POLICYHOLDER BEHAVIOR IN THE TAIL
VARIABLE ANNUITY GUARANTEED BENEFITS SURVEY
2012 RESULTS

Survey Highlights

Five Year Results

- A majority of insurers now use dynamic lapse functions for GMDBs. The percentage increased from 25% in 2008 to over 55% in 2011 and 2012. (Figure 17 on Page 18)
- Fewer insurers are using dynamic variation for the utilization of GMWB today than 5 years ago. The percentage of respondents who vary GMWB utilization dynamically dropped from 73% in 2008 to 38% in 2012. (Figure 22 on Page 21)

One Year Results

- Differences in tail scenarios, dynamic lapse assumptions, and product features can cause the distribution of lapse assumptions in the tail to vary widely by insurer (e.g., 0% to 20% or more). (Figures 12-16 on Pages 15-17)
- The median cumulative return, measured across the respondent's least tail scenarios, tracks but is somewhat lower than the 10^{th} percentile of the AAA pre-packaged scenarios. 2012 participants indicate their companies can sustain significantly worse equity performance, compared to most prior years, without needing additional assets. (Figure 5 on Page 8)
- There is extreme variation in the description of the least tail scenario (as defined on page 6) across insurers. (Figure 3 on Page 7)
- 60% of respondents indicated they changed assumptions since the last annual survey; about the same as last year's 63%. (Figure 32 on Page 30)
- 41% of respondents made changes to their policyholder behavior assumptions in the tail due to emerging experience over the past four years. (Figure 36 on Page 32)

- Median base assumption lapse rates show very little difference across benefit types. (Figure 11 on page 12)
- The median base assumption lapse rate at the end of the surrender charge period increased by over 45% from 2011 to 2012, reverting back to those comparable to the 2010 survey results. (Tables on Page 14) See comment on page 4 regarding influx of new respondents.
- 80% of respondents use dynamic lapses for contracts with guaranteed minimum living benefits. Nearly all of those described their function as one-sided. (Figure 18 and Figure 19 on Pages 19 and 20, respectively)
- 89% of respondents projected results over at least 30 years (Figure 2 on Page 6), using at least 1,000 scenarios. (Figure 1 on Page 5)
- Half of the companies participating in the survey this year have at least $20 billion of variable annuity total account value with guaranteed benefits. (Figure 37 on Page 33)
- A majority of insurers indicated that best estimates (i.e., professional judgment) were used as one of the sources for tail lapse assumptions. Company experience was also used by almost half of the companies. (Figure 30 on Page 28)

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 (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.

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Acknowledgements

The Society of Actuaries' Policyholder Behavior in the Tail (PBITT) working group gratefully acknowledges Stephen Hodges and Chuck Bremer for all of their 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 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 or Steve Siegel, Society of Actuaries Research Actuary at ssiegel@soa.org.

Background

In late 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 C-3 Phase II calculation. Each edition of the survey has had approximately 20-30 responses; however not every company answered every question. The following sections highlight responses from the 2012 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.

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, at the level of the total survey, and considering only those whose identity was revealed, there are 11 new respondents, 24 continuing respondents (to both surveys), and 2 prior respondents that did not participate in the latest survey.

Specifics of C-3 Phase II Calculation

Insurers were asked to provide details on their C-3 Phase II (C3P2) calculation, such as the number of scenarios used and the length of projection horizon. C-3 Phase II is a principles based approach to calculating the minimum amount of capital for market risk required to be held for various products offered by insurance companies including variable annuities with guaranteed living and death benefits. Every 2012 respondent, as in 2010, indicated that at least 1,000 scenarios were used. The percentage of companies indicating that 1,000 scenarios were used decreased slightly in 2012 due to the increase in the percentage of respondents using more than 1,000 scenarios. All of the 2012 respondents indicated they projected results over at least 20 years, with 89% (25 of 28) of respondents projecting results 30 years or more.

