2007 SOA Annual Meeting
Washington, D.C.

Session 130PD:
Preparing for the Future: Modelling LTC

Speakers: Al Schmitz, FSA, MAAA
Paul Morrison, ASA, MAAA

Moderator: John Heins, FSA, MAAA

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Preparing for the Future: Modeling LTC

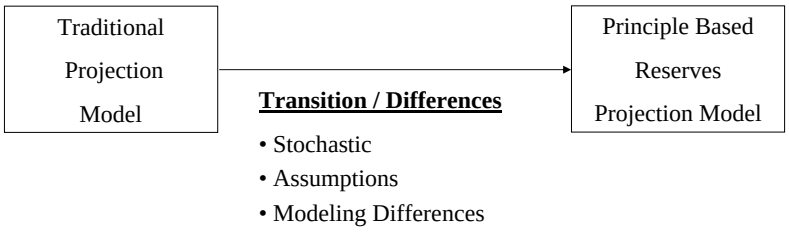
Al Schmitz, FSA, MAAA

LTC Models

- Pricing Models
- Reserving Models
- Experience Analysis Models
- Projection Models

3

LTC Models



4

Stochastic Models Introduction

LTC Risk Characteristics

- Lapse Rates
- Morbidity
  - Incidence / severity
  - Claim variability
- Mortality
- Interest Rates & Economic Environment

5

Stochastic Models Introduction

- Reflection of rate increases in future cash flows under stochastic scenarios
- Changing marketplace and government programs' impact on assumptions and products
- Margin for Rates vs. Margin for Reserves
- Limitations of experience
- Regulatory action

6

Stochastic Models Introduction

- Conditional Tail Expectation (CTE)
  - x% CTE = average of lowest (1 – x)% scenarios
  - Different CTE for reserves vs. surplus
  - Other lines of business

7

Assumptions

Traditional Projection Model

- Morbidity
  - Own experience
  - Outside sources
- Persistency
  - Published mortality table
  - Own experience
- Investment Income
  - Long term rate
- Expenses
  - Own experience
- Rate Increases
  - Approved increases
  - Future increases

8

Assumptions (Stochastic)

Principle Based Reserve Model

- Morbidity
  - Need for industry table
  - Adjusted for own experience
- Persistency
  - Industry vs. own experience
- Investment Income
  - Stochastic interest rate scenarios
- Expenses
  - Own experience
- Rate Increases
  - Future increases

9

Modeling Differences

Incurred Claims

Traditional Projection Model

Many Variations

- Incidence rates / termination rates
- Incurred claims / runoff factors

Principle Base Reserves Projection Model

- Incidence rates / recovery rates / death rates

10

Modeling Differences

Lives / Exposure

Traditional Projection Model

Many Variations

- Total lives – many adjustments needed
- Active / disabled lives
- Benefit exhaustion

Principle Base Reserves Projection Model

- Active / disabled lives

11

Additional PBR Model Considerations (From Issues Subgroup)

To Be Included in Stochastic Model

- Allow for premium rate changes
  - Focus on unscheduled premium rate changes
  - Timing of changes at discretion of writing company
    - Trigger point for premium rate action defined in model
    - Reaction time
    - Effectiveness of filed premium rate increases
    - Premium rate actions may vary w/ intensity of management oversight and amount reinsured
    - May depend on whether or not company is writing new business
    - May include appropriate premium rate actions

12

Additional PBR Model Considerations

To Be Included in Stochastic Model

- Allow for premium rate changes (cont.)
  - Policyholder behavior at time of rate increase notification
    - Anti-selective lapses
    - Policyholder optional benefit reduction offers
    - Non-forfeiture offers at time of premium rate increase

13

Additional PBR Model Considerations

To Be Included in Stochastic Model

- Allow for Interest Rate Scenarios
  - Include traditional impacts on asset earned rates and insurance liabilities
  - May include impact on policyholder behavior
    - New market entrants and competition re-prices to lower premium rates
    - Anti-selective shock lapses for existing business
    - Reduced need for premium rate increases on existing business
    - Mandatory decrease in premium rates for existing policyholders
    - Over-insurance and induced utilization of covered benefits
    - Impact of interest rate variability on existing business limited by financial hedging strategies

14

Additional PBR Model Considerations

To Be Included in Stochastic Model

- Allow for Scenarios that Include Unanticipated Changes in Morbidity or Benefit Utilization Patterns
  - Account for possibility of shift in claim cost curve
  - Examples of factors that could result in changes in morbidity:
    - Greater utilization of lower intensity services
    - Services become more attractive to compete for business of seniors in need of assistance
    - State or federal action resulting in increased availability of long-term care facilities or services

15

Additional PBR Model Considerations

To Be Included in Stochastic Model

- May Consider Regulatory Intervention
  - Upon reasonable expectation of new regulation, impact of regulation could be modeled in future results
  - Examples:
    - Mandated coverage for new services
    - Changing interpretation of law or regulations
    - Federal or State action to increase / decrease governments share of LTC coverage
  - Consider precedent of retroactive application of new regulations
    - Rate stability requires disclosure of past increases
    - Florida HB 947

16

Additional PBR Model Considerations

To Be Included in Stochastic Model

- May Consider Morbidity and / or Mortality Improvements
  - Measurable "population" impact not directly applicable to insured data
    - Varies by underwriting style
    - Socioeconomic selection
  - Impact of treatment "breakthroughs" or cures for important senior health conditions
  - Is it possible that morbidity or mortality improvement can exist in isolation?
  - Lower level of claim incidence may be accompanied by longer length of claim

