

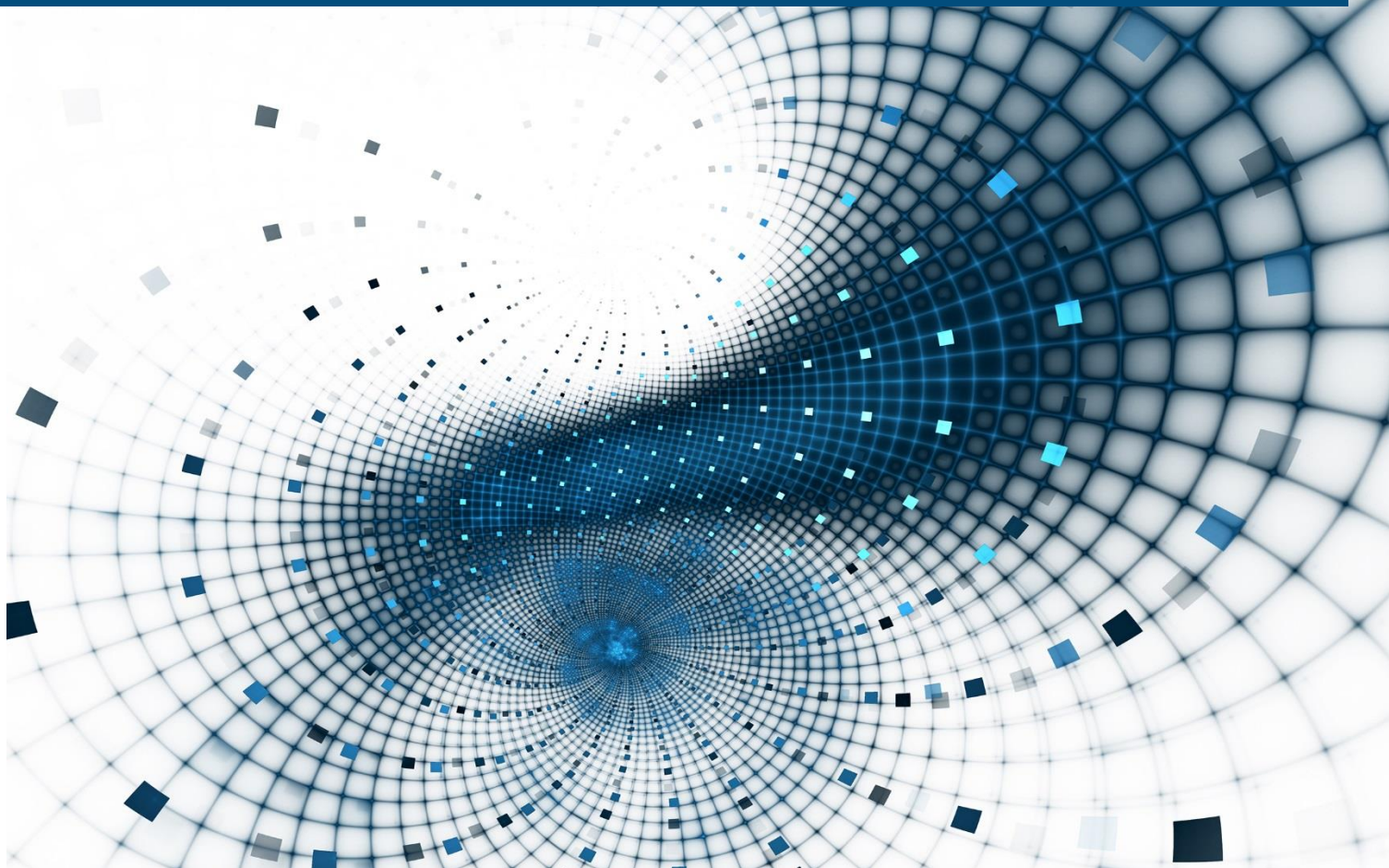


SOCIETY OF  
ACTUARIES



# 2016 Variable Annuity Guaranteed Benefits Survey

Survey of Assumptions for Policyholder Behavior  
in the Tail



October 2016



# 2016 Variable Annuity Guaranteed Benefits Survey

Survey of Assumptions for Policyholder Behavior in the Tail

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## **Caveat and Disclaimer**

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## Survey Highlights

### Overview

- Twenty companies provided responses to the survey, down from twenty-six last year. The PBITT committee appreciates the participation of these companies.
- The trend of companies using a projection horizon longer than 30 years continues, with several companies citing projections of 50 or more years (Figure 3).

### Tail Scenario

- The median equity tail scenario was higher than the 10<sup>th</sup> percentile return of the AAA equity index (Figure 7). In past years the median tracked the 10<sup>th</sup> percentile more closely.
- However, the cumulative equity return in the tail scenario for individual companies varies widely (Figure 4).

### Dynamic Lapses

- Dynamic lapse functions are used by the majority of companies across all benefit types (Figure 9).
- Some companies use a floor lapse rate as a percentage of the base and some use a constant floor (Figure 10, Figure 12, Figure 14, Figure 16, and Figure 18).
- Dynamic lapse functions are influenced by a variety of factors including policy duration, the length of the surrender charge, and policy size (Figure 11, Figure 13, Figure 15, Figure 17, and Figure 19).

### Lapse Assumptions for a Newly Issued Policy

- The median base lapse rate assumption is similar across benefit types (Figure 20) for a newly issued policy.
- The median lapse assumption for a tail scenario is similar across benefit types and is also similar to the base scenario.

### Lapse Assumptions for an Aggregate Block

- Base lapse rates for GMAB are noticeably higher than for other benefit types.
- Median tail lapse rates are generally lower than median base lapse rates, especially after the early projection years, for all benefit types (Figure 44 through Figure 48).

### Income, Withdrawal, and GLWB Utilization Assumptions

- Guaranteed minimum income benefit (GMIB) dynamic utilization assumptions are heavily influenced by In-the-Money. Age and duration are also significant factors in the calculation.
- For the majority of companies, the utilization of guaranteed minimum withdrawal benefits (GMWB) does not vary between the base and tail scenarios.
- Guaranteed living withdrawal benefits (GLWB) utilization is similar in the tail and base scenarios.

- No company indicated any difference specifically between tax qualified and non-tax qualified statuses.

#### **Source of Assumptions**

- Company experience is relied on much more heavily for base assumptions than for tail assumptions (Figure 54).
- A higher percentage of companies reported using 10+ years of experience in lapse studies (Figure 52).

#### **Changes in Assumptions**

- Most companies changed assumptions since the prior year (Figure 56), typically to update experience.
- The vast majority of participating companies test base lapse sensitivities (Figure 57).
- In addition, about half of the participating companies test equity and utilization sensitivities (Figure 57).

**Table of Contents**

Survey Highlights..... 3

Background ..... 6

Respondents Profile..... 7

Tail Scenario ..... 7

Dynamic Lapses..... 12

Base Lapse Assumptions – Newly Issued Policy ..... 21

Lapses in the Tail – Newly Issued Policy ..... 25

Base Lapse Assumptions – Aggregate Block..... 28

Lapses in the Tail – Aggregate Block..... 31

GMIB Annuitization Utilization Rates in the Tail ..... 36

GMWB Withdrawal Utilization Rates in the Tail ..... 37

GLWB Withdrawal Utilization Rates in the Tail ..... 37

Lapses by Distribution Channel ..... 38

Source of Assumptions ..... 38

Changes in Assumptions..... 43

Sensitivities..... 44

## Acknowledgements

The Society of Actuaries' Policyholder Behavior in the Tail (PBITT) working group gratefully acknowledges Jeff Hartman for all of his efforts in analyzing the survey data and drafting this report.

Special thanks to all of the companies that responded to the survey and provided helpful information. Without their efforts, this survey would not be possible. The identities of survey participants are kept confidential and known only to Society of Actuaries' staff.

The Policyholder Behavior in the Tail group is interested in comments on the survey and results. Please e-mail comments to either Jim Reiskytl, Chair of the Policyholder Behavior in the Tail group, at [jimreiskytl@wi.rr.com](mailto:jimreiskytl@wi.rr.com) or Steve Siegel, Society of Actuaries Research Actuary at [ssiegel@soa.org](mailto:ssiegel@soa.org).

## Background

In 2005, the Society of Actuaries' Policyholder Behavior in the Tail (PBITT) committee distributed a survey to insurers. The goal of the survey was to gain insight into companies' assumptions of variable annuity policyholder behavior in the tail of the C3 Phase II calculation. Each edition of the survey has had approximately 18-30 responses; however, not all companies responded to every question. The following sections highlight responses from the 2016 survey and, where applicable, illustrate how answers compare to previous years' results. As a way to judge the credibility of results, most charts indicate how many companies responded to the question for the five most recent survey years.

It is our hope that this study's report on assumptions will enable actuaries to improve and compare their 'tail' expectations with those assumed by others. Actuaries may use this study to both (a) aid in setting their assumptions and (b) in setting up experience studies to parameterize such dynamic functions, especially from experience gained in "tail" historical periods.

The latest survey reflects a different response group from that in the prior survey. As a result, some of the changes described below reflect different respondents, not necessarily a change by any given company. While the exact relationships of new versus prior respondents vary by individual question, Society of Actuaries' staff was able to verify that 9 respondents also participated in the 2014 survey, 4 did not, and the remainder did not provide their identity.

Please note that when percentages of responding companies are shown, the percentages are based on the number of respondents and not their size.

When providing responses, companies were asked to consider five different benefit types:

- GMDB – guaranteed minimum death benefit with no living benefit

- GMIB – guaranteed minimum income at annuitization; may also include death benefit
- GMWB – guaranteed minimum income over specified (non-lifetime) period; may also include death benefit
- GLWB – guaranteed income stream for life; may also include death benefit
- GMAB – guaranteed minimum account value at a specified time; may also include death benefit

**Respondents Profile**

Figure 1 indicates the relative size of companies responding to the survey as measured by Total Account Value. This year’s survey reflects larger (>\$100B) and small (<\$1B) carriers. This year, 7 of 15 companies (47%) fall into one of those two categories in contrast to 2015 when only 4 of 23 (17%) did.

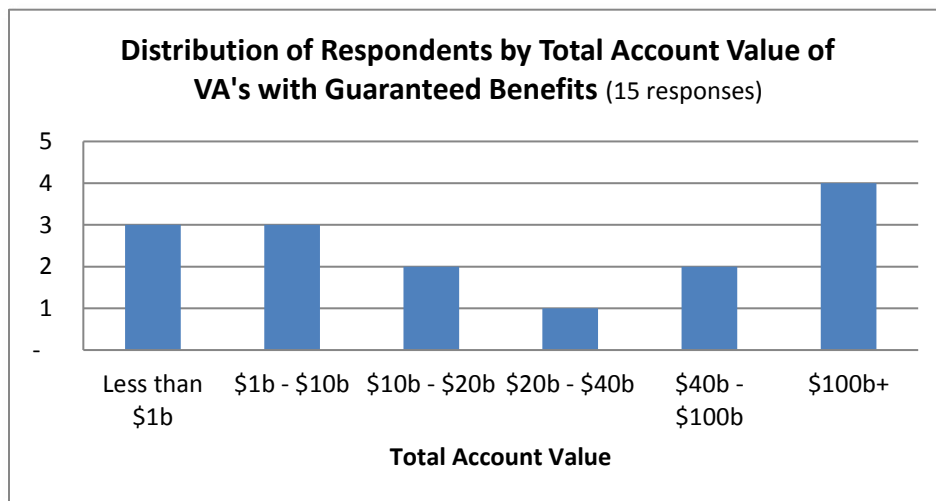


Figure 1

**Tail Scenario**

As in past years the vast majority of respondents indicated that they used stochastic modeling to set capital levels. In the 2016 survey 19 out of 21 (90%) indicated that they did use stochastic scenarios to set capital levels.

Of those 19 that use stochastic scenarios, 18 provided details regarding their calculation. In 2016, as in past years, 1,000 scenarios was the predominant response (Figure 2).

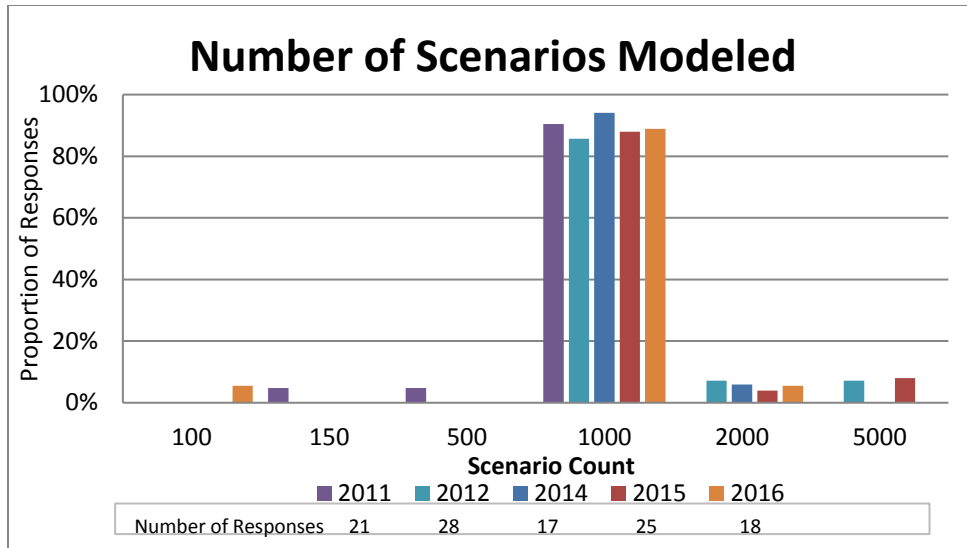


Figure 2

In terms of projection horizon the most common responses were 30 years and 50 years, similar to past surveys. Although 30 years was cited more frequently than in 2015's survey, there is still a general trend toward longer projection horizons (Figure 3).

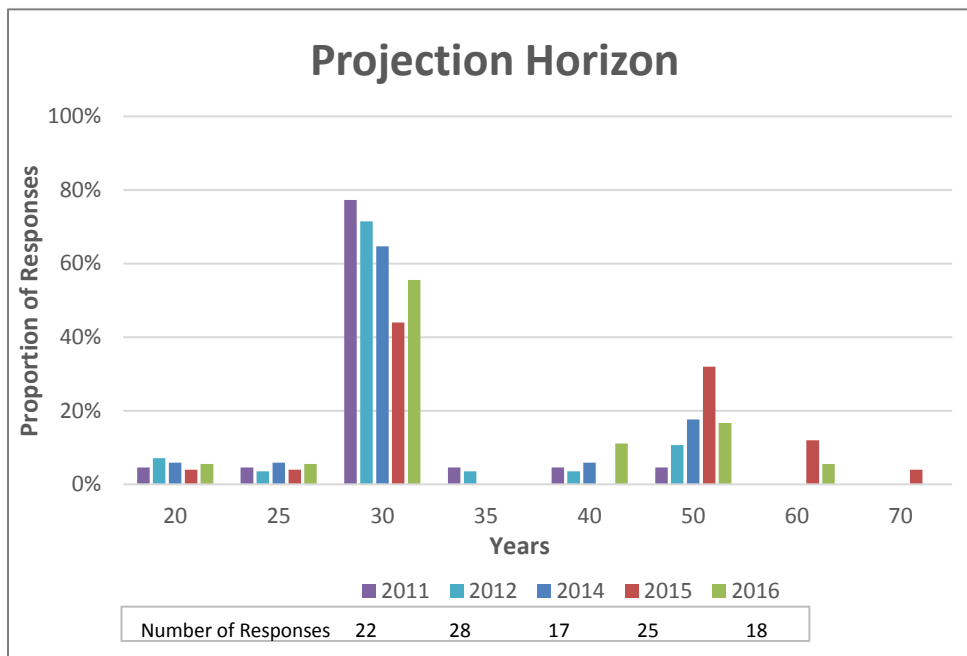


Figure 3

Insurers were asked to describe the tail scenario that determines the first negative result of their modified 90 CTE calculation (that is, the least negative result of all scenarios with a negative present value). If no scenario produced a negative result, the scenario with the smallest positive was provided.



Responses varied widely among insurers regarding the equity returns of the tail scenario. Figure 4 shows the equity performance in their tail scenario on a cumulative basis for each of the 16 insurers that provided data. Focusing on year 10, 6 companies showed a negative cumulative return by year 10, 5 had a cumulative return of 0-40%, and 5 had a cumulative return of over 100%. This disparity could be due to the treatment of hedge income; for example, the existence of a clearly defined hedging strategy.