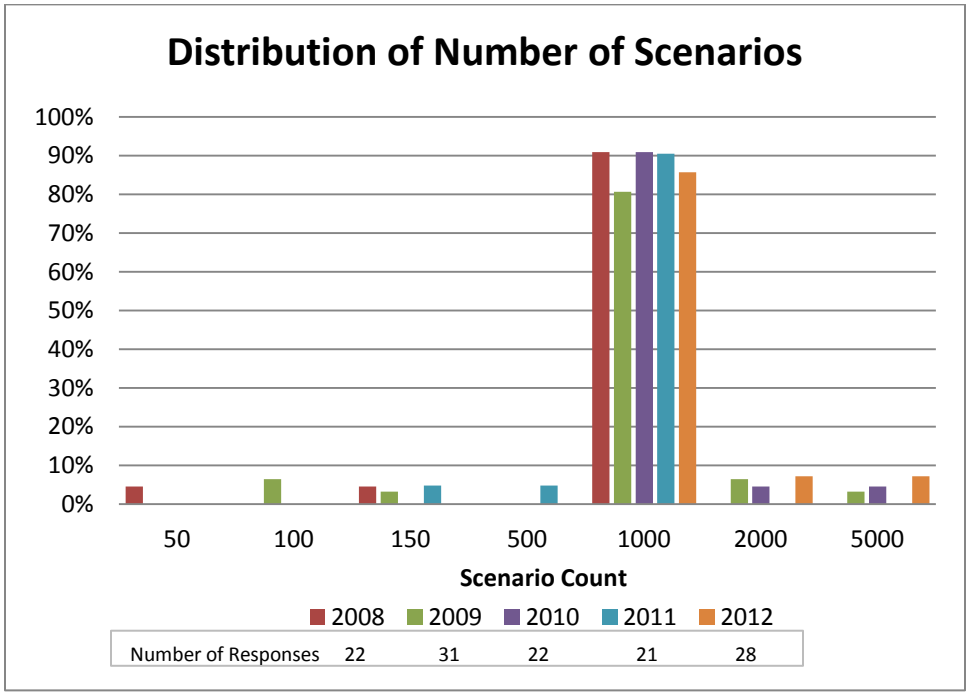

Figure 1

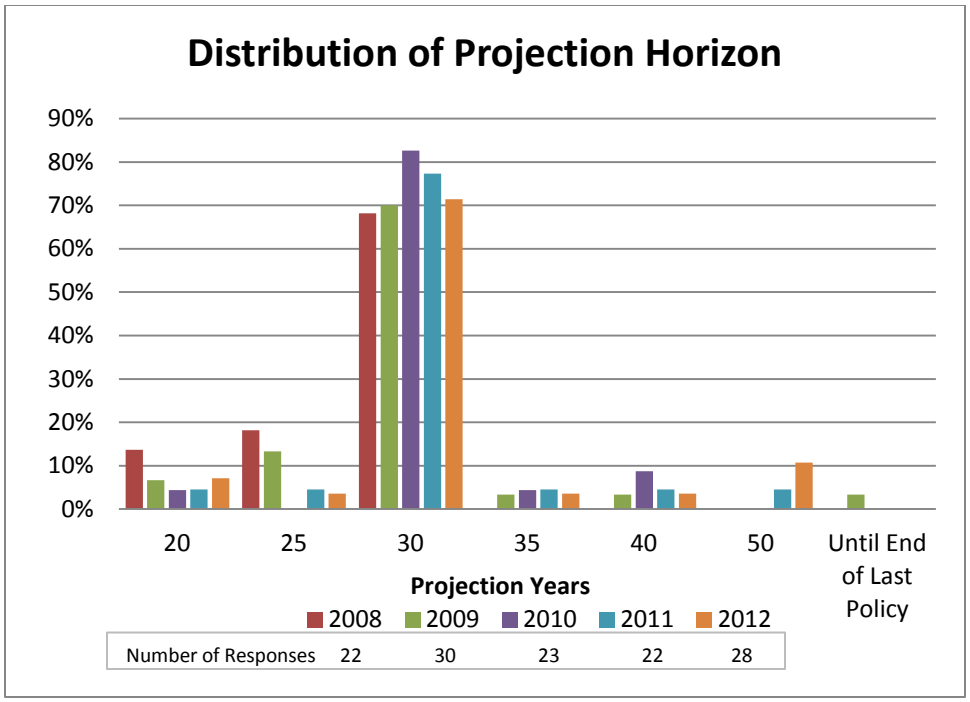

Figure 2

Tail Scenario

Insurers were asked to describe the tail scenario that determines the first negative result of their modified 90 CTE calculation. For example, if the sorted present values for each scenario in the tail were -100, - 90, -50, -30, -15, 5, 20, etc., the scenario the insurer would provide would be the one that produced a present value equal to -15.