17

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Stochastic Models Introduction
LTC Risk Characteristics

- Lapse Rates
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19

Stochastic Models Introduction
LTC Other Concerns

- Reflection of Rate Increases in Future Cash Flows under stochastic scenarios
- Changing marketplace and government programs' impact on assumptions and products
- Margin for Rates versus Margin for Reserves differences
- Limitations of experience
- Anticipated limits on interest rate assumptions and regulatory action

20

Long Term Care PBS Technical Work Group

- Chair: Al Schmitz, Milliman
- Specify Model Requirements
- Design, Develop and Test Model
- Analyze Results
- Monitor and Support LRWG and LRWG Modeling Subgroup
- Coordinate with SVL2 Economic Scenario Group

21

LTC Technical Work Group Considerations and Progress

- Consider potential management action
- Ease of ability to program the multi-stochastic-variable LTC product lines
- How much variance is acceptable?
- # of trials to run to establish the proper reserve and capital levels

22

LTC Technical Work Group Modeling Stage

- Non-Excel models not viable
  - confidentiality issues
  - portability
- Launching pad: Excel-based Cash Flow projection model developed by Jim Robinson, independent consultant
- Must consider business segmentation

23

LTC Technical Work Group Modeling Stage – Method 1

Random Walk by Policy

Process a single policy through every time interval

A random number at the beginning of each time interval tests the policy's probability of a change in status within the time interval

Move to next policy

24

LTC Technical Work Group Modeling Stage – Method 1

- Easy to understand
- Easy to program
- Difficult to implement management action
- Potentially long execution time

25

LTC Technical Work Group Modeling Stage – Method 2

Random Walk by Duration

- Process a single time interval through every policy
- A random number at the beginning of each time interval tests the policy's probability of a change in status within the time interval
- Move to beginning of next time interval

26

LTC Technical Work Group
Modeling Stage – Method 2

- Similar to Method 1
- Easy to understand
- Easy to program
- Easier to implement management action
- Still has long execution time

27

LTC Technical Work Group
Modeling Stage – Method 3

Stochastic Simulation using Database Lookup

- Pre-process all possible result paths and store in a database
- Generate one random number for each policy and use it to select the result path from the database

28

LTC Technical Work Group Modeling Stage – Method 3

- Similar to Method 1
- Reduces run time for the simulation
- Pre-processing will likely increase overall run time but it is only done once
- Database will be quite large
- Management action would be difficult to implement
- Paths do not have equal probability

29

LTC Technical Work Group Modeling Stage – Method 4

Waiting Time Model

Suggested by Eric Stallard, Research Professor, Duke University

Generate two random numbers for each policy

- The first determines the time of the next change in status
- The second determines what the status change is

30

LTC Technical Work Group
Modeling Stage – Method 4

Waiting Time Model (con't)

Relies on the hazard rate function:

$$ {}_{k}H_{x+t} = -\log {}_{k}p^{r}_{x+t} $$

Assuming independent probabilities:

Total Hazard Rate = Σ Individual Hazard Rates

31

LTC Technical Work Group
Modeling Stage – Method 4

- Similar to Method 1
- Reduces the number of trials for every policy
- Reduces the run time for the simulation
- Allows for management action
- Less intuitive
- May require software other than Excel

32

LTC Technical Work Group
Modeling Stage – All Methods

- Most assumptions are based on the policy year while some are based on calendar year
- The policy year survival function is normalized to a calendar year valuation date
- Interpolation methods used for normalization can also be used to choose the exact event timing within the calendar year interval

33

LTC Technical Work Group
Modeling Stage – All Methods

- Secondary and tertiary events
- The stochastic liability cash flow is not the end product

34

LTC Technical Work Group Modeling Stage – Preliminary Results

- Prototypes for initial stage of Models 1 & 4
  - Follows policyholder to first event
  - Records the time and type of event
  - Monthly approach to Model 4

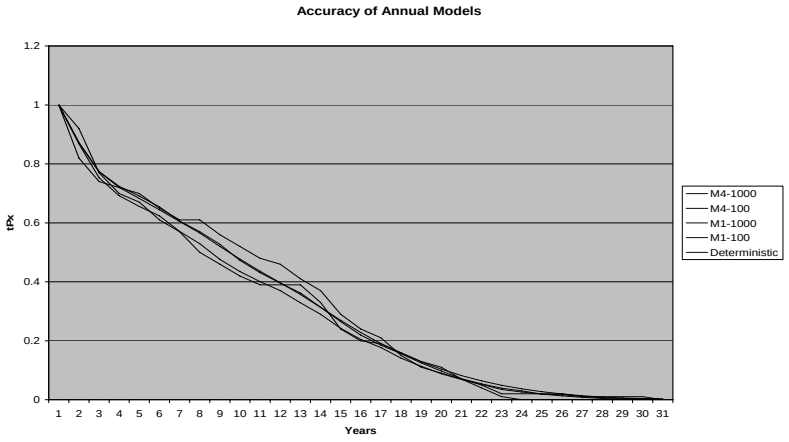
35

LTC Technical Work Group Modeling Stage – Preliminary Results

- Run Time Benchmarks
  - Pure result is meaningless without full context
  - Model 1 is 2.8 times slower than Annual Model 4
  - Monthly Model 4 is 3.6 times slower than Annual Model 4
  - Scaling factor is < 1

36

LTC Technical Work Group Modeling Stage – Preliminary Results



37