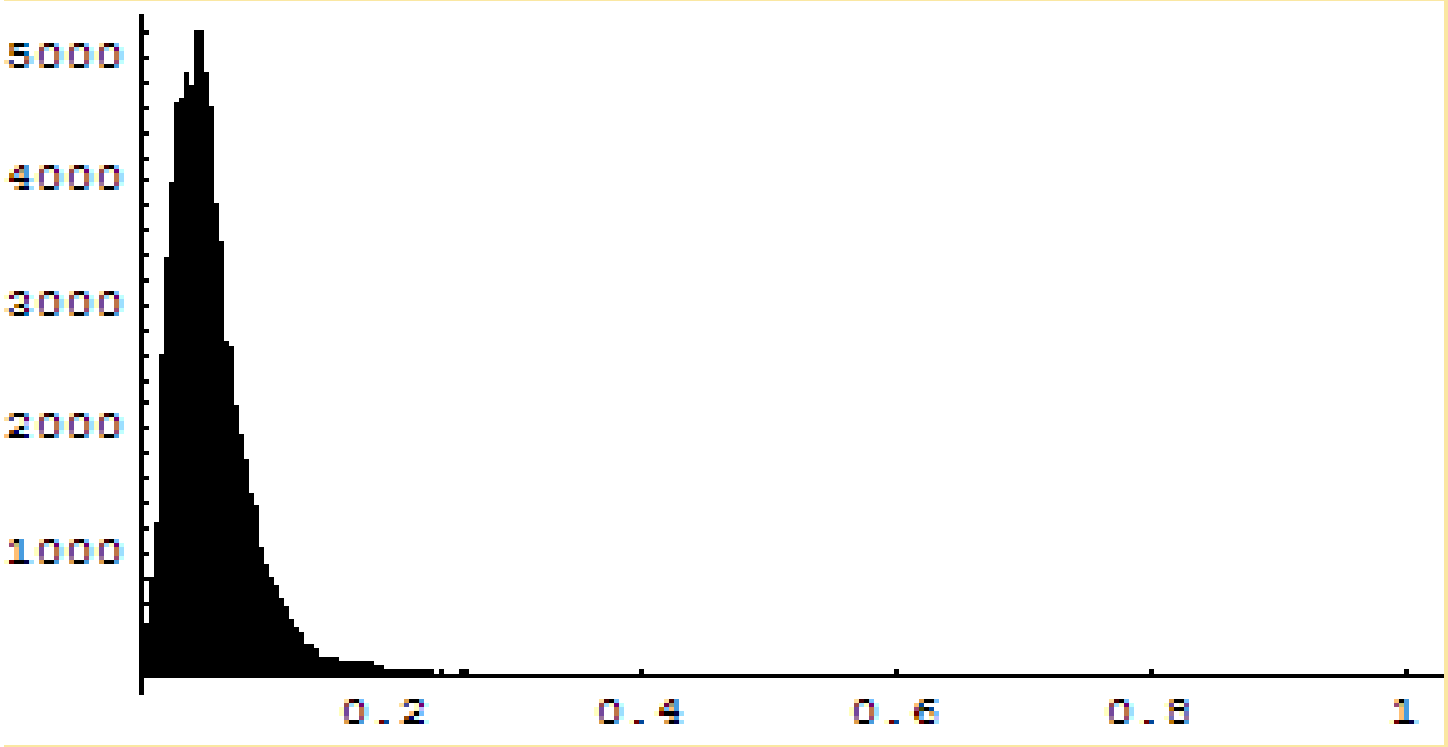
- The basis for this change is a shift in perspective from a completely historical viewpoint to a prospective view driven by an analysis of Federal Reserve Bank behaviors and objectives.
- While the MRP recommendation for today's environment is 5.4%, the ESWG believes if long-term economic and market expectations were to change in the future then the MRP recommendation would have to be reconsidered.
- These expectations include inflation, real growth, market liquidity and other risk preferences.

Distribution of Monthly Average 20 YR UST Interest Rates
GS20 -- April 53 - April 2006