Responses varied widely across insurer regarding the description of the tail scenario as they have in other reports. The chart below shows each insurer's description of the equity performance in their tail scenario on a cumulative basis. Of the 23 responses, five had negative cumulative returns through at least the first fifteen projection years. Another five were positive through the first two years before turning negative for at least 15 years. Four of the reported returns were positive throughout the whole projection period. The rest of the reports consisted of mixed positive and negative cumulative returns.

As you can see, dispersion may reflect different company's products and/or their set of scenarios.

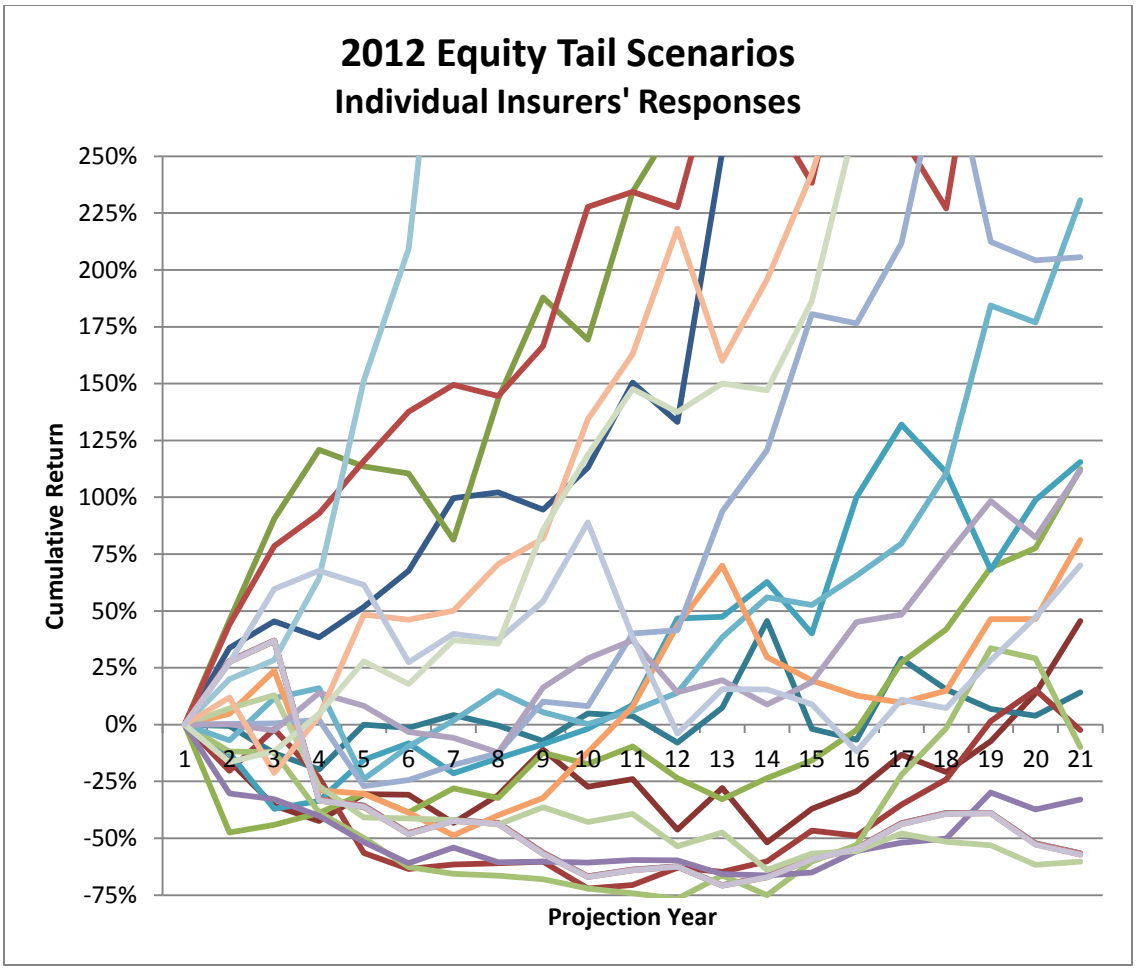

Figure 3

In Figure 4, the median of the lines in the 2012 Equity Tail Scenarios (seen in Figure 3) is plotted against the 10th percentile of the equity returns from the American Academy of Actuaries pre-packaged scenario set based on 2005 data (http://www.actuary.org/life/phase2_2.asp). For reference, the median of insurers' responses from the previous years' surveys are also plotted on the graph below (see Figure 5). Note that the lines below reference the median (of each survey year) and 10th percentile (of the AAA scenarios) with respect to the cumulative gains at a given duration, rather than representing a particular scenario over all durations. Responses from 2012 show a distinct difference between the median of insurers' responses and the 10th percentile of the AAA pre-packaged scenarios.

