Objectives of LTC PBR Work Group

- Based on the initial request from the NAIC, the objective of the work group was to develop a prototype stochastic model to be used to help set the direction of PBR for LTC
- The work group has completed its work and a report was released January 21, 2016
- The report includes considerations of stochastic modeling and suggested next steps
- The model is intended to be illustrative and not inclusive of all policy features that may be offered by an insurer or inclusive of detailed modeling considerations
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The work group identified the following objectives for a principle-based model to evaluate LTC liabilities:

- Ability to quantify the degree of variability of results, expose to entire work group;
- Appropriately address the major categories of risk associated with LTC insurance;
- Account for dynamic changes of the actions taken on the policies; and
- Serves as a prototype with adequate functionality from which refined models can be developed.
Model Objectives

- **Risk categories and mitigation**
  - A stochastic model that simulates the future financial performance of a block of LTC insurance policies over a range of scenarios can produce more useful results for principle-based analysis than the traditional point estimates from a deterministic model.

- **Prototype**
  - Excel
  - Stochastic assumptions for active mortality, lapse, incidence, recovery, and disabled mortality
  - Simplifying assumptions
  - Base model does not assume management rate action in adverse scenarios
Model Description

- Model alternatives considered
  - Random walk by policy
  - Random walk by duration
  - Simulation with pre-process look up
  - Waiting time (this is the approach taken)

- Functionalities, structure, and process
  - Role of hazard rates
    - The survival rate of an event \( m \) for a short interval \( k \) can be converted to a hazard rate as follows:
      \[
      H_{x+t}^m = \log \beta P_{x+t}^m.
      \]
    - The hazard rates are additive to arrive at the total hazard rate. Thus the probability that a specific event occurs given an event is known to have occurred is:
      \[
      H_{x+t}^m / \sum_{s} H_{x+t}^s
      \]
Model Strengths and Challenges

**Strengths**
- Formulas are transparent in Excel
- Handle multiple risks in multiple states on a stochastic basis
- Can be enhanced to handle many other features such as disabled lives, policyholder behavior, etc.

**Challenges**
- Excel has limited ability to automatically distribute processing over a server farm. This caused very lengthy run times (e.g., a single trial for 6,000 policies took approximately one hour on most workstations)
- Excel workbook size limited the number of trials run at one time
- Only process risk measure
- Stochastic interest rate generators could not be easily integrated
- Validation of the model by comparison to a deterministic model was a lengthy process
Calibration of Cash Flows

Comparison to Deterministic – Inforce Block of LTC Insurance

Sample block of 6,000 policies
Data compiled by the LTC PBR Work Group for final report
Results

Distribution Characteristics of PV of Cash Flow @ 4%

- Mean 87 m
- Maximum 106 m
- Minimum 72 m
- Std Dev 5.261 m
- Skewness 0.138209
- Kurtosis 0.168010

Sample Block of 6,000 Policies

Data compiled by the LTC PBR Work Group for final report
Results

Sample block of 6,000 LTC insurance policies, CTE calculations

- CTE 0 (GPV)  87m  100.0%
- CTE 10  88m  101.2%
- CTE 20  89m  102.1%
- CTE 30  90m  102.9%
- CTE 40  90m  103.8%
- CTE 50  91m  104.8%
- CTE 60  92m  105.8%
- CTE 70  93m  107.1%
- CTE 80  95m  108.6%
- CTE 90  97m  110.8%
- CTE 95  98m  112.8%
- CTE 99  103m  117.8%

Note: CTE 90, for example, is equal to the average of the worst 10% of scenarios, each scenario cash flows discounted at 4%

Data compiled by the by LTC PBR Work Group for final report
Future Refinements and Model Considerations

- Product features

- Management rate action

- Other
  - Accommodate policy feature or benefit changes initiated by a policyholder
  - Incorporate trends (other than those related to rate increases) in the model. This includes, for example, changes in utilization pattern for claimants of policies with inflation protection features
  - Dynamically combine interest rate scenarios with liability scenarios to reflect policyholders’ behavior and expenses under various interest rate environments
  - Run disabled lives simulation as of the projection date for existing claims in a block of LTC policies
  - Accommodate combination policies
  - Excel platform

- Parameter risk – assumption variability
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