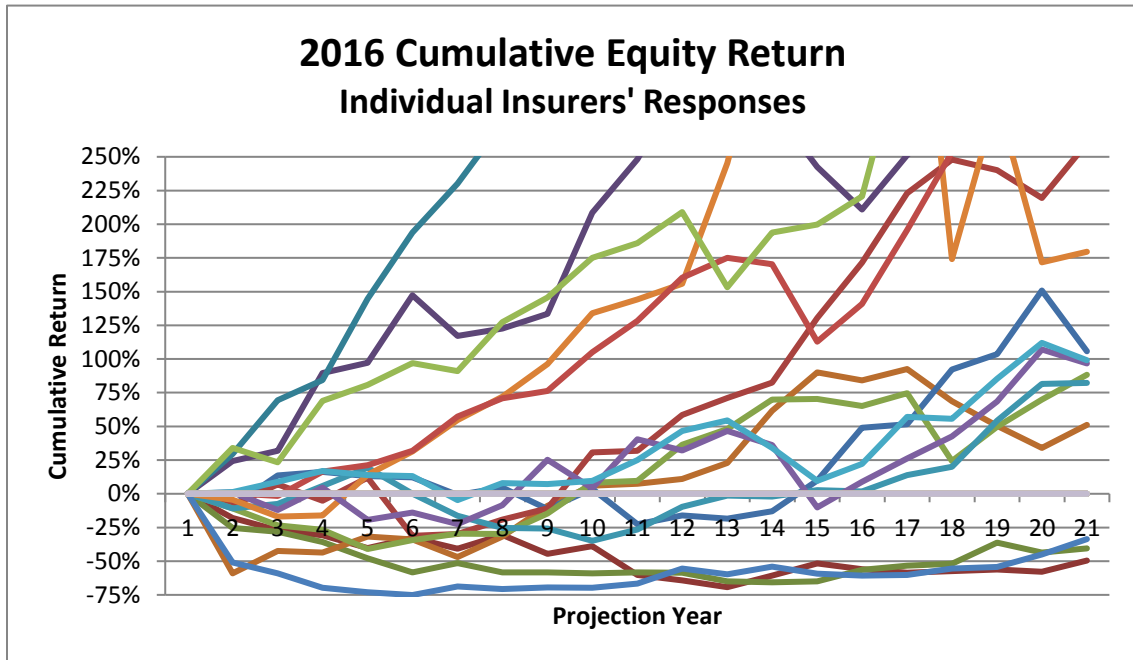


Figure 4

Figure 5 shows the cumulative returns of the bond funds in the tail scenario.

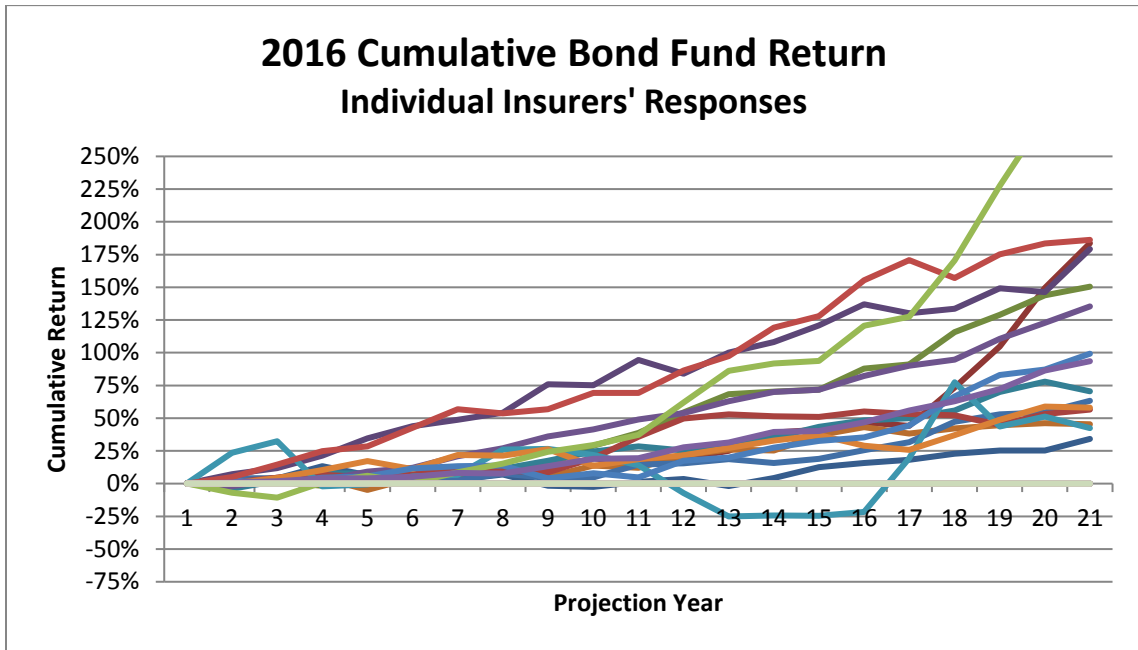


Figure 5

Figure 6 shows the 5-year Treasury interest rate in the tail scenario. The majority of responses had rates that never exceeded 5% in the first 20 years.

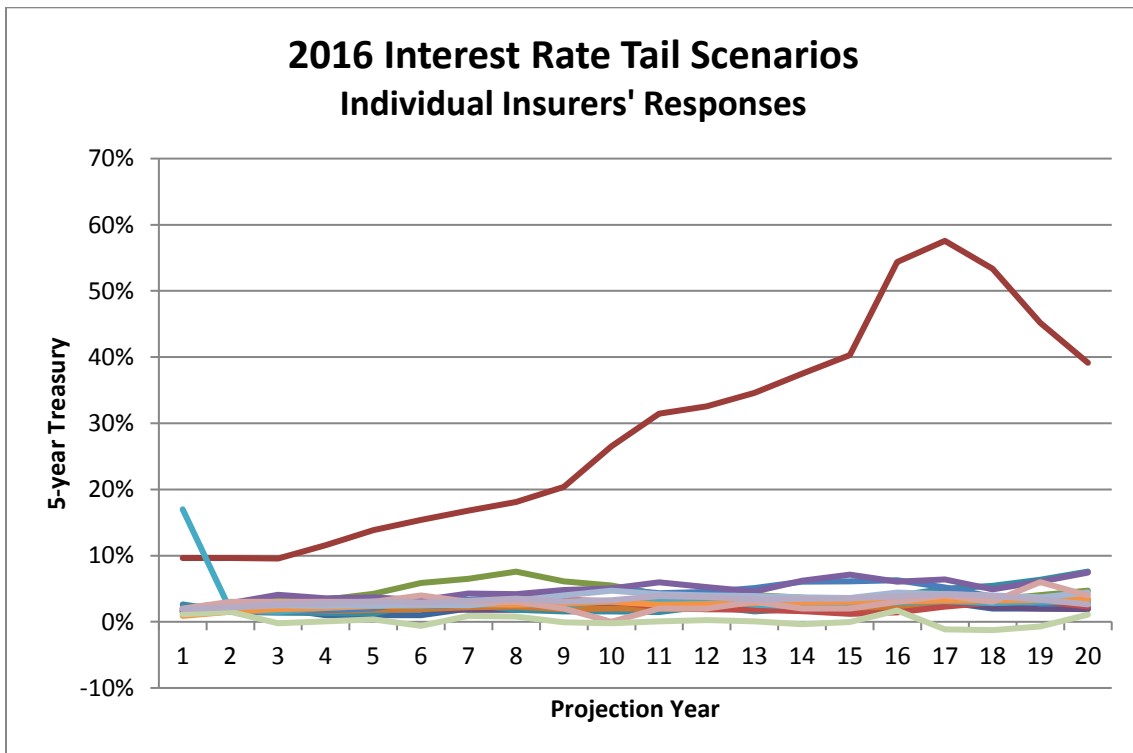


Figure 6

In Figure 7, the median of the 2016 Equity Tail Scenarios (from Figure 4) is plotted against the 10<sup>th</sup> percentile of the equity returns from the American Academy of Actuaries (AAA) pre-packaged scenario set based on 2005 data ([http://www.actuary.org/life/phase2\\_2.asp](http://www.actuary.org/life/phase2_2.asp)). The median of insurers' responses from 2016 had a cumulative return that is significantly higher than the 10<sup>th</sup> percentile of the AAA pre-packaged scenarios.

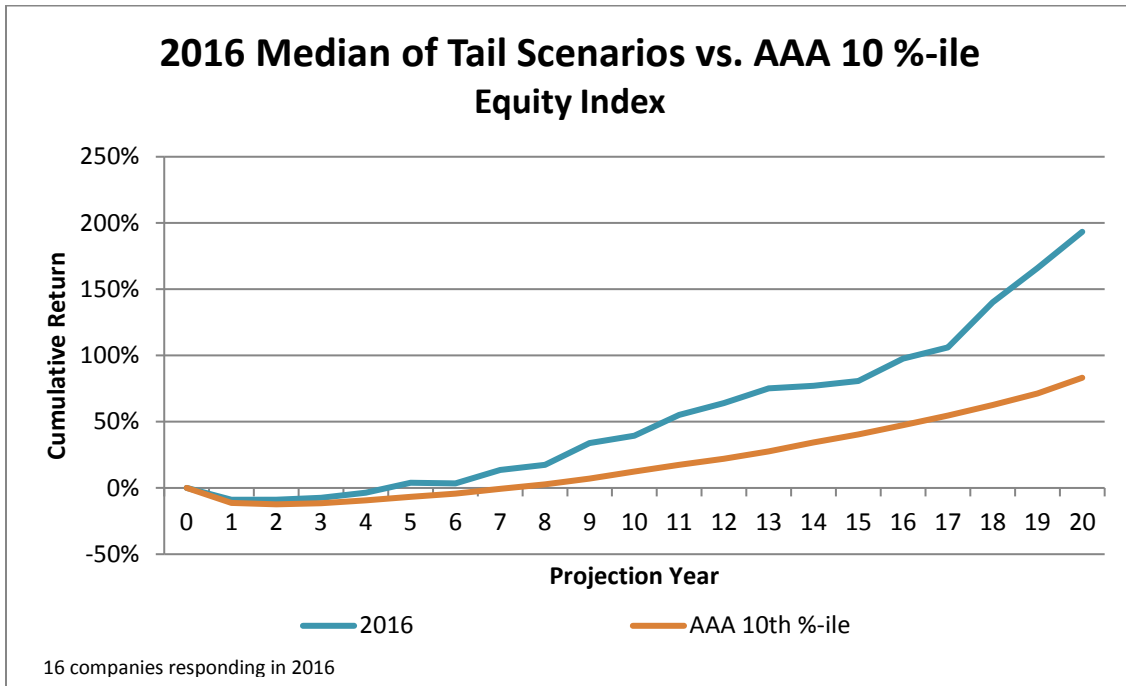


Figure 7

The median equity tail scenario response to the 2016 survey was significantly higher than in prior surveys (Figure 8). Responses may vary from year to year due to changes in products, assumptions or the participating respondents.

Note that the lines in Figure 7 and Figure 8 reference the median (of each survey year) and 10<sup>th</sup> percentile (of the AAA scenarios) with respect to the cumulative gains at a given duration, rather than representing a particular scenario over all durations.

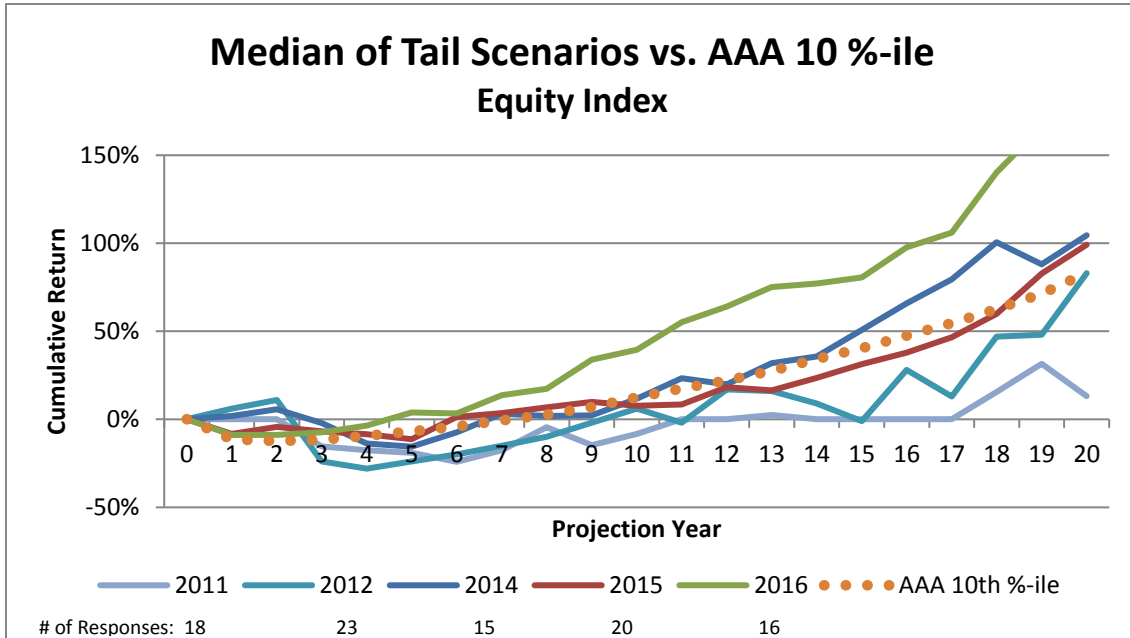


Figure 8

### Dynamic Lapses

Companies were asked whether their dynamic lapse functions varied by each of five benefit types. GMDB and GLWB were cited most frequently although at least half of the responses also cited each of GMIB, GMWB, and GMAB (Figure 9).

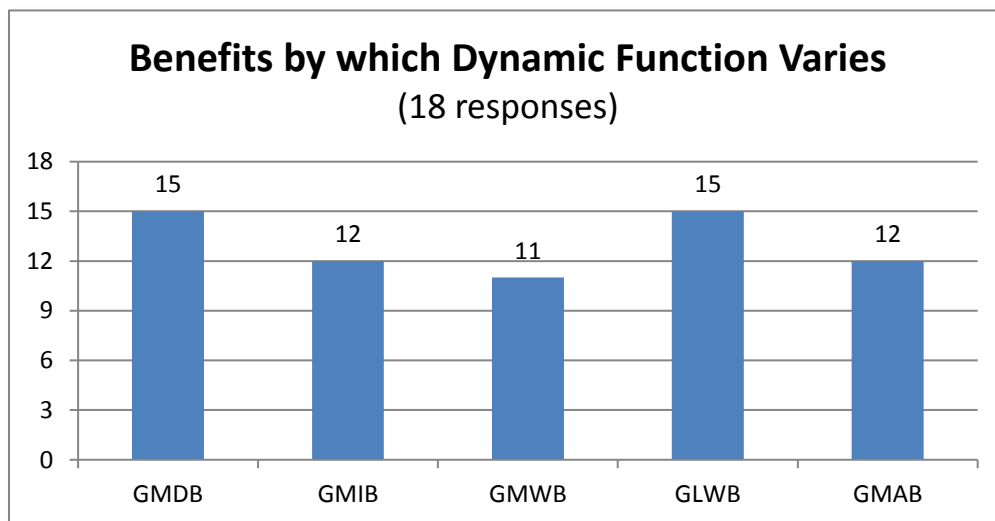


Figure 9

For each benefit type, companies were asked specific follow-up questions.

1. Is your formula one-sided or two-sided?
2. Is the floor lapse rate zero, a percentage of the base lapse rate, a non-zero constant, or other?
3. Is the dynamic aspect of your lapse function related to “in-the-moneyness”?
4. What factors influence the level of dynamic lapses for this benefit?

GMDB

For dynamic lapse functions related to death benefits, 87% of companies (13 of 15) use a one-sided dynamic formula.

Figure 10 shows the distribution of responses regarding the floor lapse rate. Of the 15 responses, 7 use a percent of the base lapse rate and 7 use a constant floor rate with 3 of those using zero. The “other” response further described their floor rate as grading down throughout the projection.

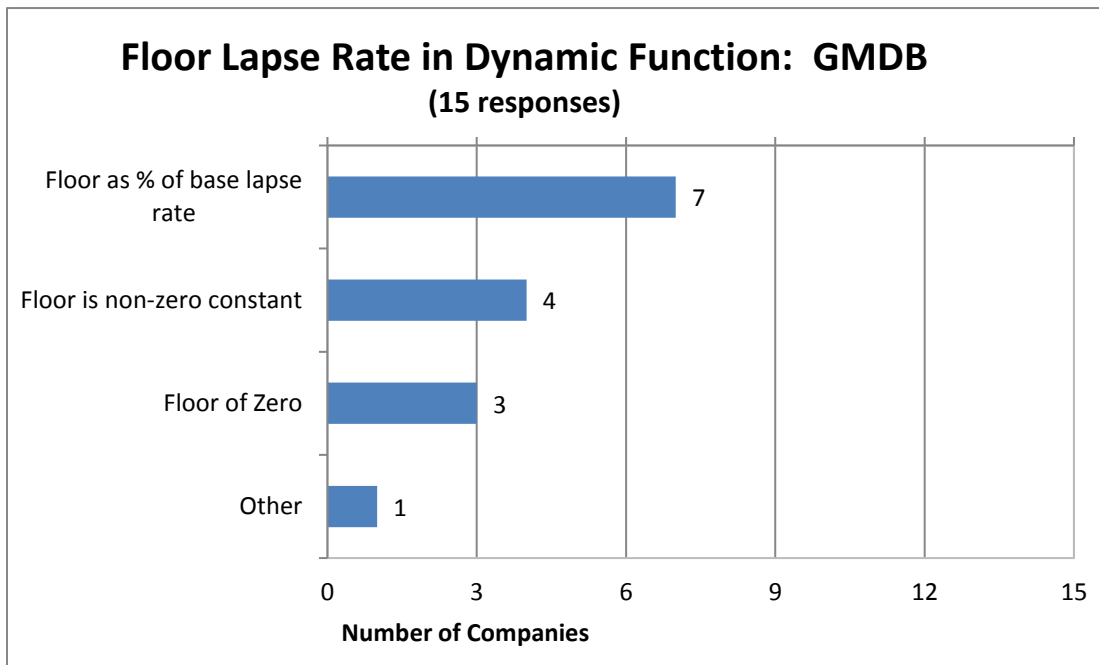


Figure 10

All 15 companies cited in-the-moneyness as a factor that influences the dynamic lapse assumption.

The length of surrender charge was the most frequently cited factor that influenced GMDB dynamic lapse formulas. Multiple other factors were cited by a few companies but none more than 4 times, as seen in Figure 11. “Other” responses included base lapse rate and issuing company.