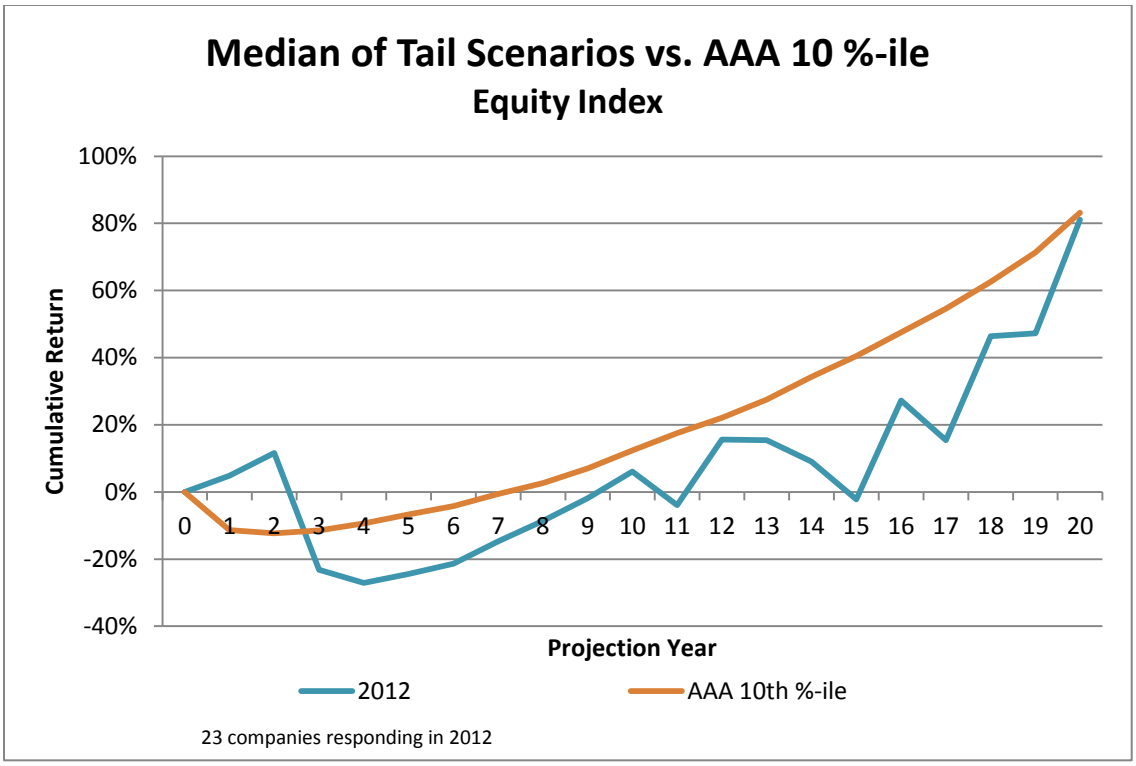

Figure 4

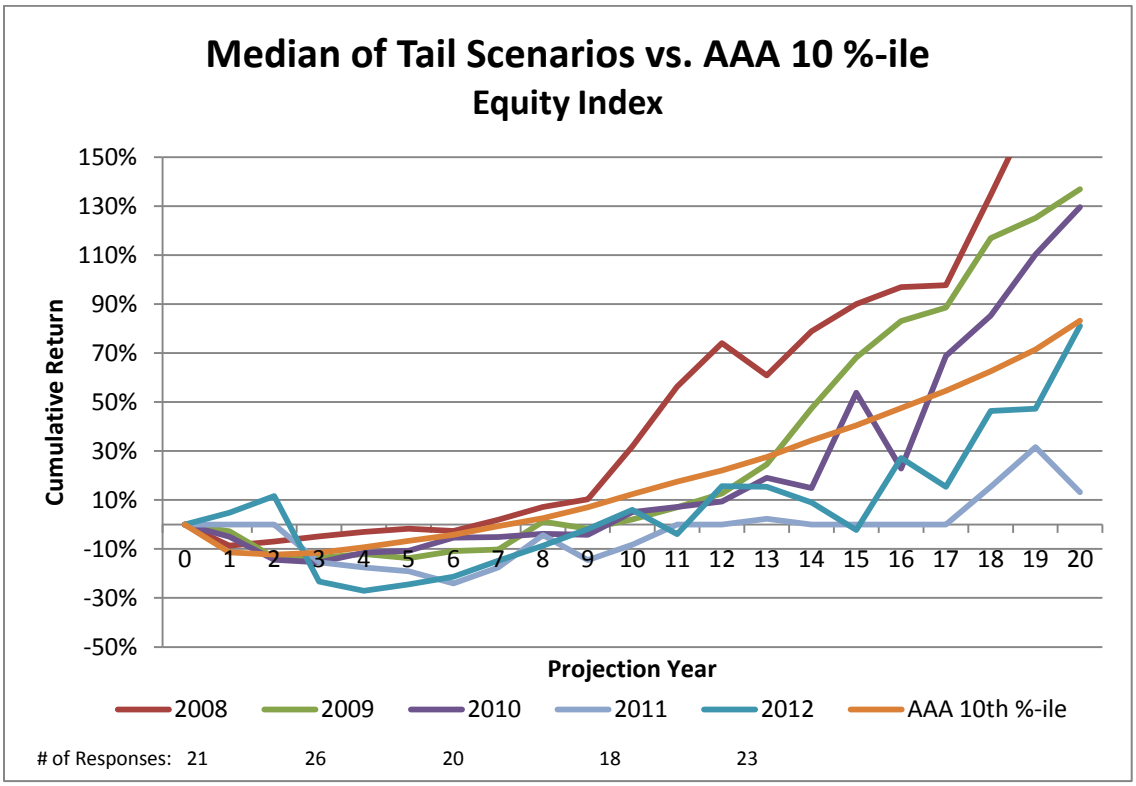

Figure 5

The median response has been fairly stable over the years, particularly in the first 5 projection years. The median of 2012 responses had a cumulative return that follows but is somewhat lower than that of the AAA scenario set. Relative to previous years other than 2011, participants indicate their companies can sustain significantly worse equity performance before needing the first small amount of additional assets.

Base Lapse Assumptions

Insurers were asked to list their base lapse assumption (non-dynamic) at policy years 1, 2, 3, as well as several durations following the surrender charge period. The survey question was enhanced for 2012 in order to provide more clarity around the definition of the end of the surrender charge period. Responses were categorized by benefit type into Death Benefits (GMDB), Accumulation Benefits (GMAB), Income Benefits (GMIB), Withdrawal Benefits (GMWB), and Combination Benefits (Combo).

The following charts list each insurer's response for base lapses for each benefit type.

