

Introduction to VBT Analysis Process



SOCIETY OF
ACTUARIES®



AMERICAN ACADEMY of ACTUARIES

Objective. Independent. Effective.™

Academy Life Experience Committee and SOA
Preferred Mortality Oversight Group (“Joint
Committee”)

Agenda

- Monitoring 2015 VBT for when to modify
- Metrics to be reviewed
- Triggers for action
- Potential corrective actions
- Next steps



Monitoring 2015 VBT for Need to Modify

- In VM-20, Section 9.C, companies are required to use an Industry Mortality Table for determining their prudent best estimate mortality.
- The industry mortality table is currently based on the 2015 VBT and corresponding RR Tables, advanced forward to the valuation date using prescribed mortality improvement factors published by the Society of Actuaries (SOA).

Monitoring 2015 VBT for Need to Modify, cont'd

- Once PBR is mandatory, there will be a significant increase in the number of contributing companies and amount of exposure and claims via the mandatory data collection within VM-51.
- The “Joint Committee” is recommending a method based on analytics to determine when there is sufficient change in the underlying mortality relative to the experience to warrant changes to the table.

Metrics to Be Reviewed

- Confidence Intervals (CI) based on normal distribution
 - CI of expected deaths vs. actual deaths
 - CI of A/E's vs. 100% reference
 - Proposed 95% CI; can be parameterized
 - $|A-E|$
- Amount based only
 - VBT based on amount-based experience
- Test 3rd moments to test if statistically $\neq 0$
- Track/check Bühlmann coefficients based on recent data



New Calculated Fields—to Be Added to Individual Life Mortality data

- Expected deaths and A/E's with and without mortality improvement adjustment to current observation year
 - Based on 2019 YE VM-20/AG38 mortality improvement factors
- Components to calculate Variance
 - By count and amount
 - To be used in CI calculation (normal distribution)
 - Will facilitate Limited Fluctuation and Bühlmann Credibility calculations
- Components to calculate 3rd Moment
 - By count and amount
 - May be used in a future, enhanced CI calculation that takes skewness into account; current limitations in software capabilities and budget prevent this today



Data Partitions for Review

- Determine how many years of data to use
- Will partition and review CI's and |A-E| of data by
 - ▣ Face amount bands
 - ▣ Gender
 - ▣ Age groups—quinquennial age groups for oldest attained ages
 - ▣ Duration groups
 - ▣ Nonsmoker/smoker status; will consider going down to preferred levels but lack of credibility may preclude this
- Each partition will be fully credible (~5,000 claims) based on frequency and severity



SOCIETY OF
ACTUARIES®

© 2019 Society of Actuaries. All rights reserved.



AMERICAN ACADEMY of ACTUARIES

Objective. Independent. Effective.™

© 2019 American Academy of Actuaries. All rights reserved.
May not be reproduced without express permission.

Trigger for Action

- Determine total number of partitions
- Determine total number of partitions outside CI
 - |A-E| by amount results used to determine materiality
- If number outside CI greater than expected, action needed by VBT team
- For example, if using 95% CI and 200 partitions
 - 10 partitions should be outside of CI; 5 above and 5 below
- Monitor trends, if nearing the limit—create watchlist, may do additional analysis



Potential Corrective Actions on Current VBT

- Slope adjustments using multiplicative factors
- Adjustments to mortality improvement factors
- New VBT developed
- |A-E| by amount results used to prioritize areas of the VBT to adjust

Software

- Recommend Tableau as delivery platform for data and calculations
- Benefits of Tableau
 - VBT team able to work with large ILEC datasets
 - CI calculations can be added using new calculated fields
 - Grouping feature can be used to create partitions of the data
 - Create visual displays of the data and areas of concern
- Current Limitations of Tableau
 - CI calc with skewness requires a new 'R' function to be developed and a Linux server. Will complete a proof of concept in 2020 and determine whether to proceed with a future implementation.

Next Steps

- Provide MIB and NAIC with request to add new calculated fields and complete Bühlmann calculations
- MIB to add new fields to 2009–2017 data
- NAIC to add new fields to 2015 test data and 2018+
- Complete Tableau calculations and visualizations in first half 2020
- Present to LATF in Summer 2020



Appendix



© 2019 Society of Actuaries. All rights reserved.