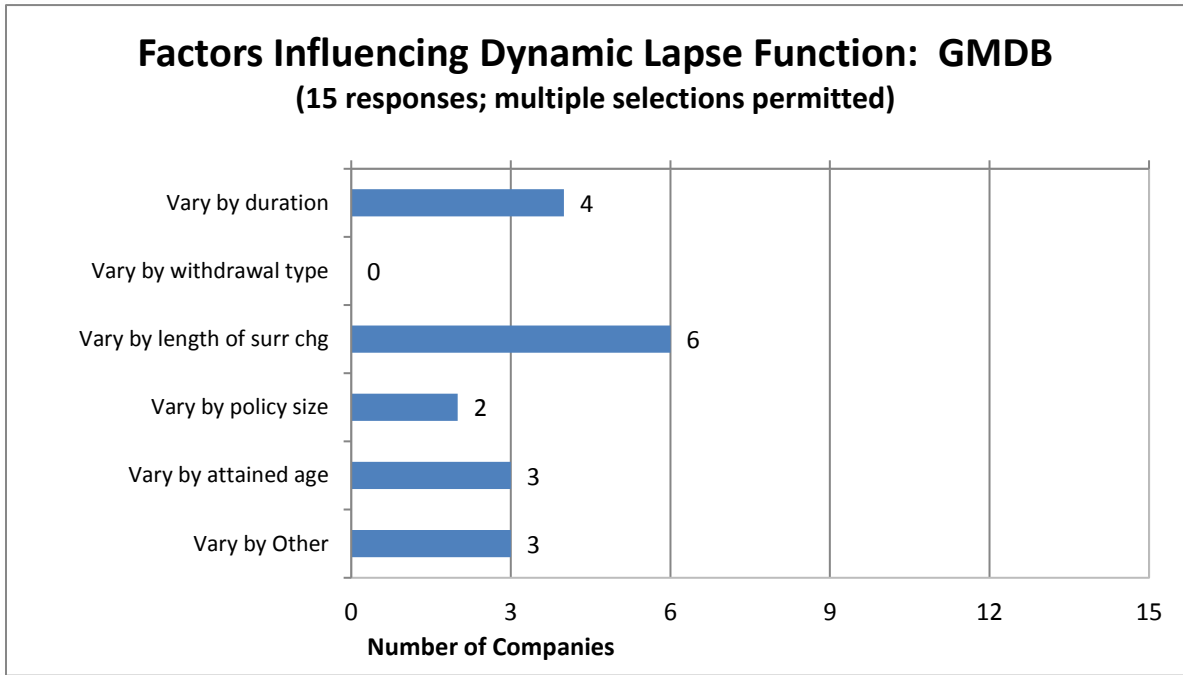


Figure 11

GMIB

For dynamic lapse functions related to guaranteed minimum income benefits, 75% of companies (9 of 12) use a one-sided dynamic formula.

Figure 12 shows the distribution of responses regarding the floor lapse rate. Of the 12 responses, 7 use a percent of the base lapse rate and 5 use a constant floor rate with one of those using zero.

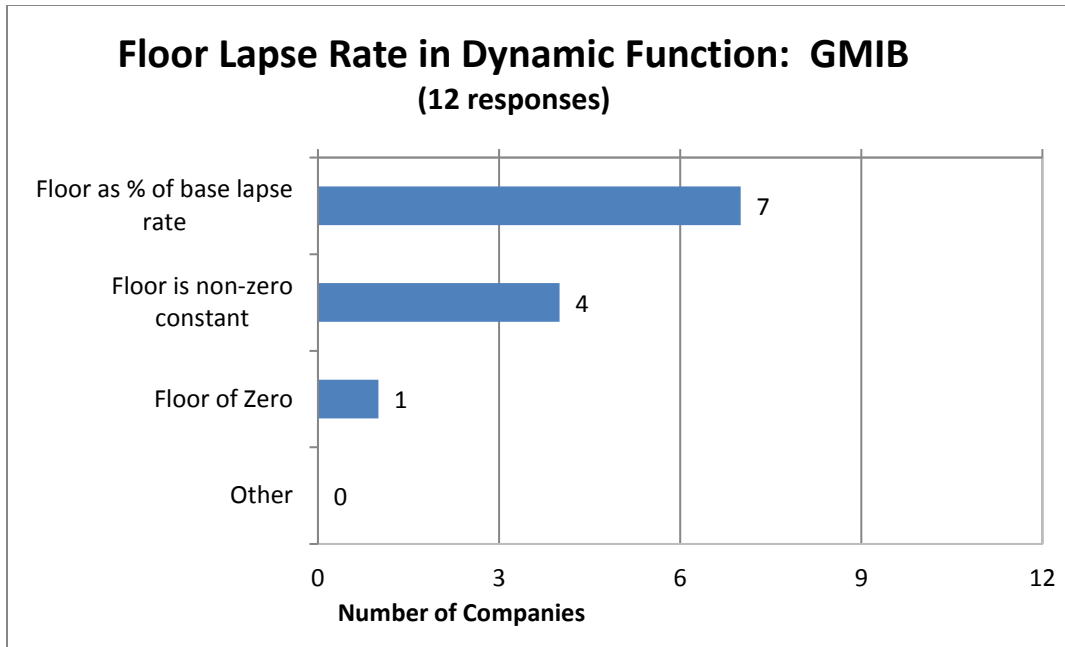


Figure 12

All 12 companies cited in-the-moneyness as a factor that influences the dynamic lapse assumption.

Multiple other factors are used to develop a dynamic function for GMIB's, but none was cited more than 4 times as seen in Figure 13. The "other" response was further described as the base lapse rate.

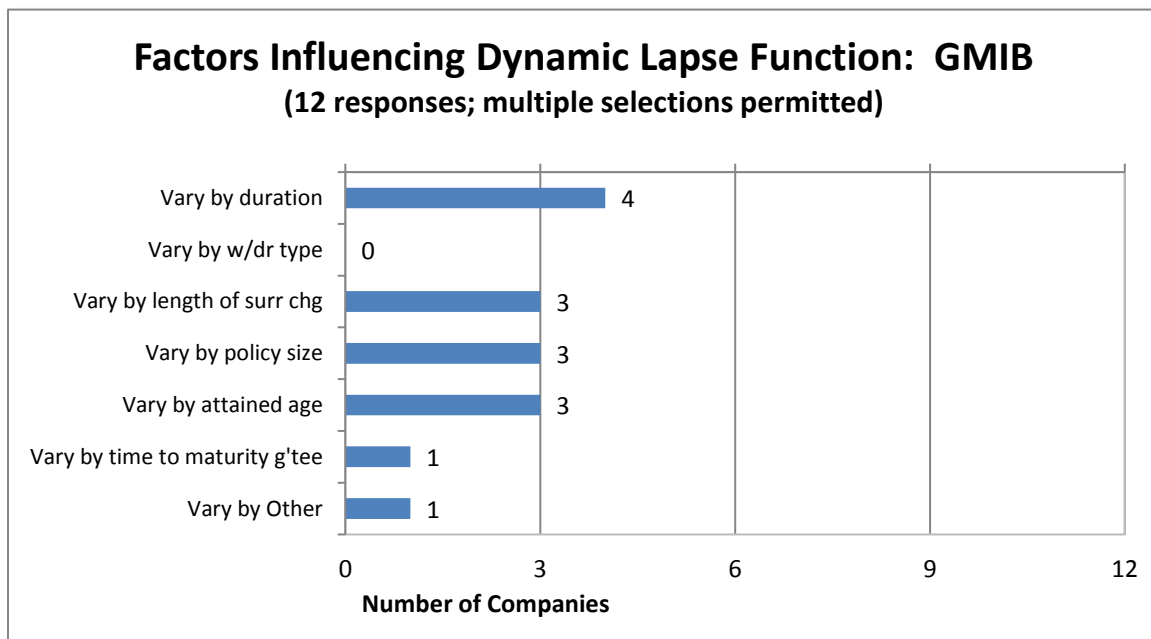


Figure 13

GMWB

For dynamic lapse functions related to guaranteed minimum withdrawal benefits, 55% of companies (6 of 11) use a one-sided dynamic formula while the other 45% (5 of 11) use a two-sided formula.

Figure 14 shows the distribution of responses regarding the floor lapse rate. Of the 11 responses, 6 use a percent of the base lapse rate and 4 use a non-zero constant floor rate. The “other” response further described their floor rate as zero during the surrender charge period then a non-zero constant thereafter.

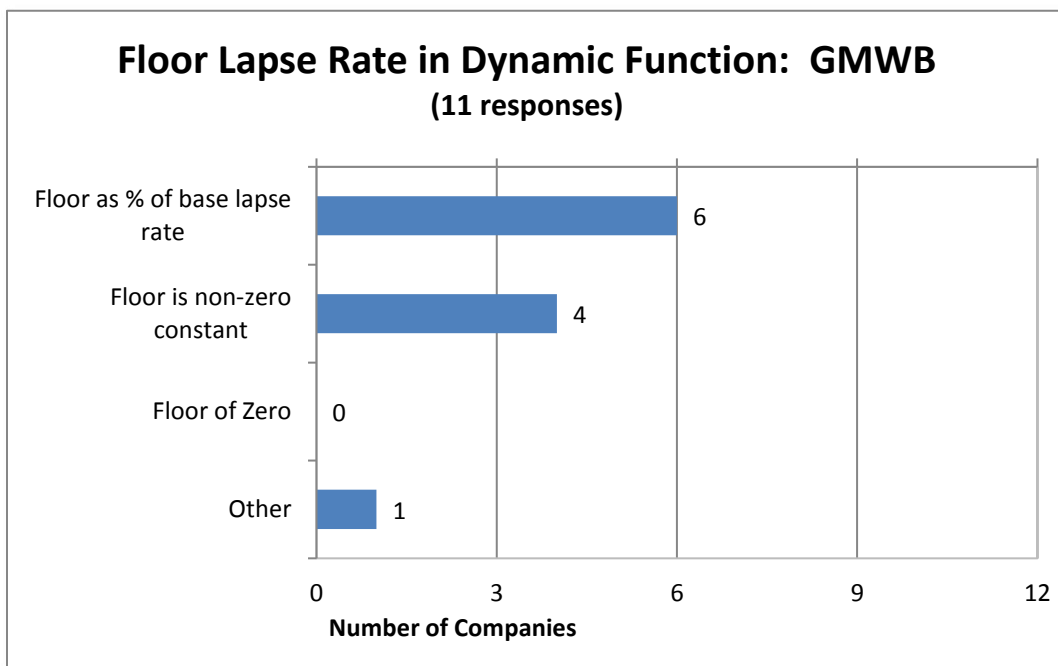


Figure 14

All 11 companies cited in-the-moneyness as a factor that influences the dynamic lapse assumption.

Multiple other factors are used to develop a dynamic function for GMWB’s, but none was cited more than 4 times as seen in Figure 15. The “other” responses were further described as a function of the base lapse rate and whether the contract holder was currently taking withdrawals.



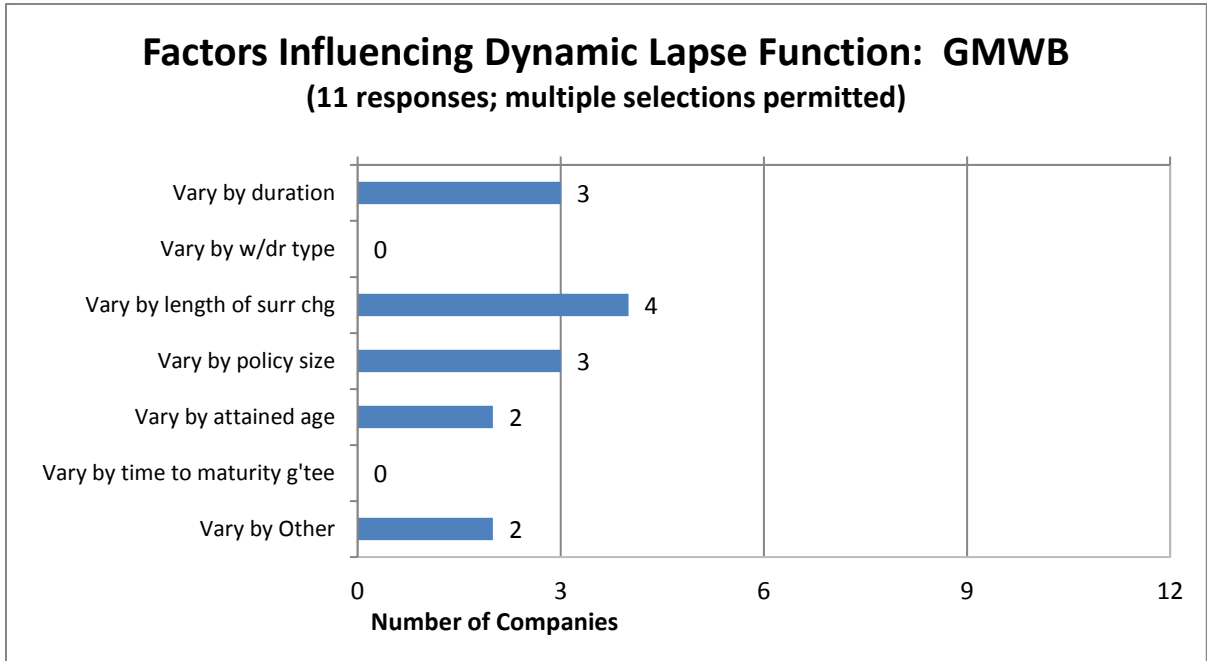


Figure 15

GLWB

For dynamic lapse functions related to guaranteed living withdrawal benefits, 60% of companies (9 of 15) use a one-sided dynamic formula.

Figure 16 shows the distribution of responses regarding the floor lapse rate. Of the 15 responses, 7 use a percent of the base lapse rate and 7 use a non-zero constant floor rate. The “other” response further described their floor rate as zero during the surrender charge period then a non-zero constant thereafter.

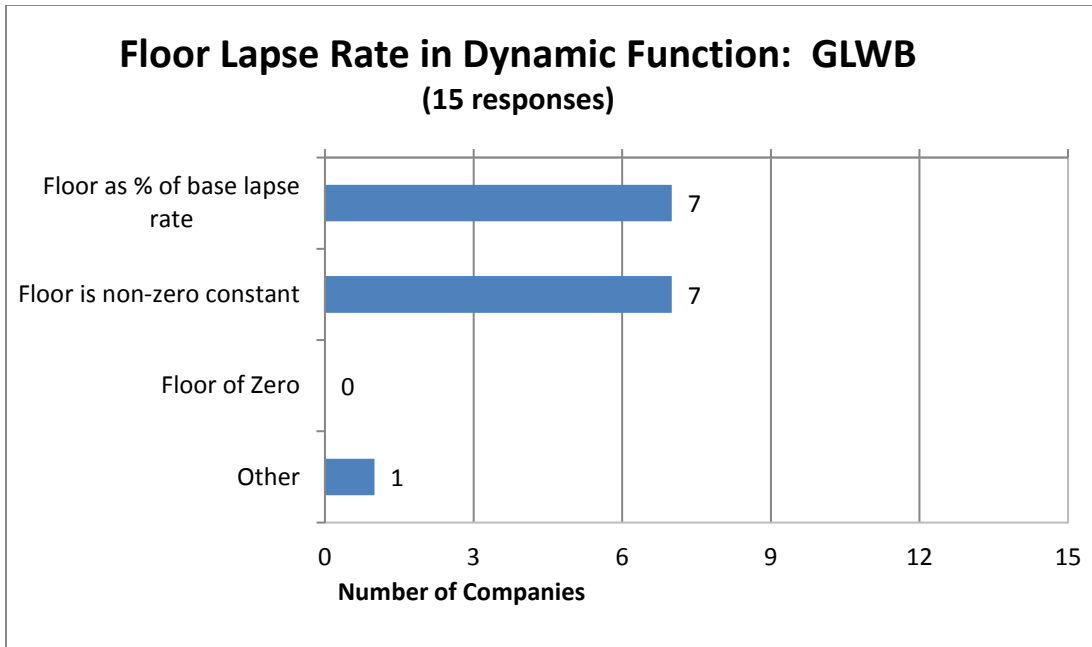


Figure 16

All 15 companies cited in-the-moneyness as a factor that influences the dynamic lapse assumption.

Duration and the length of surrender charge were the most frequently cited factors that influenced GLWB dynamic lapse formulas. Policy size and attained age were also cited by a few companies, as seen in Figure 17. “Other” responses included base lapse rate, whether the contract holder was taking withdrawals, the scenario interest rates, and the PV of future GLWB benefits based on life expectancy.

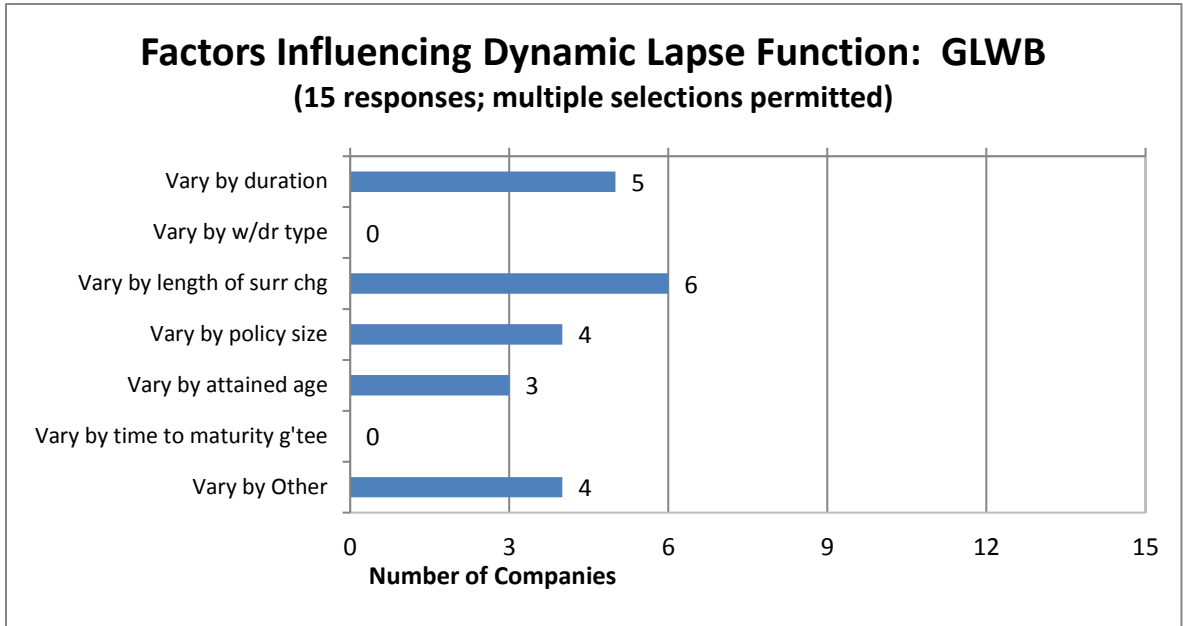


Figure 17

GMAB

For dynamic lapse functions related to guaranteed accumulation benefits, 75% of companies (9 of 12) use a one-sided dynamic formula.

