Session 6, Confronting Assumption Setting Challenges

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**Presenters:**
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Assumption Setting Process
August 31, 2015
Assumption Setting Process

Assumption Governance

- Purpose, Scope, and Extent
- Setting and Review
- Approval, Implementation, and Documentation
Polling Question - #1

• What is your company’s main product line?
  1. Life insurance
  2. Annuities
  3. Health insurance
  4. Other
Polling Question - #2

- Does your company have a formalized assumption setting process?
  1. Yes, had it for years
  2. Yes, but it’s a new process
  3. No, but work in progress
  4. No, and no plans
  5. Other
  6. N/A
Assumption Purpose, Scope and Extent

• Model Purpose
• Assumptions in Scope
• Types of assumptions and level of granularity
  – Mortality improvement
  – Policyholder behavior
  – Economic assumptions
• Frequency
Polling Question - #3

• How often do you update your best estimate assumptions?
  1. Less than once a year
  2. Once a year
  3. More than once a year
  4. Never
  5. Other/NA
Assumption Setting and Review

• Generally based on experience

• Source of data
  – Company specific experience study
  – Industry or market data
  – Regulator’s prescribed information

• Analysis of Data and Calculation
  – Statistical calculations
  – Credibility Blending
  – Controlled and repeatable process
Assumption Setting and Review (continued)

• Judgment is often required in interpreting the experience data and setting assumptions
  – Mapping of experience to assumptions
  – Trends vs. random variances
  – Macro external factors
Assumption Setting and Review – Consistency

• What is a “best estimate” assumption?
• Consistency in assumptions:
  – Across reporting bases (gaap, stat, capital etc.)
  – Across functions (pricing, valuation, ALM, forecast etc.)
  – Across lines of business
  – Across business units
  – Across country units
  – Across model types (deterministic vs. stochastic)
  – Across different modeling platforms
Assumption Approval, Implementation, and Documentation

• Assumption Approval
  – Expert judgment
  – Management actions
  – Deviation from experience data

• Implementation
  – Controlled process
  – Impact of assumption changes
  – Regression testing on assumptions (e.g. waterfall)
  – Change management

• Documentation
  – Assumptions inventory
Contact Details

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Assumption Setting – Emerging Issues
Governance
Big Data
Harold Luber, FSA, MAAA, CERA
ASSUMPTION GOVERNANCE: OUR EXPERIENCE
Who owns your assumptions?

• The Board of Directors?
• The CEO?
• The CFO?
• The Chief Actuary?
• Subject Matter Experts?
• The first-year actuarial student putting together the experience study and making a recommendation?
Answer: The Assumption Committee

• AXA US has developed a comprehensive system of delegated responsibilities devolved from the Board of Directors

• The Assumption Committee has been delegated as the body responsible for setting experience-based actuarial assumptions used in EEV, GAAP and IFRS reporting

• Committee is chaired by Chief Actuary
Assumption communication

• Assumption grid = comprehensive list of all assumptions:
  – Owner
  – Date last updated
  – Brief summary of assumption
  – Any deviations across accounting basis
  – Moderately adverse assumption used for statutory testing
  – Solvency II shock

• Assumption grid and documents are stored in a central location accessible to all relevant parties
  – Options include intranet or central share drive
  – Hyperlinking should be used, but needs to be easy to set up
  – Try not to use e-mail
Assumption document template

• The assumption documentation follows a pre-defined template:
  – Methodology used
  – Source of data
  – Results of analysis
  – Assumption recommendation
  – Judgment required
  – Comments on data quality
  – Comparison to industry benchmarking
  – Financial impacts

• Allows for easy compliance with ASOPs 7, 23, 41
Levels of Authority

• While the Chief Actuary chairs the committee, the Board has delegated authority based on the impact of the assumption change
  – Chief Actuary: $x m
  – CFO: $y m
  – CEO: Unlimited

• Appointed Actuary remains solely responsible for assumption used for cash-flow testing, AG43, etc.
  – Best estimate assumptions give a solid starting point for development of “moderately adverse” assumptions
BIG DATA AND ASSUMPTION
SETTING: SOME INITIAL THOUGHTS
What is big data?
What is big data?
What is big data? 4 V’s

- Variety
- Volume
- Veracity – ASOP 23
- Velocity – more of a concern in marketing

And…. Non-traditional analysis
The FOUR V's of Big Data

Volume
- Scale of Data
- 40 Zettabytes (3.4 QuintillionBytes) of data will be created by 2020, an increase of 360 times from 2010.
- 6 billion people have cell phones.
- World population: 7 billion.

Velocity
- Analysis of Streaming Data
- The New York Stock Exchange captures 1 TB of trade information during each trading session.
- Modern cars have close to 100 sensors that monitor items such as fuel level and tire pressure.
- By 2016, it is projected there will be 18.9 billion network connections—almost 2.5 connections per person on earth.