AMERICAN ACADEMY of ACTUARIES

Objective. Independent. Effective.™

© 2019 American Academy of Actuaries. All rights reserved.
May not be reproduced without express permission.

New Calculated Fields

FA = face amount
 XPO_C = exposure on a count basis
 q = expected qx from the 2015 VBT
 MI=2019 mortality improvement factors for AG38 & VM20; varies by gender and age

| Variable Name | Description | Formula | |
|------------------------------|---|---|----------------------------------|
| 1 ExpDeathQx2015VBTwMI_byPol | Expected Deaths - Count - w/MI | $XPO_C * q * ((1-MI)^{(ObservationYear-2015)})$ | |
| 2 ExpDeathQx2015VBTwMI_byAmt | Expected Deaths - Amount - w/MI | $XPO_C * q * ((1-MI)^{(ObservationYear-2015)}) * FA$ | |
| 3 2CenMomP1wMI_byAmt | 2nd Central Moment - Amount - w/MI - Part 1 | $XPO_C * (q * ((1-MI)^{(ObservationYear-2015)})) * (FA^2)$ | |
| 4 2CenMomP2wMI_byAmt | 2nd Central Moment - Amount - w/MI - Part 2 | $XPO_C * ((q * ((1-MI)^{(ObservationYear-2015)}))^2) * (FA^2)$ | |
| 5 3CenMomP1wMI_byAmt | 3rd Central Moment - Amount - w/MI - Part 1 | $XPO_C * (q * ((1-MI)^{(ObservationYear-2015)})) * (FA^3)$ | |
| 6 3CenMomP2wMI_byAmt | 3rd Central Moment - Amount - w/MI - Part 2 | $XPO_C * ((q * ((1-MI)^{(ObservationYear-2015)}))^2) * (FA^3)$ | |
| 7 3CenMomP3wMI_byAmt | 3rd Central Moment - Amount - w/MI - Part 3 | $XPO_C * ((q * ((1-MI)^{(ObservationYear-2015)}))^3) * (FA^3)$ | |
| 8 2CenMomP1wMI_byPol | 2nd Central Moment - Count - w/MI - Part 1 | $XPO_C * (q * ((1-MI)^{(ObservationYear-2015)}))$ | same as '3' & '5' except FA =1 |
| 9 2CenMomP2wMI_byPol | 2nd Central Moment - Count - w/MI - Part 2 | $XPO_C * ((q * ((1-MI)^{(ObservationYear-2015)}))^2)$ | same as '4' & '6' except FA =1 |
| 10 3CenMomP3wMI_byPol | 3rd Central Moment - Count - w/MI - Part 3 | $XPO_C * ((q * ((1-MI)^{(ObservationYear-2015)}))^3)$ | same as '7' except FA =1 |
| 11 2CenMomP1_byAmt | 2nd Central Moment - Amount - Part 1 | $XPO_C * (q) * (FA^2)$ | |
| 12 2CenMomP2_byAmt | 2nd Central Moment - Amount - Part 2 | $XPO_C * (q^2) * (FA^2)$ | |
| 13 3CenMomP1_byAmt | 3rd Central Moment - Amount - Part 1 | $XPO_C * (q) * (FA^3)$ | |
| 14 3CenMomP2_byAmt | 3rd Central Moment - Amount - Part 2 | $XPO_C * (q^2) * (FA^3)$ | |
| 15 3CenMomP3_byAmt | 3rd Central Moment - Amount - Part 3 | $XPO_C * (q^3) * (FA^3)$ | |
| 16 2CenMomP2_byPol | 2nd Central Moment - Count- Part 2 | $XPO_C * (q^2)$ | same as '12' & '14' except FA =1 |
| 17 3CenMomP3_byPol | 3rd Central Moment - Count - Part 3 | $XPO_C * (q^3)$ | same as '15' except FA =1 |

Contact Information

Mary Bahna-Nolan, MAAA, FSA, CERA
Chairperson, Academy Life Experience
Committee and SOA Preferred Mortality
Oversight Group



AMERICAN ACADEMY of ACTUARIES

Objective. Independent. Effective.™

Ian Trepanier
Life Policy Analyst
American Academy of Actuaries
Trepanier@actuary.org