Figure 18 shows the distribution of responses regarding the floor lapse rate. Of the 12 responses, 8 use a percent of the base lapse rate and 4 use a constant floor rate with two of those using zero.

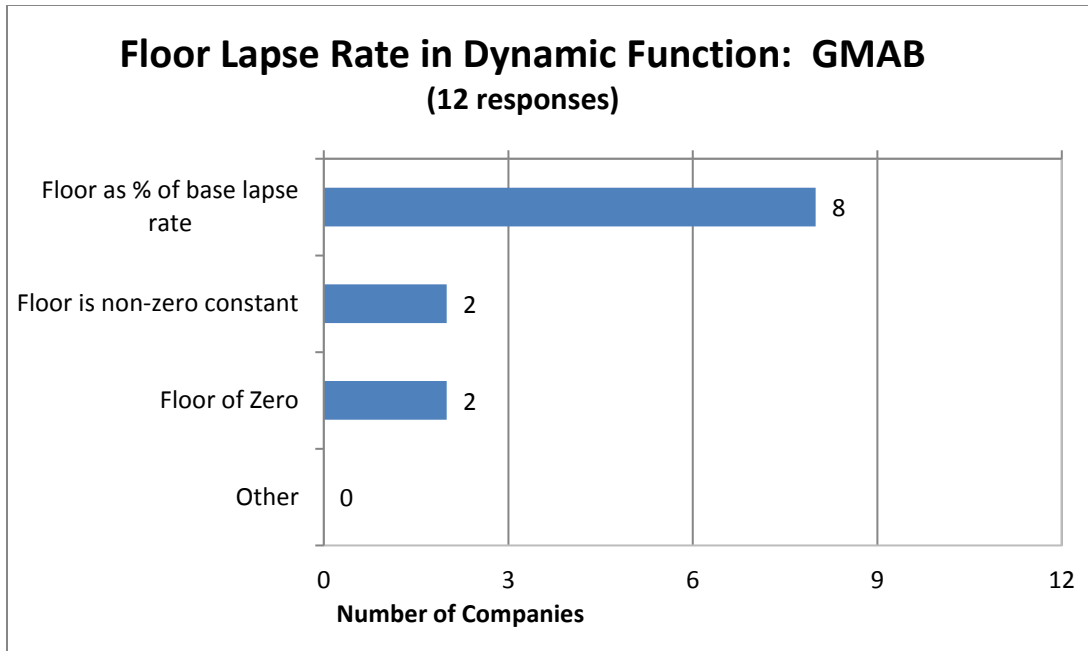


Figure 18

All 12 companies cited in-the-moneyness as a factor that influences the dynamic lapse assumption.

Multiple other factors are used to develop a dynamic function for GMAB's, but none was cited more than 4 times as seen in Figure 19. The "other" response was further described as a function of the base lapse rate.

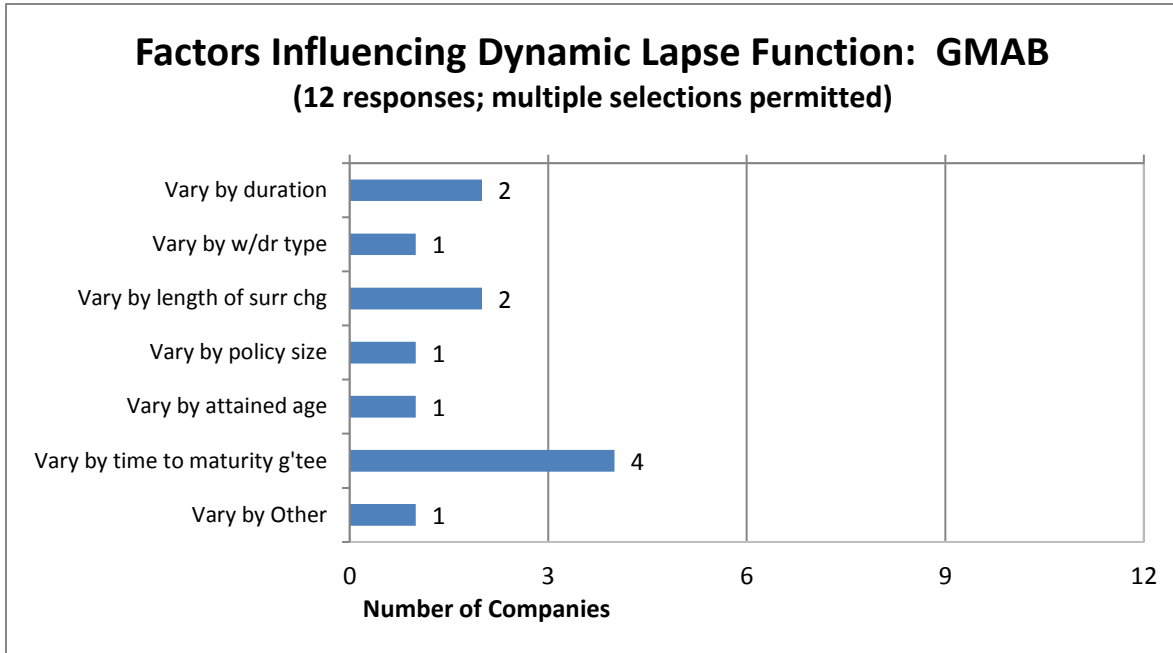


Figure 19

**Base Lapse Assumptions – Newly Issued Policy**

Insurers were asked to provide their base lapse assumption (non-dynamic) for a newly issued policy for each of the five benefit types. The vast majority of responses indicated that year 8 was the first year without surrender charge. Other responses indicated that years 1, 4, and 9 were the first without surrender charge (one response each).

Figure 20 compares the median response for each of the benefit types. The pattern of base lapse rates is very similar across benefit types, especially in the first 12 years.

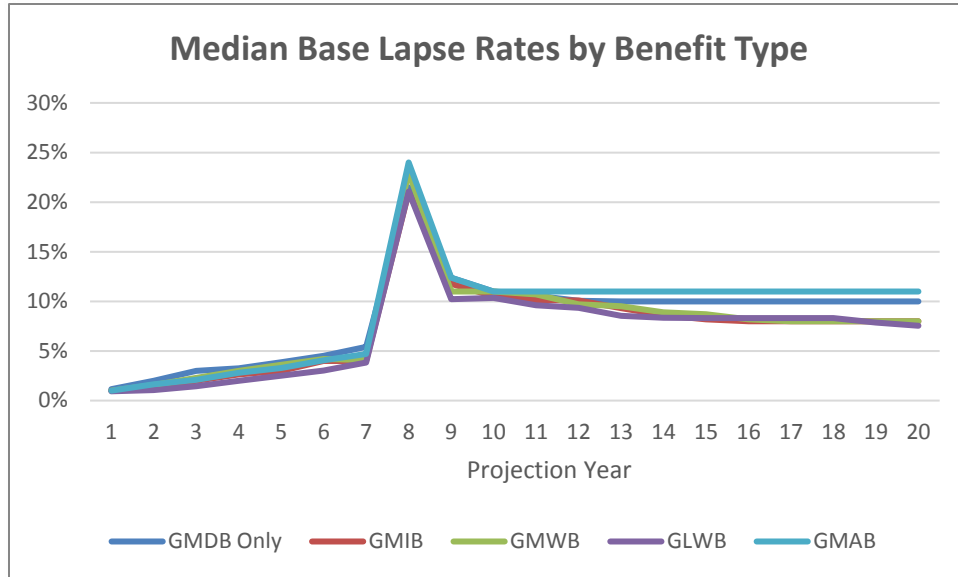


Figure 20

Figure 21 through Figure 25 shows each insurer’s response for base lapses for each benefit type to show the distribution of individual company responses. Most but not all companies indicated an increase in base lapse rates after surrender charge expiration. Also, note the wide range of ultimate lapse rates.

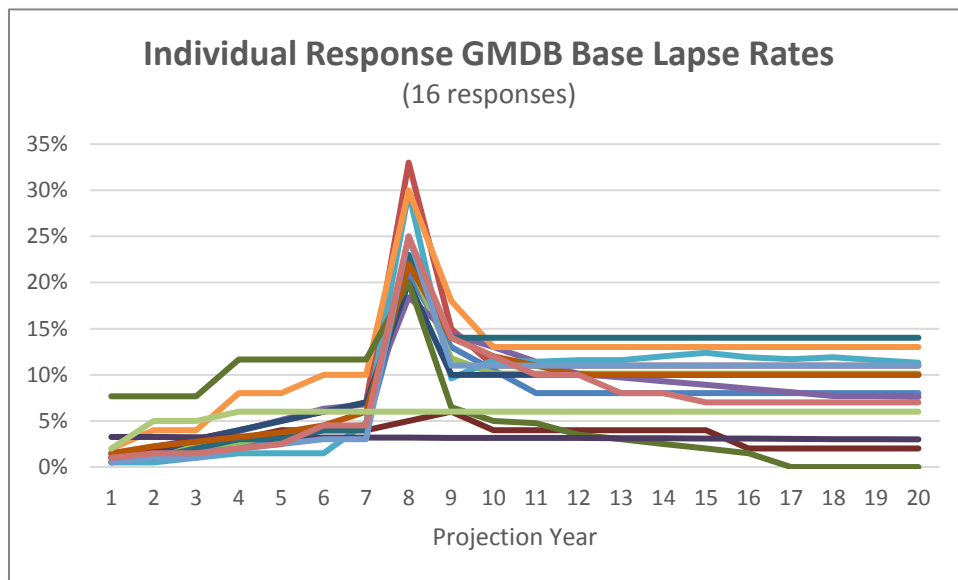


Figure 21

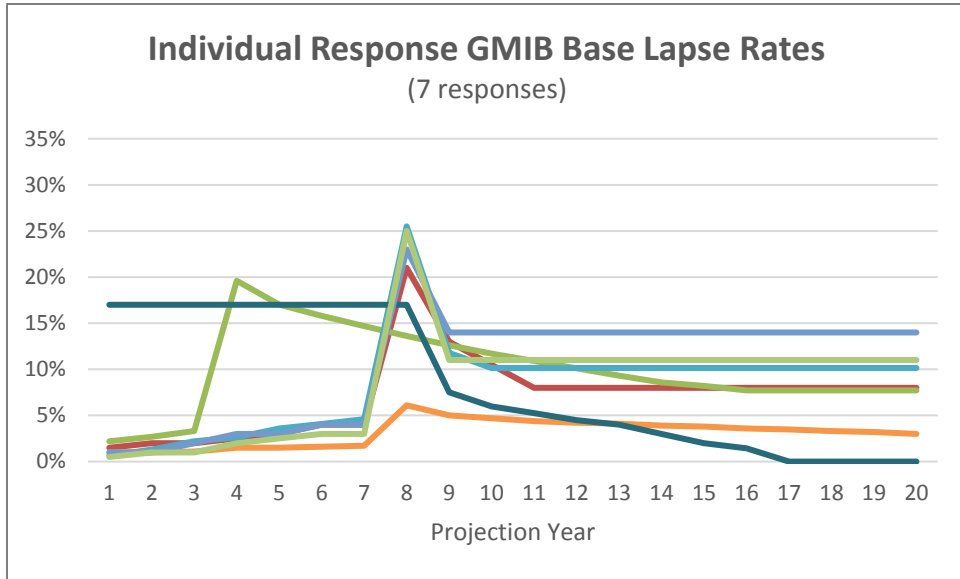


Figure 22

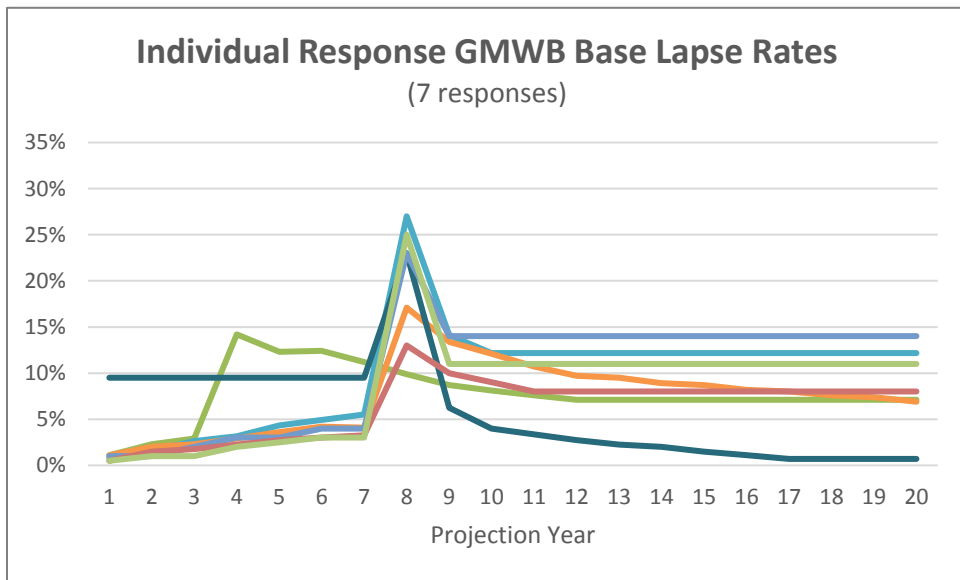


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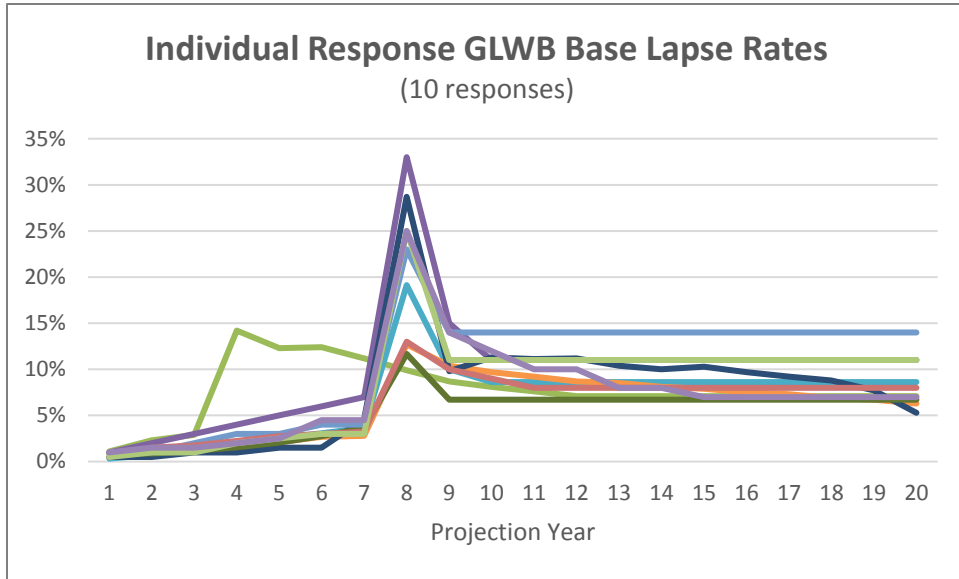


Figure 24

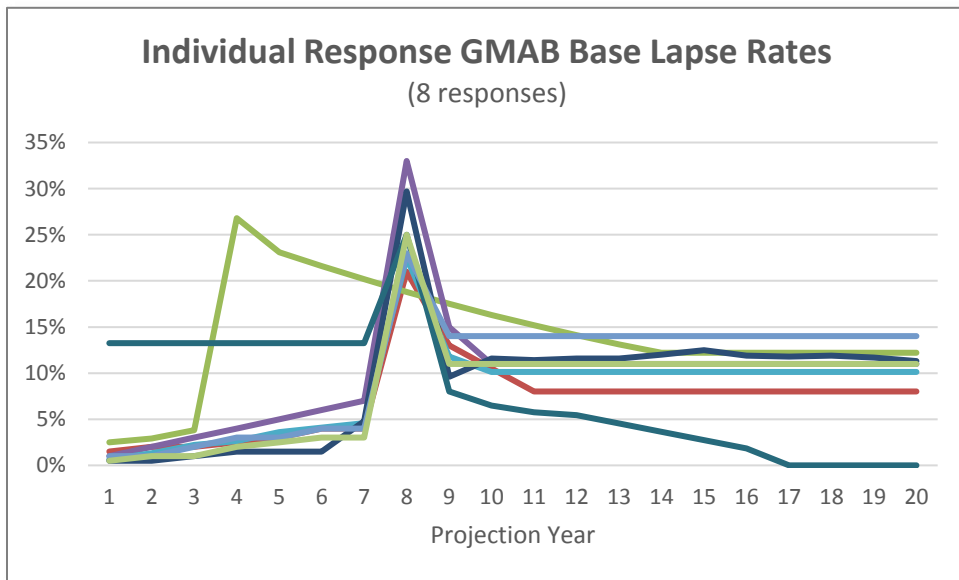


Figure 25



### Lapses in the Tail – Newly Issued Policy

Insurers were asked to list the dynamic lapse rate assumption assuming the tail scenario for each of the five benefit types. As described in the Tail Scenario section, the tail scenario is defined as the scenario that gives the first negative result of the insurer’s modified 90 CTE calculation when rank ordered.