Variety
- Different Forms of Data
- As of 2011, the global size of data in healthcare was estimated to be 150 exabytes (12.5 quadrillionBytes).
- By 2014, it's anticipated there will be 420 million wearable, wireless health monitors.
- 4 billion+ hours of video are watched on YouTube each month.
- 30 billion pieces of content are shared on Facebook every month.
- 400 million tweets are sent per day by about 100 million monthly active users.

Veracity
- Uncertainty of Data
- By 2016, 4.4 million IT jobs will be created globally to support big data, with 1.9 million in the United States.
- 1 in 3 business leaders don't trust the information they use to make decisions.
- Poor data quality costs the US economy around $3.1 trillion a year.

Sources: McKinsey Global Institute, Twitter, Cisco, Gartner, EMC, SAS, IBM, MEPTEC, GIG.
Variety and Volume for Life Insurers

• In addition to traditional decrement data....

• Internal data
  – Full admin system data / transaction data
    • Can premium patterns predict lapse?
  – Underwriting systems / application data
  – Call center data
  – Think OCR to open up older data sources

• External data
  – Company-owned marketing databases
  – Weather data
    • Does extreme cold lead to additional insured deaths?
Problems with traditional analysis

• Traditional actuarial analysis looks at experience across dimensions
  – Example: Mortality by channel, duration, rating class

• Looking across single dimensions makes it difficult to identify the true causes of deviation
  – Female mortality is higher than male mortality
  – Higher face amounts have higher mortality than low ones
  – Which factor is driving the results?

• Looking across multiple dimensions quickly reduces the credibility of each cell
Examples of advanced analysis

• Random forests and other machine-learning tools start from an unbiased view and discover the key drivers of results

• Generalized linear models allow the actuary to identify which variables have the largest impact on the final results

• Clustering gives a better view of homogenous groups beyond traditional methods
Areas of concern - data

• Quality of third-party data
  – Do you know who input the data?
  – Are you sure what the data means?

• Consistency of data sources
  – Are you talking about the same person?
  – Has the data been refreshed
    • Do you want the original or refreshed data?

• Privacy issues (HIPAA)
Areas of concern - analysis

• Credibility of findings
  – Don’t take the first model result as the absolute truth
  – Need to validate results vs. traditional analysis

• “Overtraining” models on data = validity of model
  – You need training and test data sets!
  – Cross-validation

• Communicating results to management
  – Especially if they are looking to find something to justify their investment in Big Data
  – How does this impact the business?

ASOPs still work with Big Data!
Session 6

Confronting Assumption Setting Challenges

Lessons from Industry Experience Studies and Ten Years of Annuity PBA

Timothy Paris
Ruark Insurance Advisors, Inc.

August 31, 2015
8:00-9:30am
7 Lessons
Cleansing Pays
1/3  ~100%
Range and Tails
VA Surrenders

Surrender Rate

ITM 100+%  
ITM 50 - 100%  
ITM 25 - 50%  
ITM 5 - 25%  
ATM  
OTM 5 - 25%  
OTM 25+%  

Years Remaining in Surrender Charge Period

7 or more 6 5 4 3 2 1 0 -1 -2 -3 or more
The Luxury
We Do Not Have
VA Surrenders

Years Remaining in Surrender Charge Period

Surrender Rate

2008 2009 2010 2011 2012 2013 2014
Explore and Surprise
VA Mortality

- Actual / Expected
- Death benefits
- Living benefits
- Aggregate
VA Surrenders and Partial Withdrawals Interaction

Years Remaining in Surrender Charge Period

- 7 or more
- 6
- 5
- 4
- 3
- 2
- 1
- 0
- 1
- 2
- 3 or more

Surrender Rate

Legend:
- No Prior WDs
- LT Full WDs
- Full WDs
- Excess WDs
VA Partial Withdrawal Amounts

Older Ages

- Full
- Less Than Full
- Excess
Speed
Surrender rates declined noticeably, by as much as half, during the onset of the economic recession and have not returned to prior levels.

- Ruark, October 2010
Aggregation and Credibility
VA Surrenders by Company

Surrender Rate vs. Years Remaining in Surrender Charge Period

Societal Actuaries

Valuation Actuary Symposium
VA Surrenders by Company

GLWB Spike Lapse
ITM 50-100%
Great Craftsmen
Traditional Analysis

Statistical Techniques
Logistic Regression – Multiple Factors for VA Surrenders
### Ruark - Sample Logistic Regression Model for Policyholder Behavior (Surrenders)

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<th>Coefficient</th>
<th>Std Dev</th>
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**Example:** Consider a policy with YrsRem = 1, ITMGrp = 25, Dist = 2

\[
B = -0.6530 + -0.5101 + -0.5560 + -1.8700 = -3.5891
\]
\[
\text{Odds} = e^B = 0.0276
\]
\[
\text{Probability of Surrender} = \frac{\text{Odds}}{1 + \text{Odds}} = 0.0269
\]
Industry Data

Traditional Analysis

Statistical Techniques

Expert Judgment
Optimization hinders evolution.  

*Alan Perlis*

Statistics are no substitute for judgment.  

*Henry Clay*
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