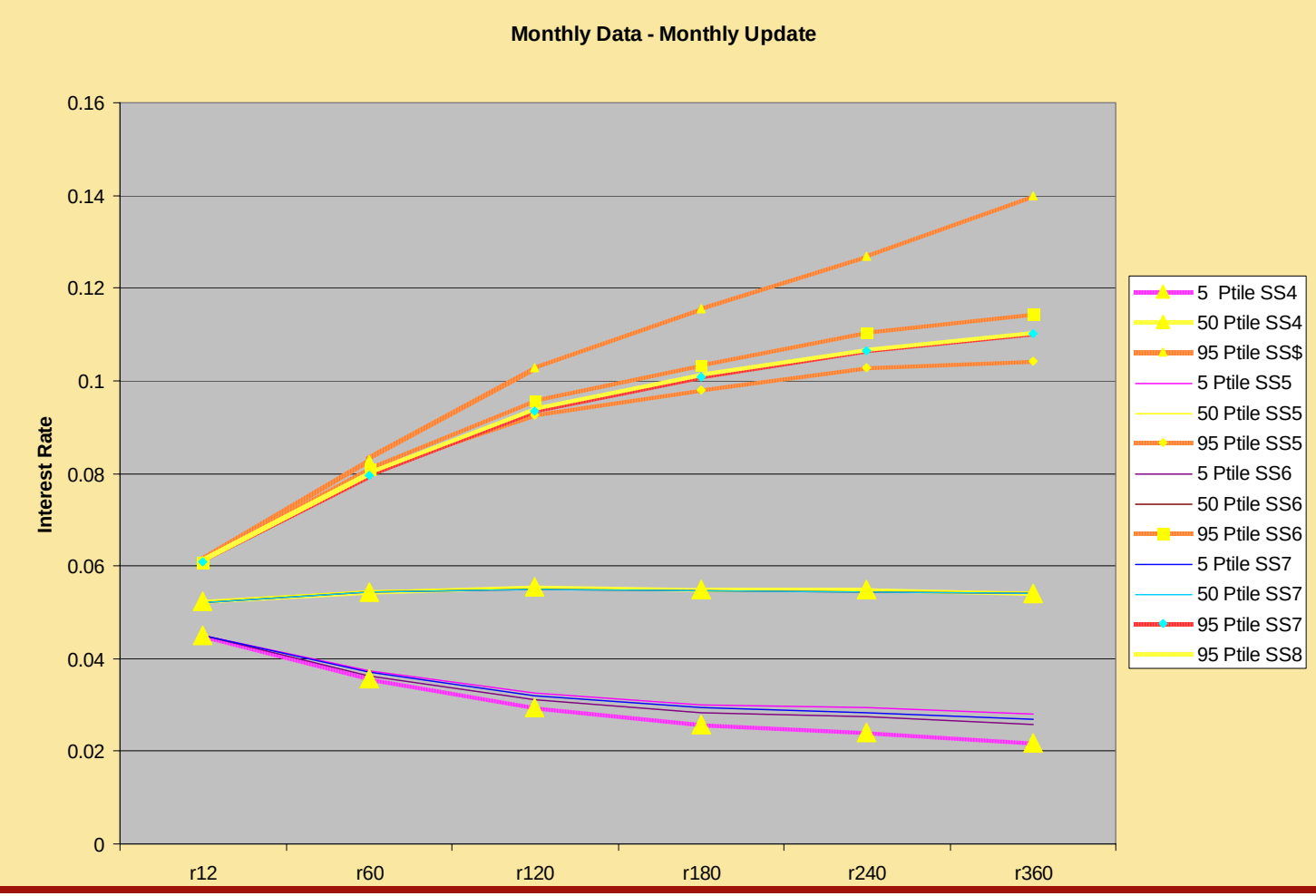
Historical GS20 -- April 53 - April 2006	
0.05	0.0306
0.1	0.0374
0.15	0.04
0.2	0.0419
0.25	0.0452
0.3	0.049
0.35	0.0536
0.4	0.0578
0.45	0.0604
0.5	0.0636
0.55	0.0674
0.6	0.0714
0.65	0.0757
0.7	0.0787
0.75	0.0814
0.8	0.0856
0.85	0.0908
0.9	0.1063
0.95	0.1216

Distribution of Modeled (Ultimate) 20 YR UST Interest Rates Scenario Set 8



Modeled(Ultimate) Scenario Set 8	
0.05	0.026
0.1	0.031
0.15	0.035
0.2	0.039
0.25	0.042
0.3	0.045
0.35	0.048
0.4	0.051
0.45	0.054
0.5	0.057
0.55	0.060
0.6	0.063
0.65	0.067
0.7	0.071
0.75	0.077
0.8	0.083
0.85	0.091
0.9	0.103
0.95	0.125

20Yr US Treasury Rate Scenarios under various Parameter Sets



American Academy of Actuaries

Life Capital Work Group
C3 Phase 3 Update

Peter Boyko, FSA, MAAA
Chair, Life Capital Work Group

LCWG Charge

The charge of the AAA Life Capital Work Group is to review and evaluate the interest rate and market risk (C3) component of the current Life Risk Based Capital framework in the context of life products valued under a principles-based reserving approach. The AAA Life Capital Work Group will work with the AAA Life Reserves Work Group and recommend changes to the Life Risk-Based Capital formula, as necessary.

- Scope of the work does <u>not</u> include review of C1 or C2 components.

C3 Phase 3 Framework: Working Construct

- C-3a Component of Risk-Based Capital = TAR - reserve
- TAR will be set at CTE(90), consistent with risk level set for variable annuity capital charge.
- TAR determination will use GPVAD calculation, consistent with the principles-based reserve methodology for life and annuity products.
- Capital charge will apply to all life insurance products inforce. No restriction to those polices in LRWG scope.

C3 Phase 3 Framework: Working Construct (cont'd)

- The stochastic interest and equity scenarios will be developed according to the SSMWG principles, consistent with other stochastic methods used to calculate reserves and capital. Note that the LRWG methodology is based on the greater of a deterministic and a stochastic calculation. The C3P3 calculation will be based solely on the stochastic methodology.
- The C3P3 calculation will explicitly incorporate interest rate hedges if used by the insurer.
- The LCWG anticipates the actuarial certification of the C3P3 results, similar to the C3P2 certification.

C3 Phase 3: Outstanding Issues

- **Handling of Single Premium Whole Life**
  - Currently, SPWL falls under C3P1
  - SPWL falls under LRWG scope, so also under C3P3?
- **Projection assumptions for inforce business**
  - Same as reserves? Same as cash flow testing?
  - Best estimate or prudent best estimate?
- **Discounting**
  - LCAS is undertaking a discounting project to ensure that a consistent methodology is used in discounting values for various capital calculations.
  - Will/should this LCAS discounting methodology differ from the discounting methodology contained in the LRWG proposals?

C3 Phase 3 Timing

- **Expose approach by December, 2006**
- **Recommend RBC formula changes by December, 2006**
- **Implement for RBC at year-end 2007?**