Figure 26 compares the median response for each of the benefit types. The pattern of tail lapse rates is very similar across benefit types, especially in the first 12 years. Further, the level and pattern of median tail lapse rates is very similar to the level and pattern of median base lapse rates.

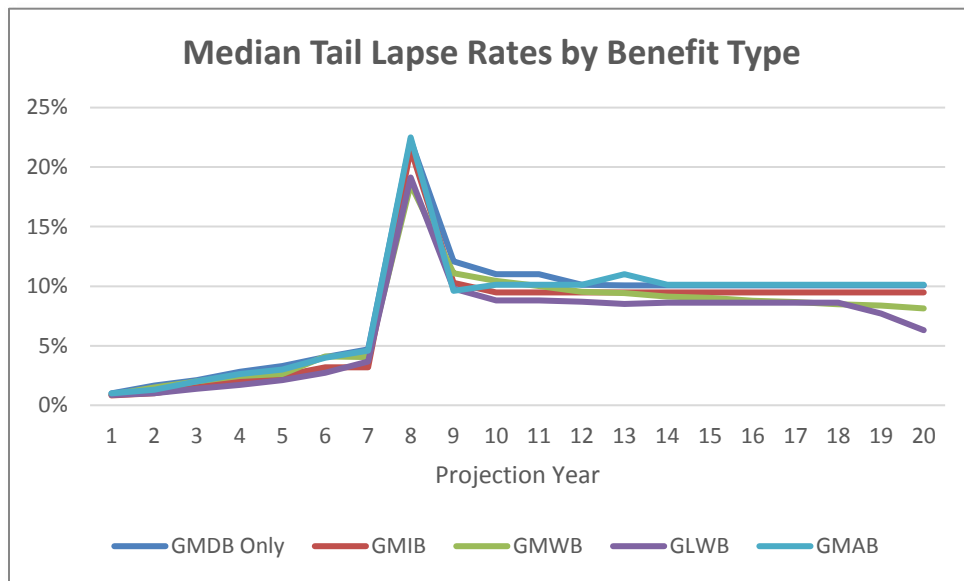


Figure 26

Figure 27 through Figure 31 show each insurer’s response for tail lapses for each benefit type to show the distribution of individual company responses. Most but not all companies indicated an increase in base lapse rates after surrender charge expiration. Also, note the wide disparity of ultimate lapse rates.

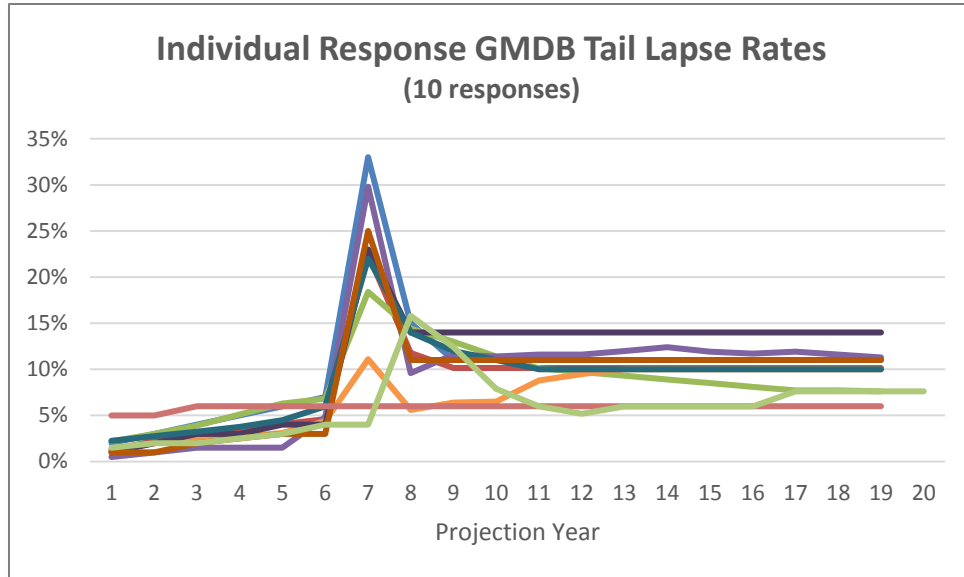


Figure 27

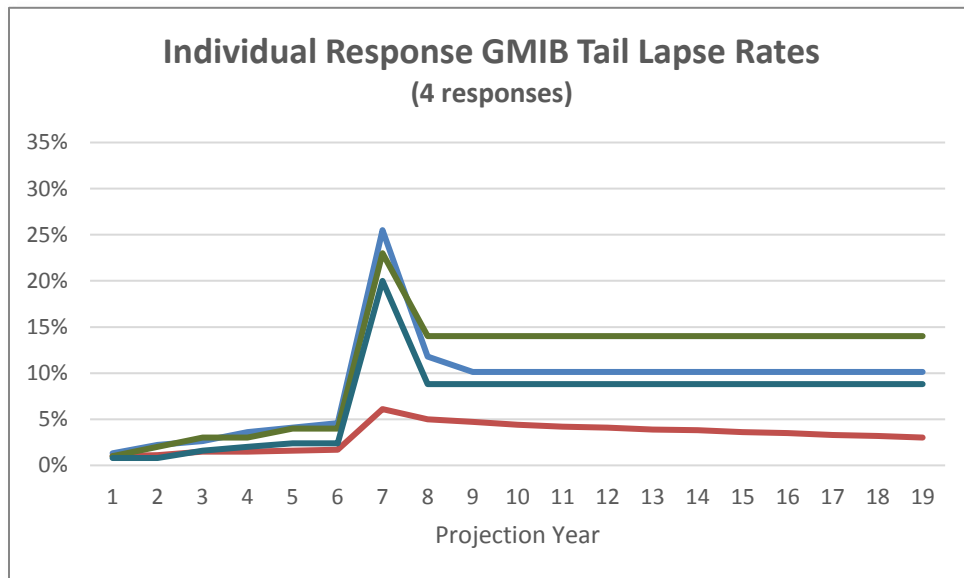


Figure 28

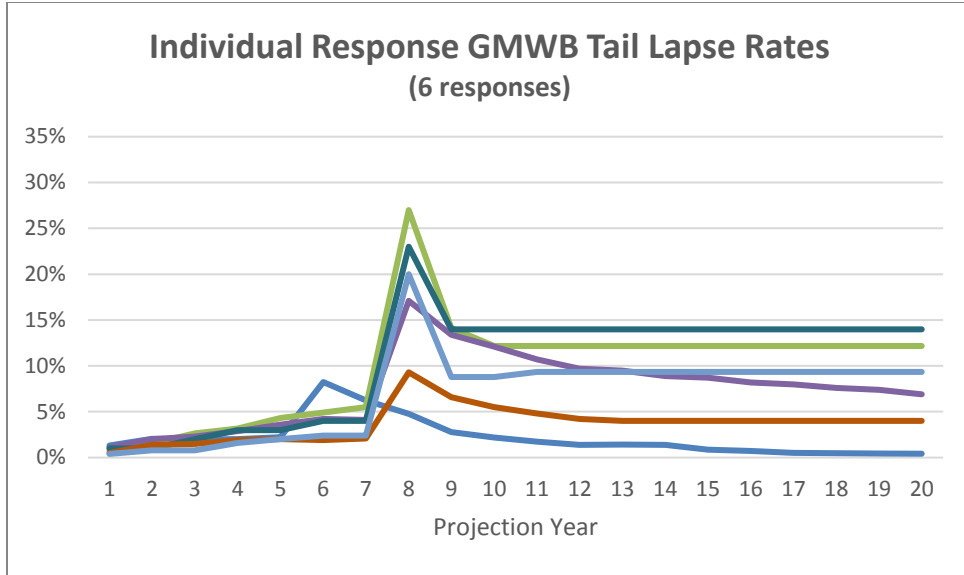


Figure 29

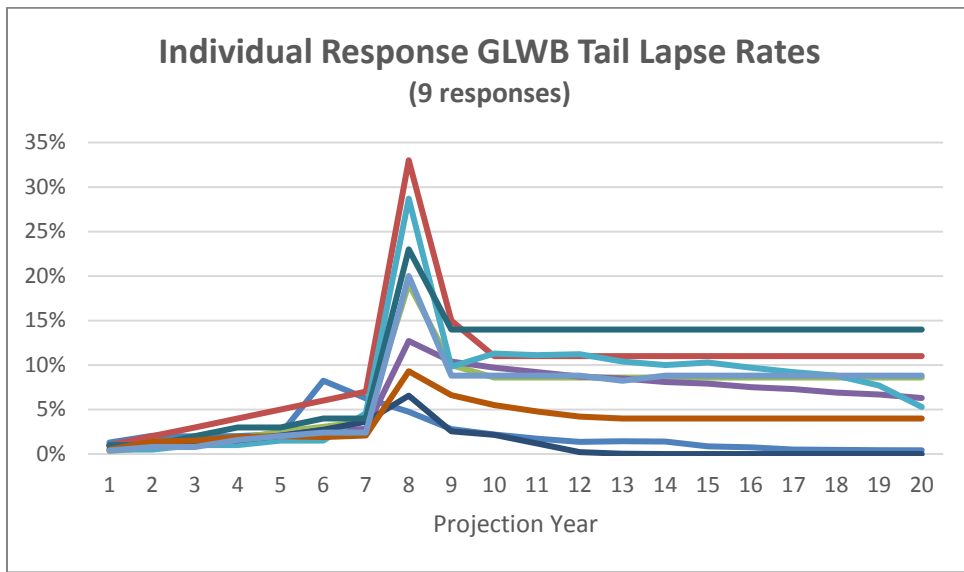


Figure 30

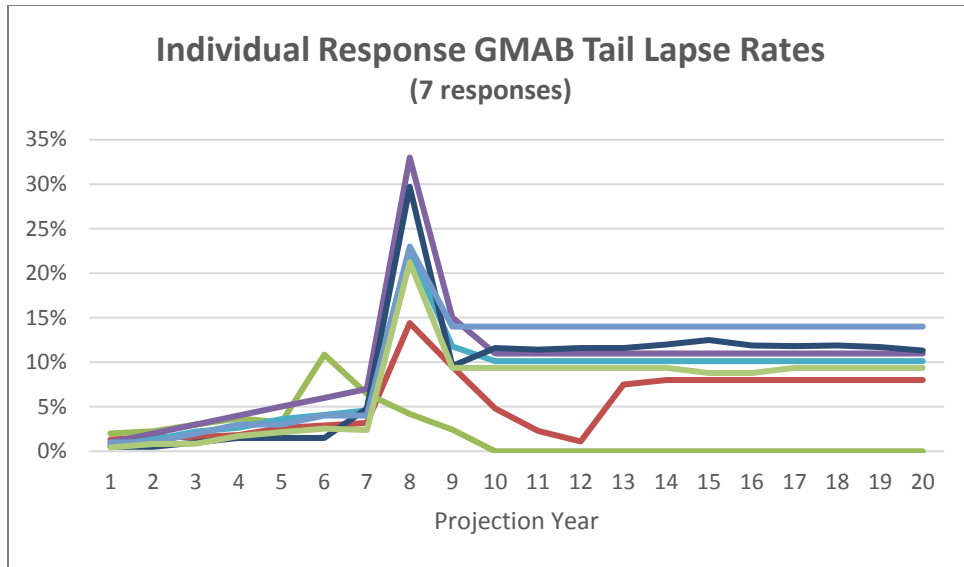


Figure 31

**Base Lapse Assumptions – Aggregate Block**

As an alternative to the individual policy view, insurers were asked to list their aggregate non-dynamic lapse assumption in a normal (non-tail) scenario for each of the five benefit types.

Figure 32 compares the median response for each of the benefit types. GMAB is noticeably higher than the other benefit types.

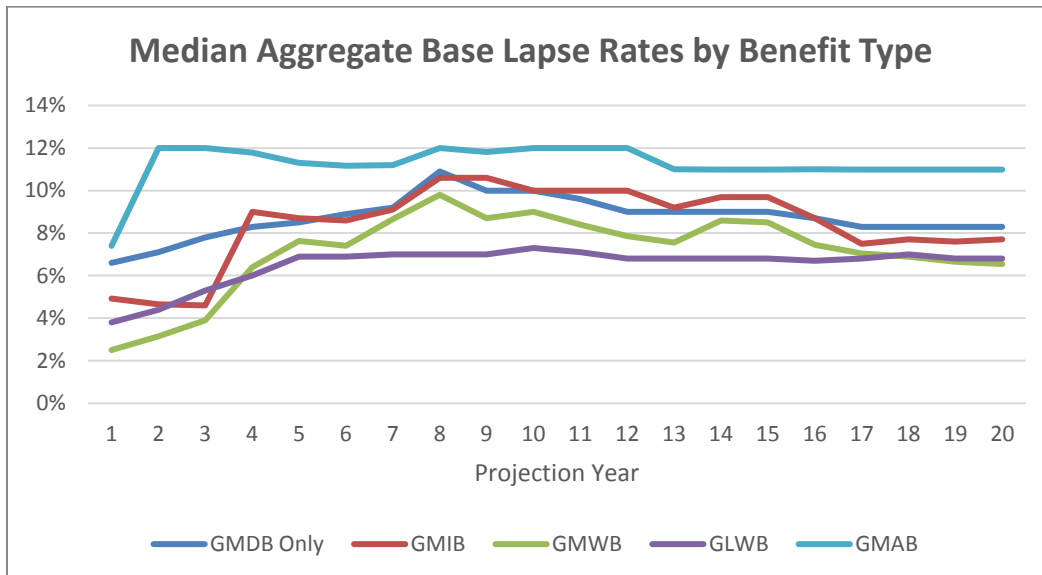


Figure 32

Figure 33 through Figure 37 show each insurer's response for aggregate normal (non-tail) lapse rates for each benefit type.

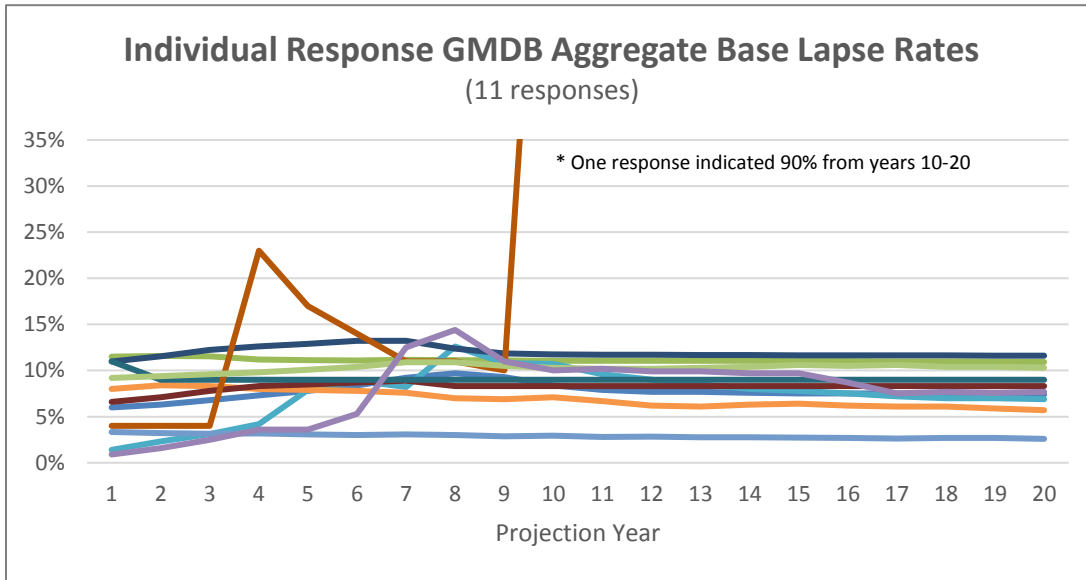


Figure 33

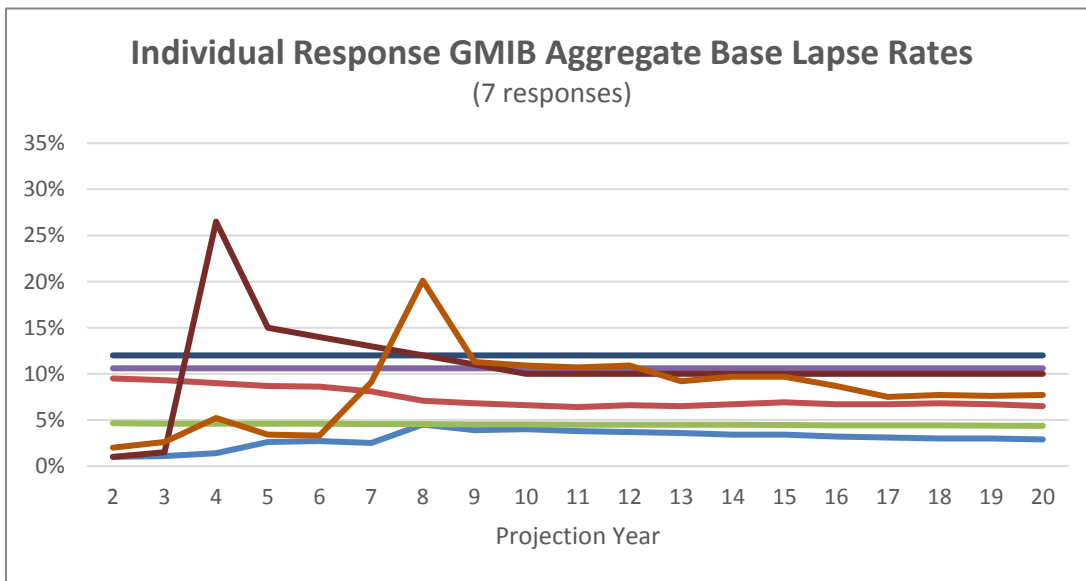


Figure 34

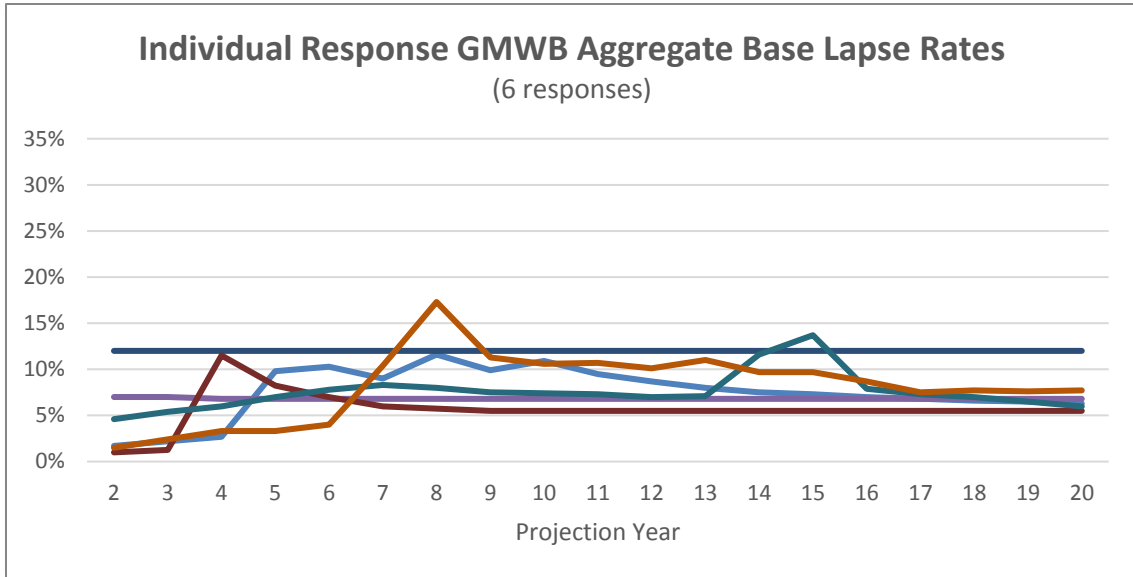


Figure 35

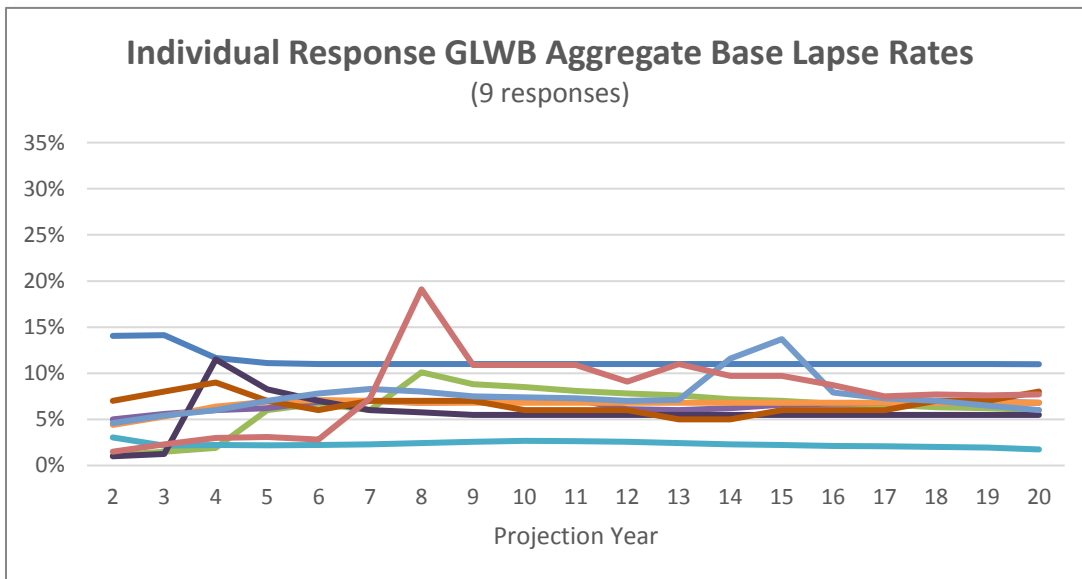


Figure 36

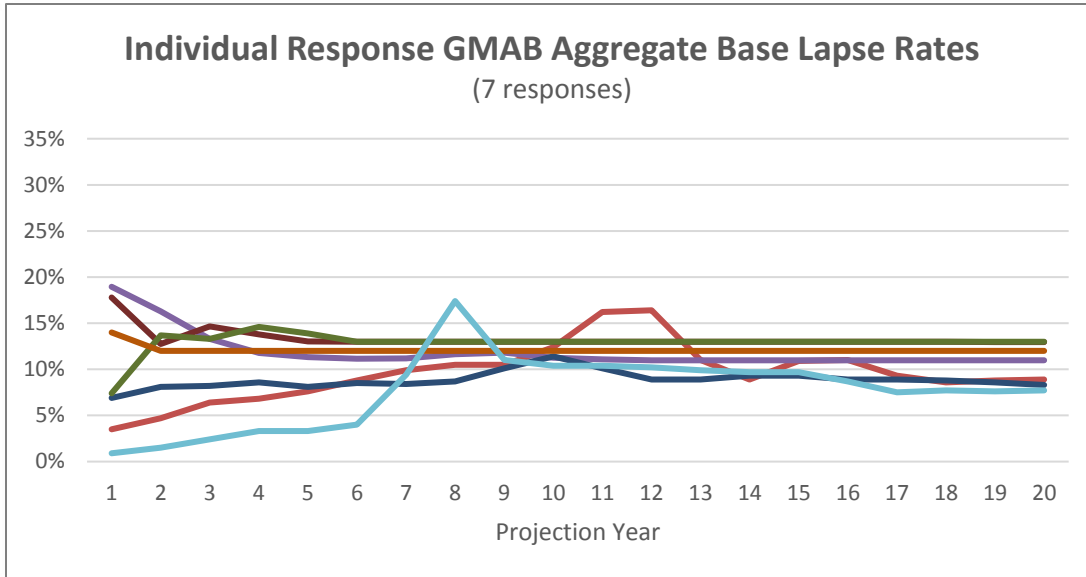


Figure 37

**Lapses in the Tail – Aggregate Block**

As an alternative to the individual policy view, insurers were asked to list their aggregate lapse assumption in the tail scenario for each of the five benefit types.

Figure 38 compares the median response for each of the benefit types. GMAB is noticeably higher than the other benefit types.

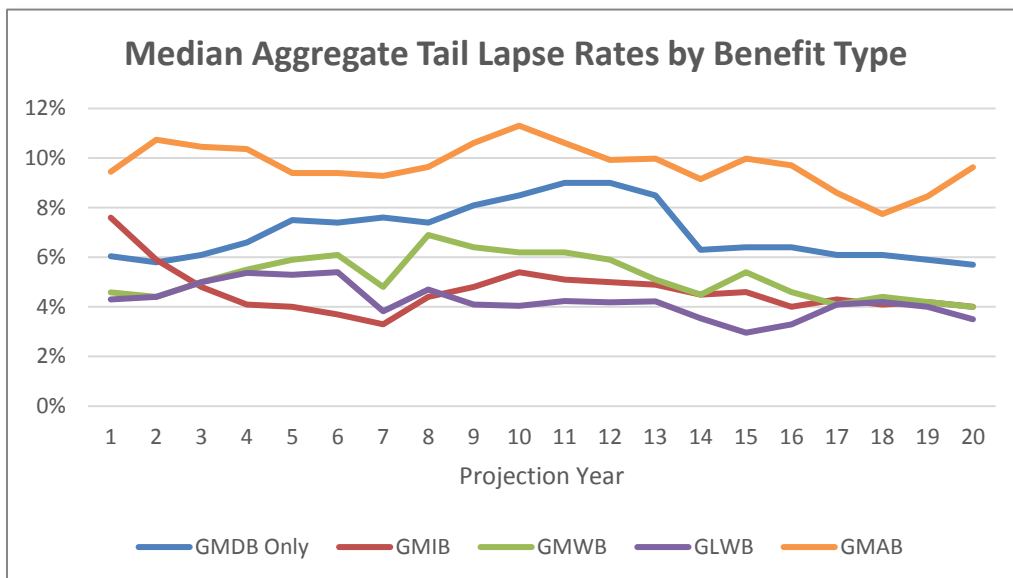


Figure 38

Figure 39 through Figure 43 show each insurer’s response for aggregate tail lapse rates for each benefit type.

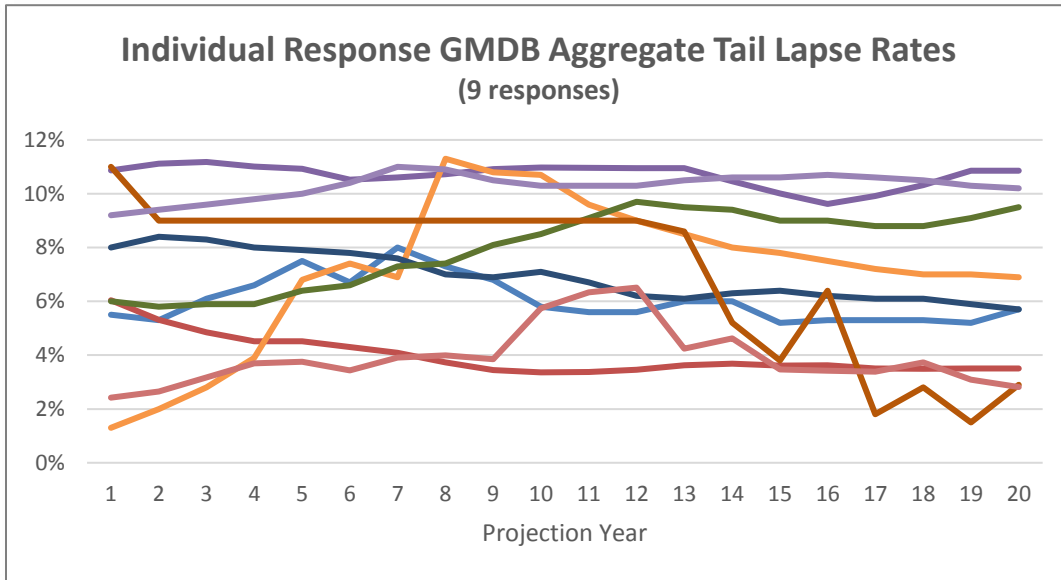


Figure 39

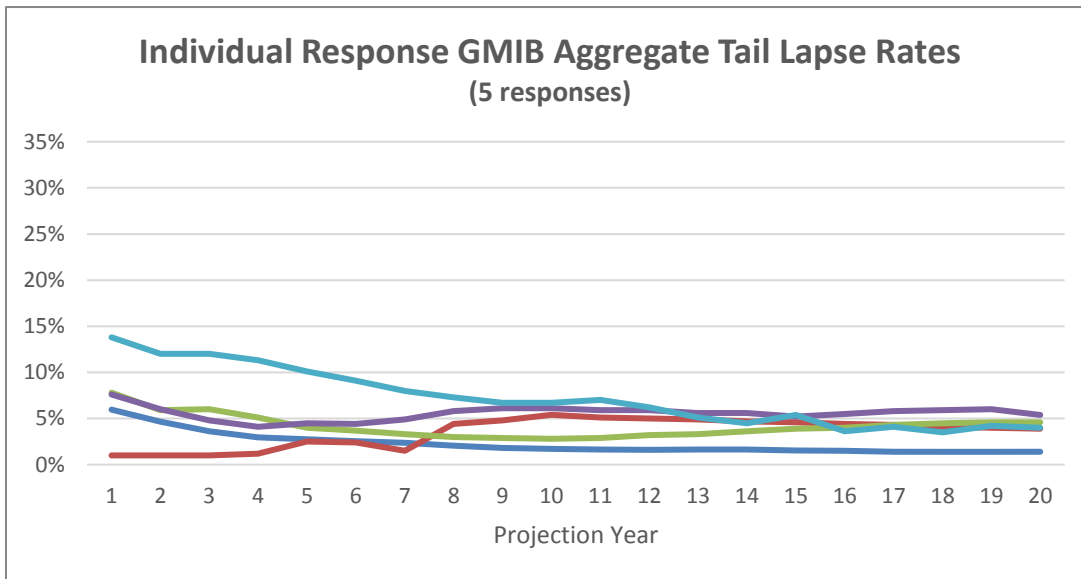


Figure 40



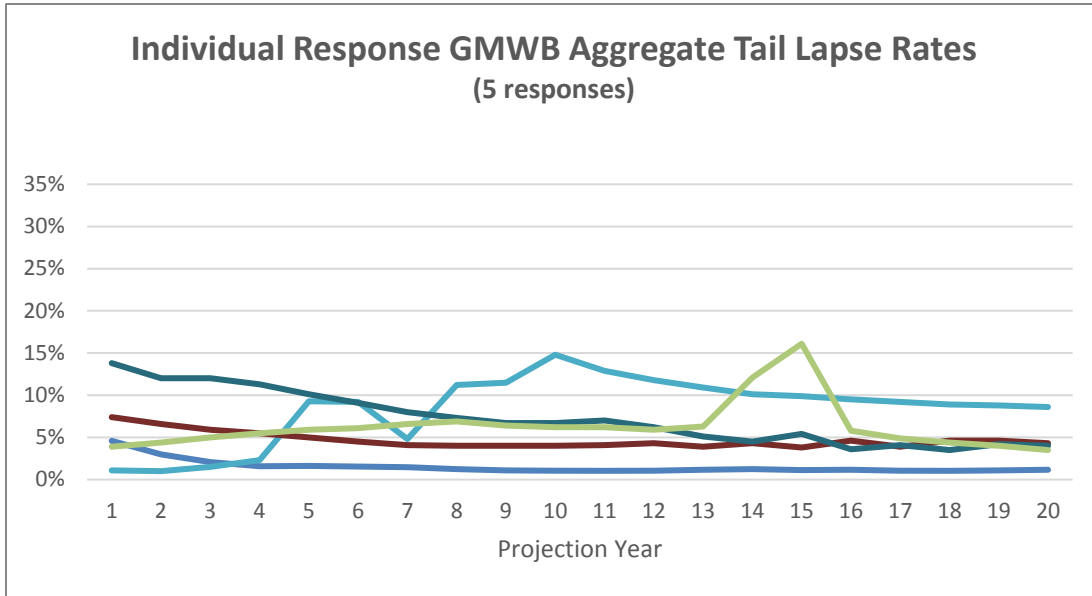


Figure 41

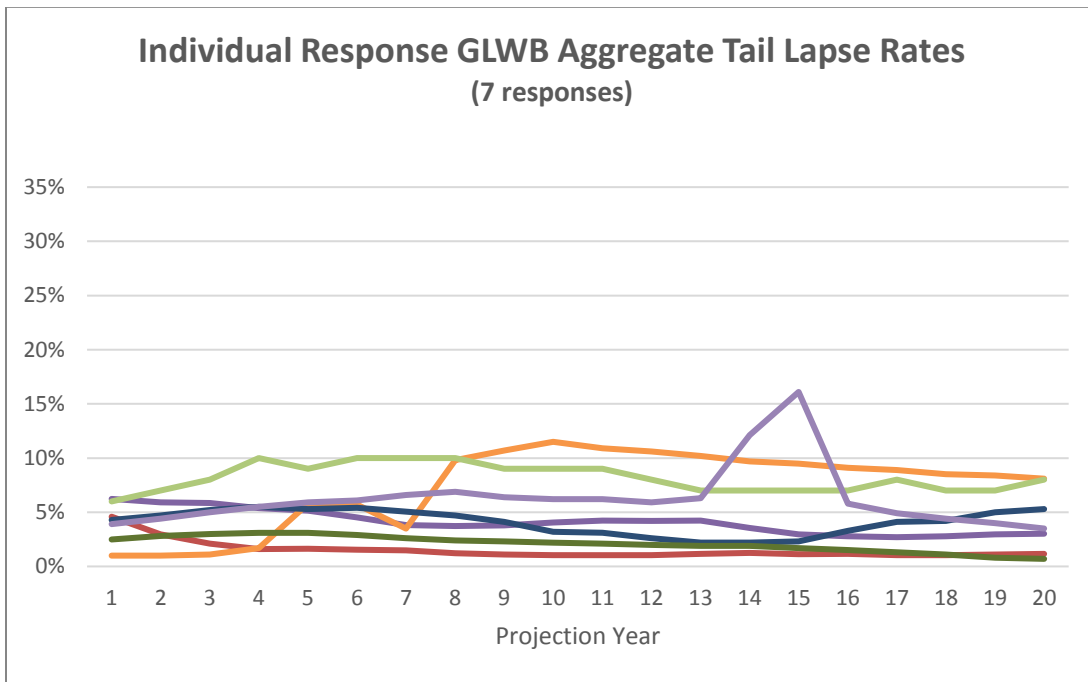


Figure 42

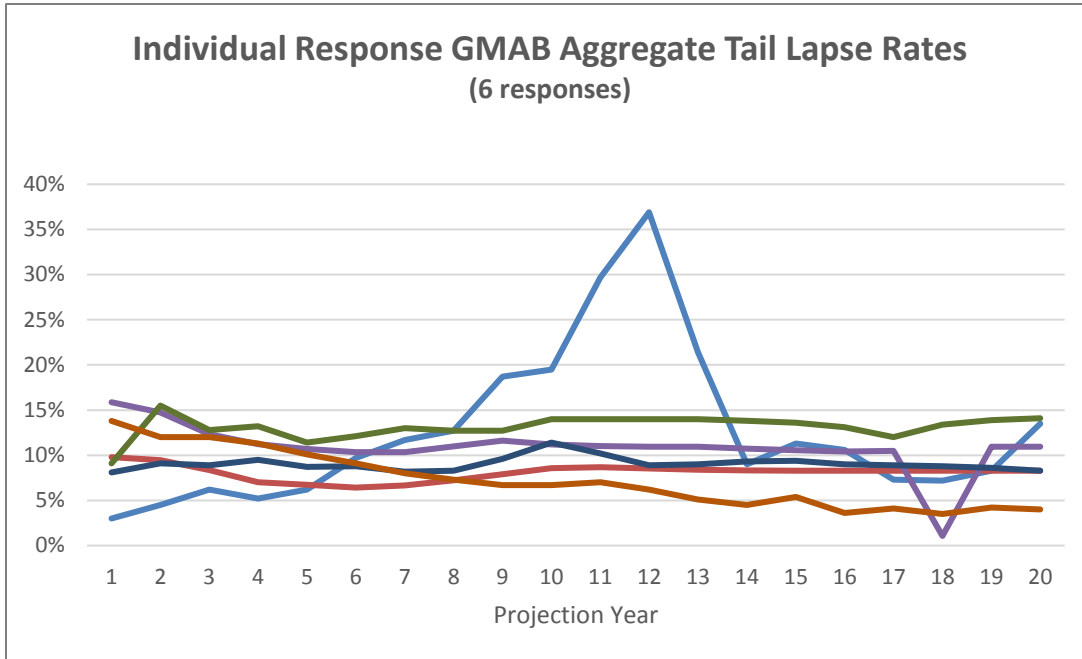


Figure 43

The next set of charts (Figure 44 through Figure 48) compares the median tail scenario lapse rate to the median normal scenario lapse rate for each benefit type. The lapse rate in the tail is generally lower as guarantees are in-the-money, but the degree varies by benefit type.

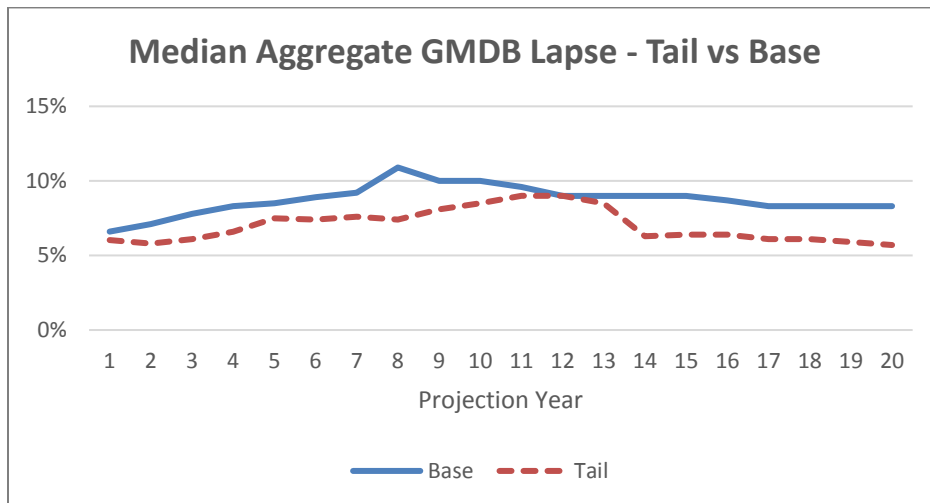


Figure 44

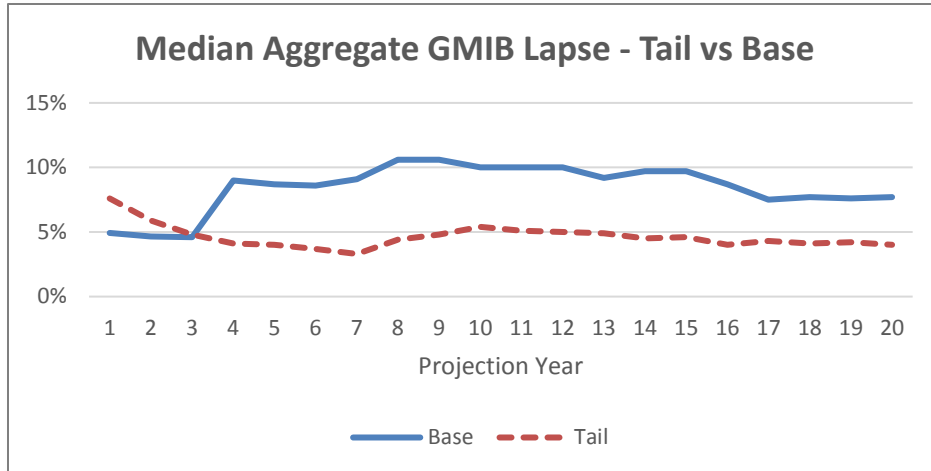


Figure 45

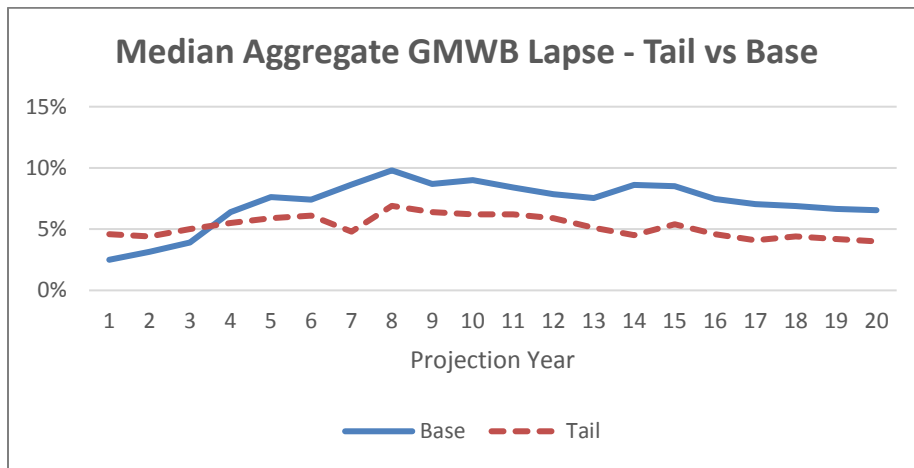


Figure 46

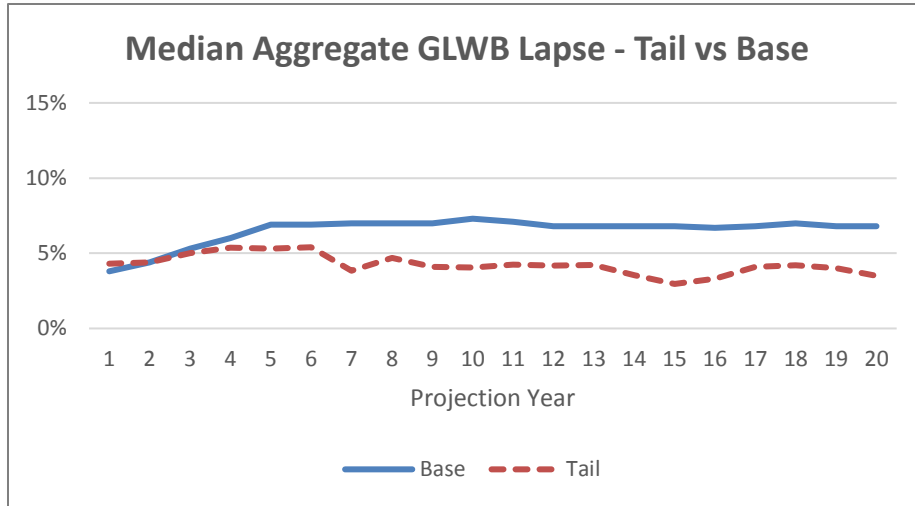


Figure 47

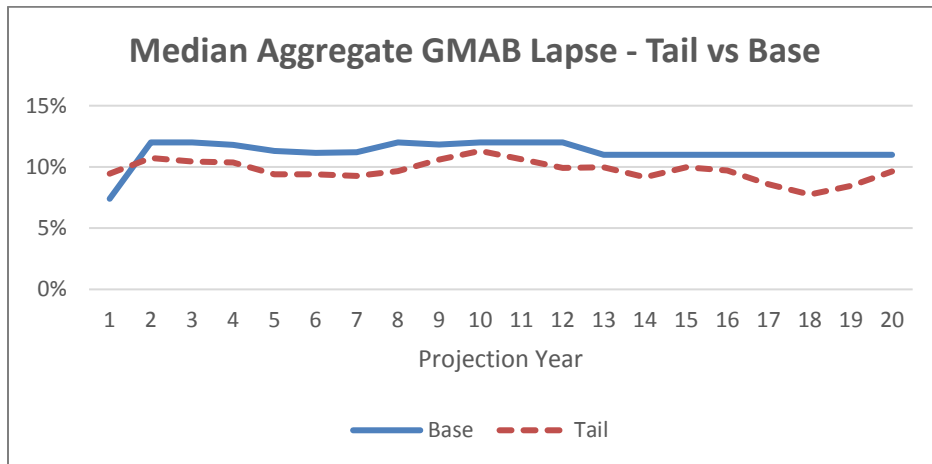


Figure 48

**GMIB Annuitization Utilization Rates in the Tail**

An open-ended question regarding utilization rates for GMIB annuitization rates asked whether or how the utilization rates assumed in the tail scenario differed from those in a normal scenario.

Thirteen (13) companies responded to this question. Of those, 11 (85%) indicated material changes to their utilization assumption based on scenario.

Of those 11, all 11 cited in-the-moneyness as a key driver of the difference between tail and normal scenario utilization rates, and this appears to be a key dependency.

In addition, 3 companies cited duration and 4 cited age. It was not clear whether utilization rates in the tail scenario varied by age because the base scenario utilization rates varied by

age or whether age influenced the degree by which the utilization rate in the tail scenario differed from the normal scenario.

Although the survey prompted companies to consider tax qualified status in their response, no company indicated any difference specifically between tax qualified and non-tax qualified statuses.

#### **GMWB Withdrawal Utilization Rates in the Tail**

An open-ended question regarding utilization rates for GMWB withdrawal rates asked whether or how the utilization rates assumed in the tail scenario differed from those in a normal scenario.

Thirteen (13) companies responded to this question. Of those, 3 (23%) indicated material differences in the utilization rate assumption based on scenario.

Of the three that cited a difference, one company commented that more contracts would utilize the WB due to lower lapses and that utilization was dependent on age and duration. Other comments were that the GMWB utilization in the tail scenario was about half that in a normal scenario and that the formula depended on in-the-moneyness.

Although the survey prompted companies to consider tax qualified status in their response, no company indicated any difference specifically between tax qualified and non-tax qualified statuses.

#### **GLWB Withdrawal Utilization Rates in the Tail**

An open-ended question regarding utilization rates for GLWB withdrawal rates asked whether or how the utilization rates assumed in the tail scenario differed from those in a normal scenario.

Fourteen (14) companies responded to this question. Of those, 2 (14%) indicated material differences in the utilization rate assumption based on scenario.

Of the two that cited a difference, one company commented that more contracts would utilize the WB due to lower lapses and that utilization was dependent on age and duration. Another commented that the GLWB utilization in the tail scenario is dependent on age and duration, but not on in-the-moneyness.

Although the survey prompted companies to consider tax qualified status in their response, no company indicated any difference specifically between tax qualified and non-tax qualified statuses.

### Lapses by Distribution Channel

Insurers were asked several questions about their distribution channels. 74% of responses (14 of 19) said that their products were sold through multiple distribution channels.

Of the 14 that use multiple distribution channels, Figure 49 shows the distribution of channels used.

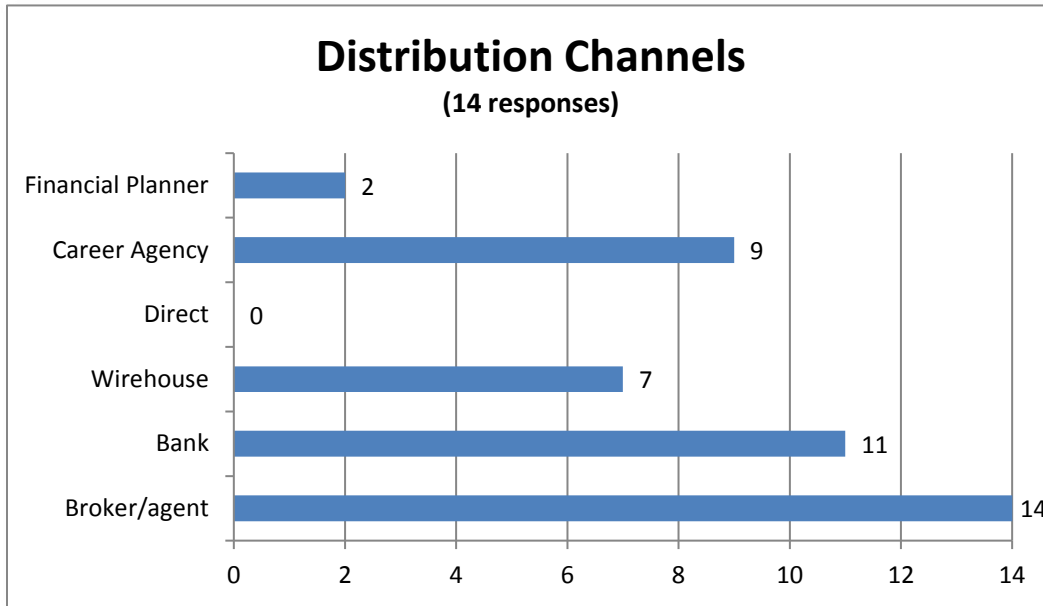


Figure 49

21% of respondents (3 of 14) measure lapse experience by distribution channel. This is a significantly lower positive response rate which was trending between 40-50% over the last 3 years of the survey.

14% (2 of 14) indicated that they vary lapse assumptions by distribution channel which is similar to past surveys. Both of these companies offered additional comments that third party distribution has generally higher lapse rates.

### Source of Assumptions

Insurers were asked to provide the sources they used for their expected lapse assumptions and the frequency of lapse studies performed in the company. “Company experience studies” continue to be the most popular source of base case assumptions (Figure 50). In 2015 there was a significant increase in the number of companies who indicated the use of industry experience, pricing assumptions, and external consultants in setting assumptions and those trends continued in 2016. One company also indicated that they use predictive models to develop lapse assumptions.

Collection, analysis, and publication of industry experience would be valuable as a supplement to any company’s specific experience. Companies of various sizes can be challenged by the statistical credibility available from only their own data, especially in the rare occurrence of a “tail” situation. Aggregation of data makes it easier to see trends otherwise obscured by statistical fluctuations. As with any aggregate industry study, each company needs to be aware of any inherent reasons why its own results may legitimately vary from that of the aggregate industry.

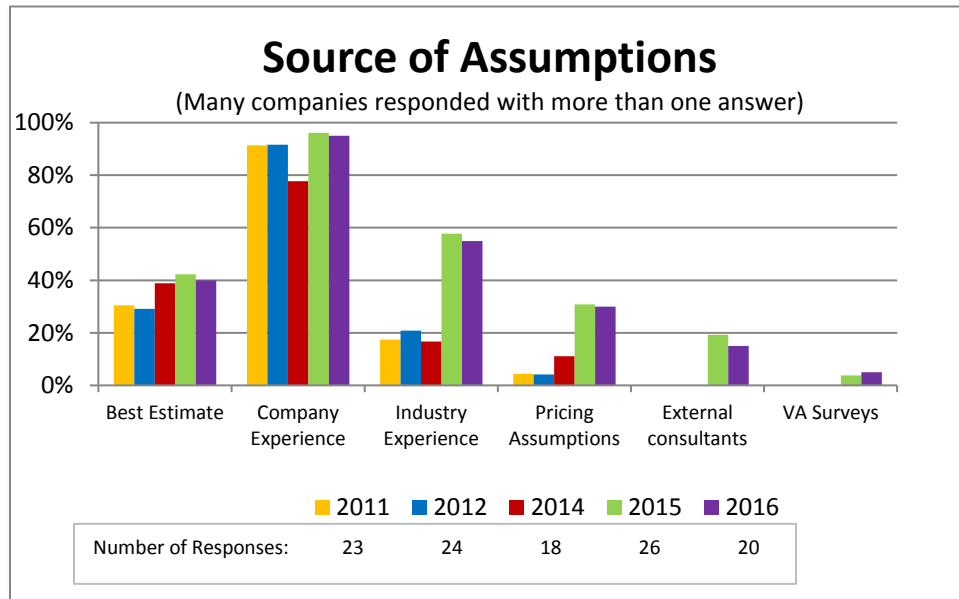


Figure 50

The most common frequency to perform experience studies is annual (Figure 51). In 2016, 70% (14 of 20) of respondents reported performing annual experience studies and 90% (18 of 20) perform experience studies on an annual or more frequent basis.

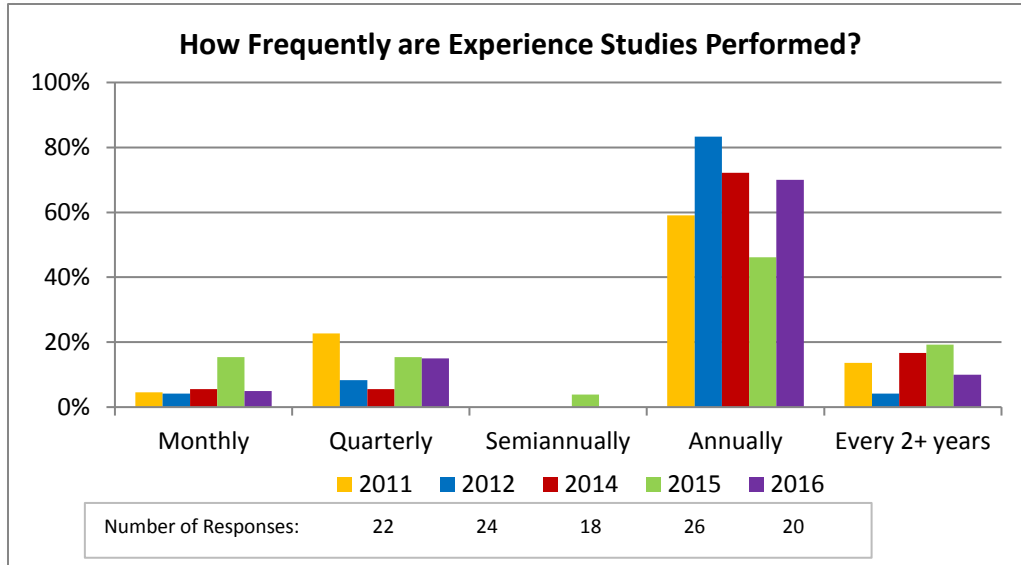


Figure 51

Insurers were asked how many years of data were used in their latest lapse study (Figure 52). Relative to past surveys, a significantly higher percentage of companies indicated that they use at least 10 years of experience as seen in Figure 52. This could be a trend as companies have older blocks of variable annuity business with guarantees or could be a result of a change in the mix of companies participating in the survey.

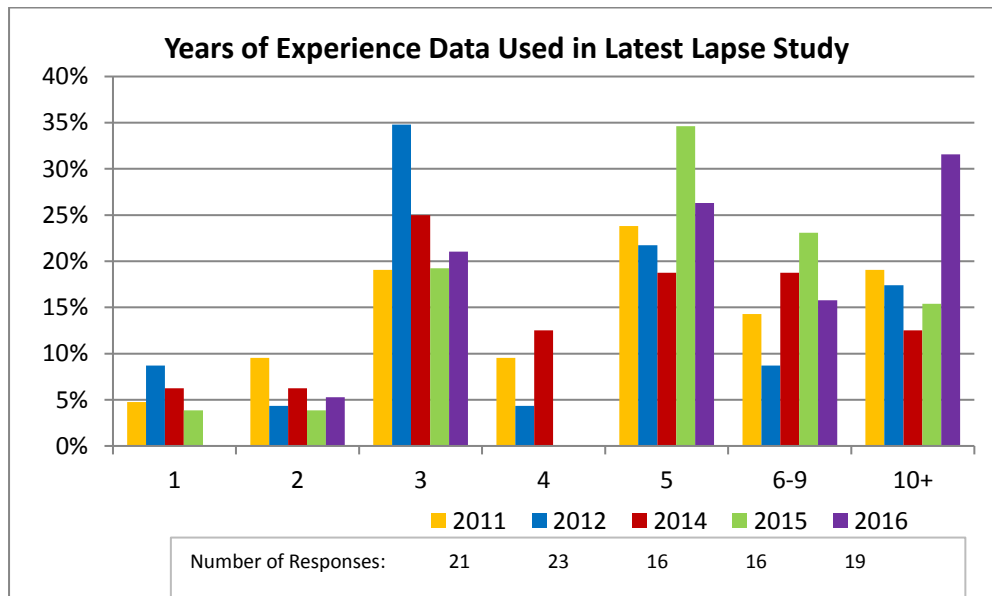


Figure 52

Companies were also asked about the sources of assumptions for “in the tail” lapsation with responses summarized in Figure 53. As was the case with base lapses, in 2015 there was a significant increase in the number of companies who indicated the use of industry



experience, pricing assumptions, and external consultants in setting tail assumptions and those trends continued in 2016. One company also indicated that it uses predictive models to develop tail lapse assumptions.

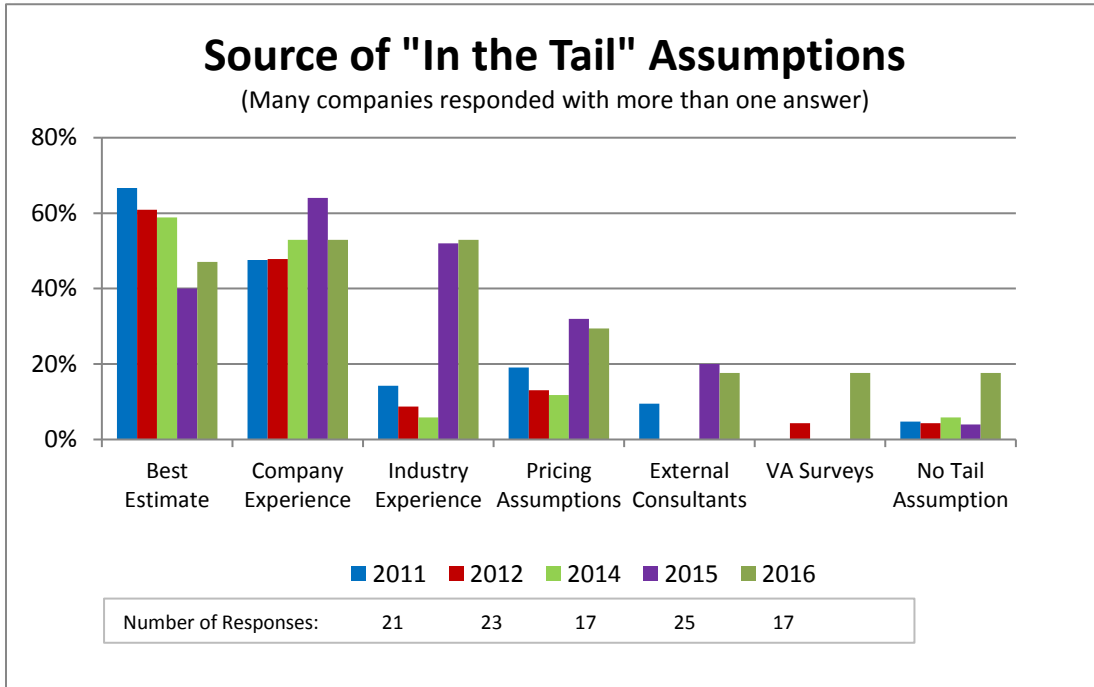


Figure 53

When asked about the years of experience considered in studies for lapses in the tail, almost all companies indicated the same time periods as in the base lapse study. One extended the years considered to include the financial crisis.

Figure 54 compares the source of base assumptions with the source of "In the Tail" assumptions for 2016, comparing the 2016 data from Figure 50 and Figure 53. This shows that more reliance is placed on company experience for base assumptions than for assumptions "in the tail." This is not unexpected since most actual experience is not in a tail scenario. Lapse assumptions in the tail require more judgement from the actuary.

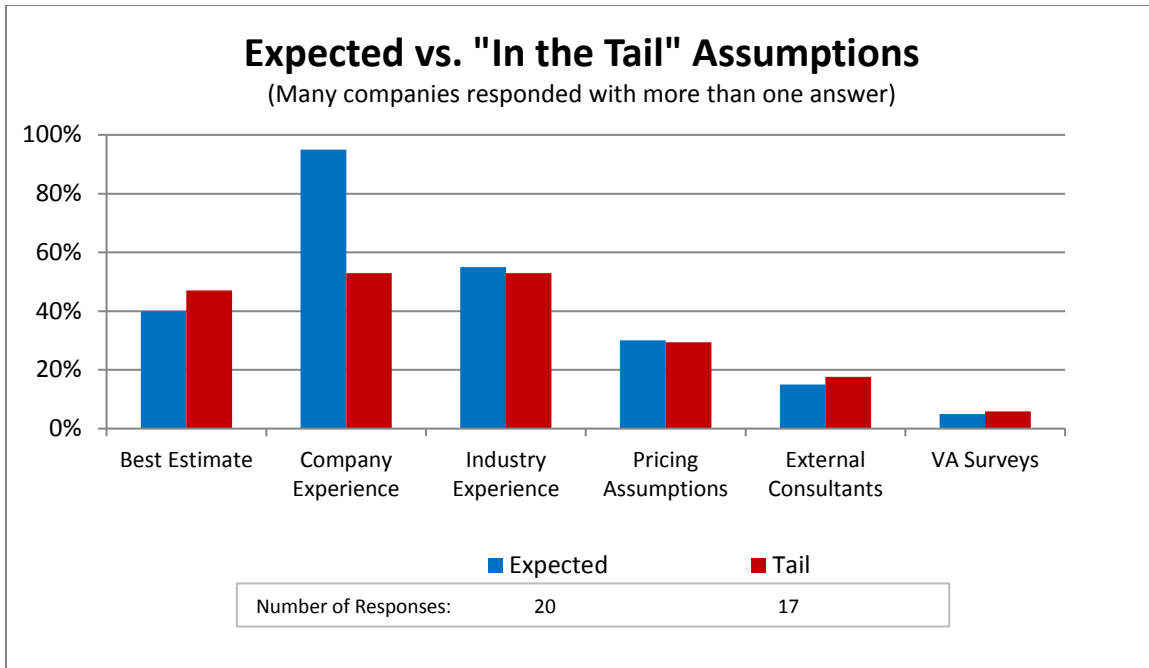


Figure 54

The survey asked companies if emerging policyholder behavior experience since 2008 (for many, a “tail” environment) caused a revision in policyholder behavior assumptions in the tail. Figure 55 shows that over half (61%; 11 of 18) made changes following the crisis with the vast majority of those (91%; 10 of 11) revising assumptions further since then.

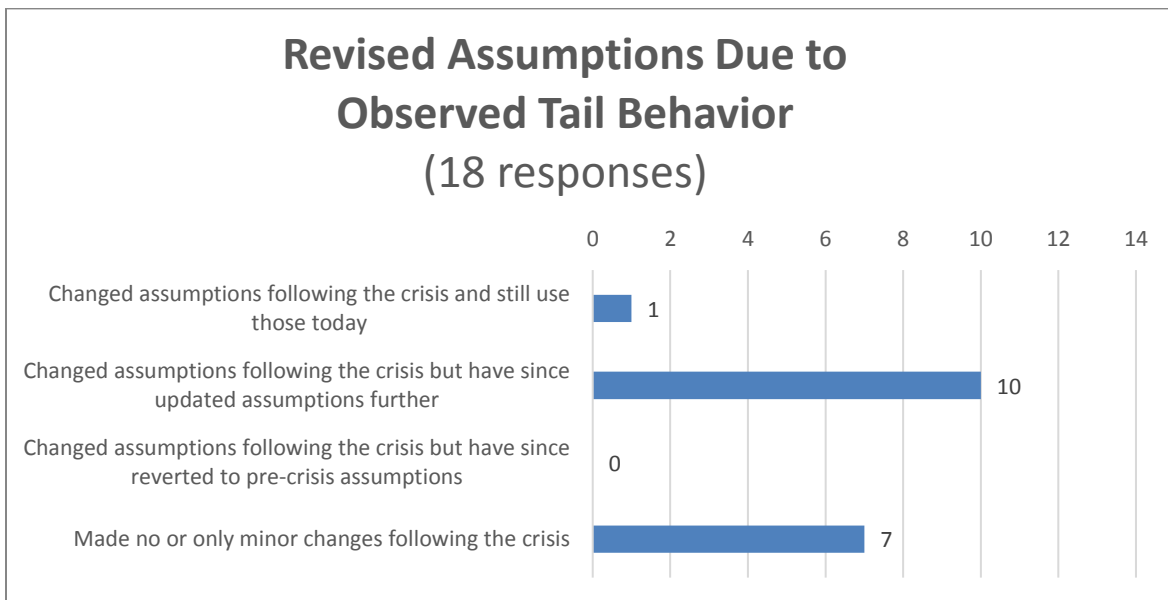


Figure 55

### Changes in Assumptions

Insurers were asked if any of the assumptions previously discussed in the survey were changed from the previous year’s analysis. The percentage of respondents indicating that some assumptions were changed in 2016 was 68% (13 of 19) which is similar to prior surveys (Figure 56).

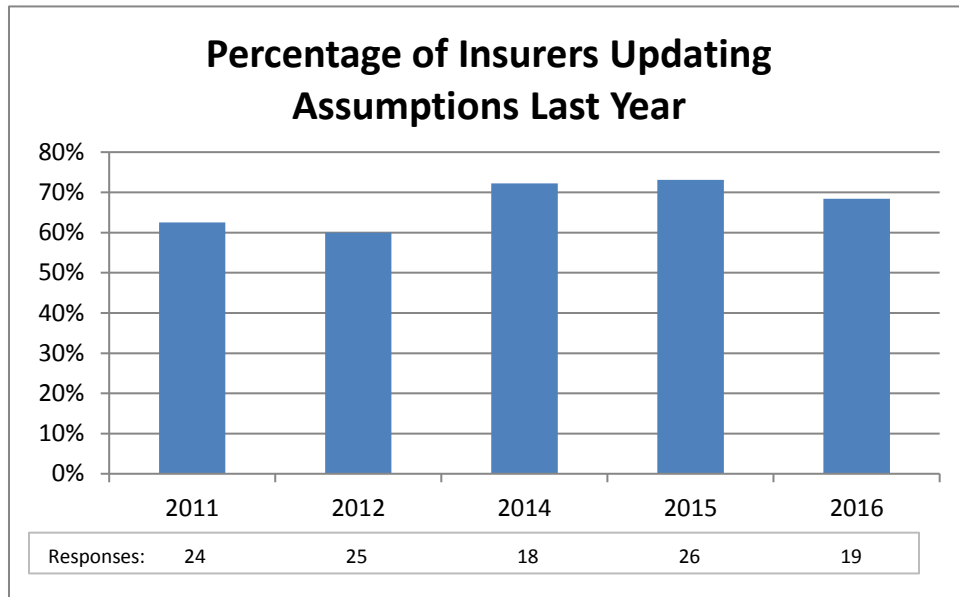


Figure 56

The question further sought open-ended responses describing what was changed for each of the five benefit types. The responses are summarized here, with the number of companies citing a particular response, if more than one.

#### GMDB

- Update experience (7)
- Added dynamic lapse
- Updated predictive model
- Decrease ultimate lapse rates by 1%

#### GMIB

- Update experience (6)
- Updated dynamic lapse and dynamic utilization
- Implemented predictive model

#### GMWB

- Update experience (5)
- Added dynamic lapse
- Eliminated moneyness from dynamic utilization function

GLWB

- Update experience (7)
- Added dynamic lapse
- Eliminated moneyness from dynamic utilization function
- Added granularity

GMAB

- Update experience (2)
- Added dynamic lapse
- Implemented predictive model

**Sensitivities**

Almost all (19 of 20; 95%) of companies indicated that they are performing sensitivity analyses related to assumptions that impact policyholder behavior.

The survey question had intended to allow multiple responses, but the survey technology actually only allowed one response this year. Many companies listed several responses within “Other,” which are tabulated then in more than one category in Figure 57, but some companies may have marked only one response when they otherwise would have marked multiple responses – had it been allowed.

Sensitivity to the base lapse rate, equity scenario, and utilization assumption were the most common types of analyses performed. “Other” responses included mortality, expenses, interest rates, and the dynamic lapse assumption (Figure 57).

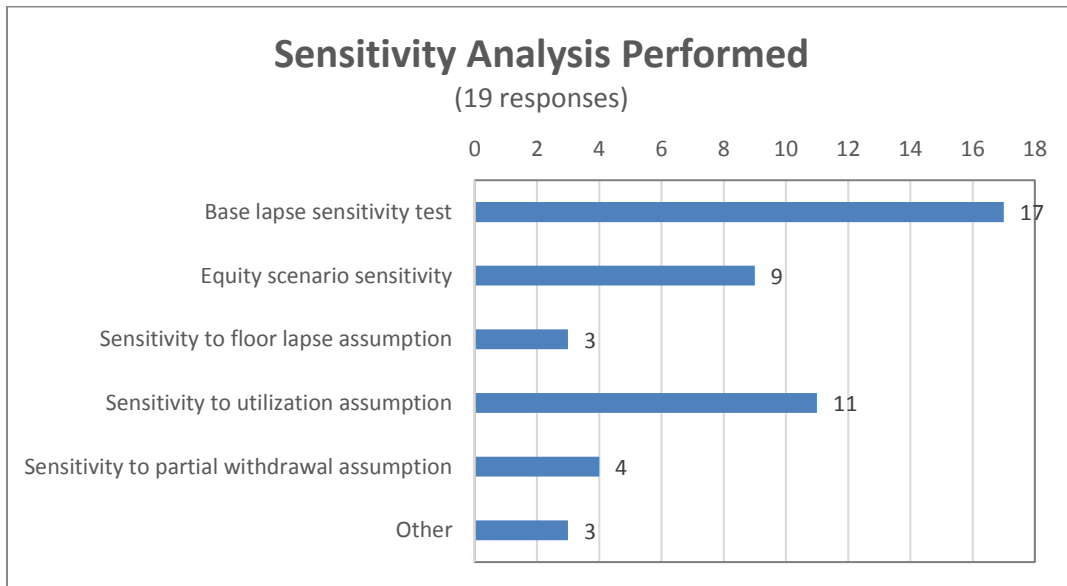


Figure 57