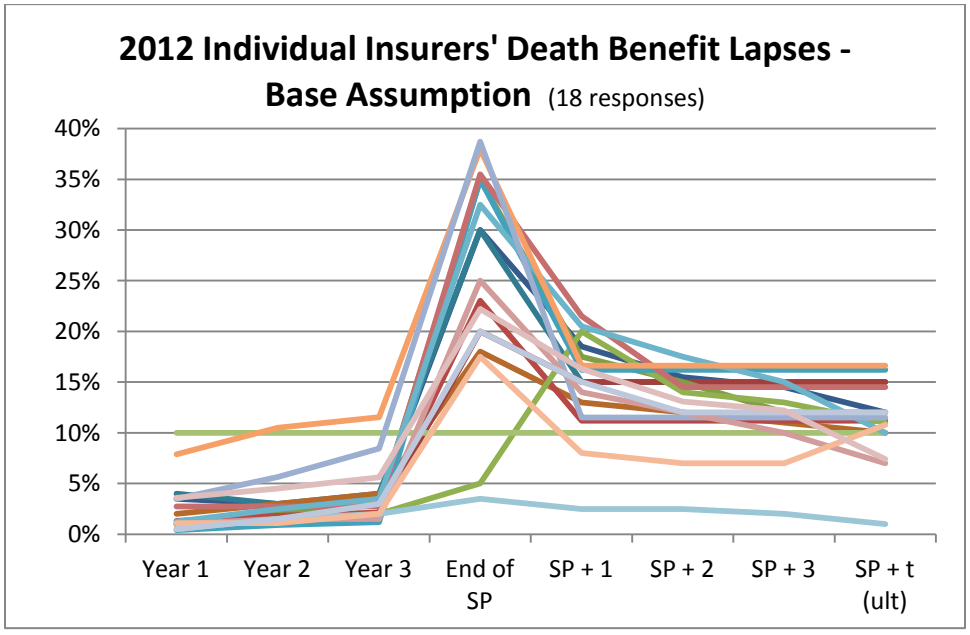

Figure 6

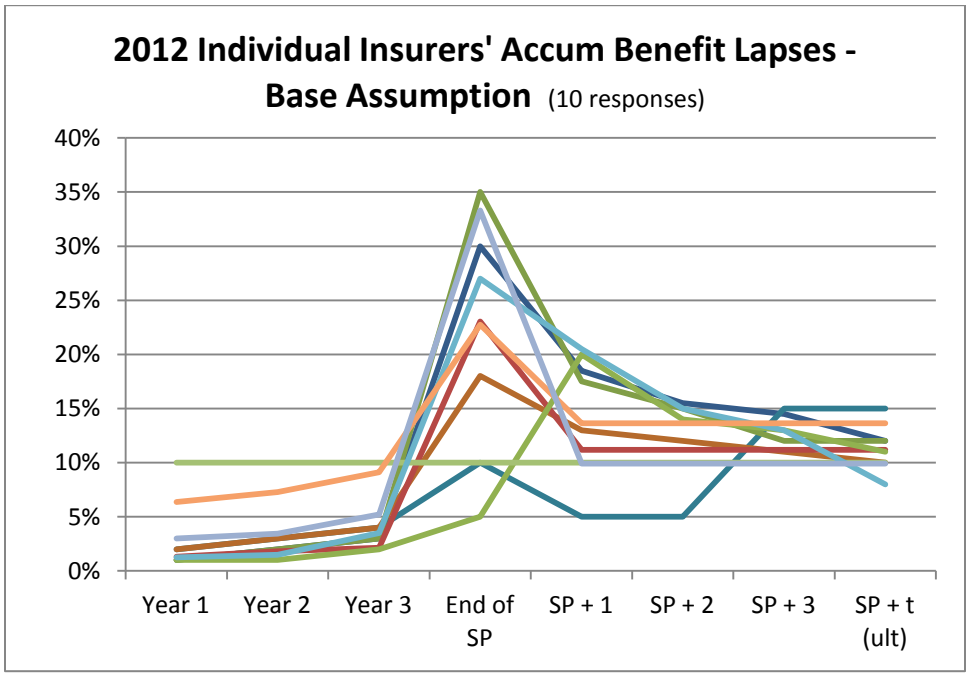

Figure 7

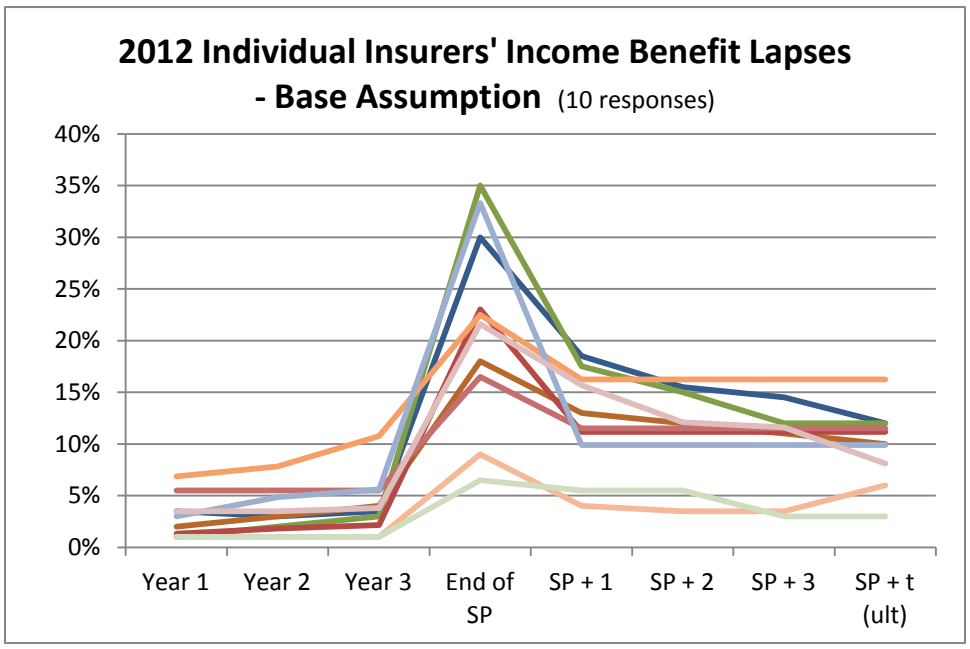

Figure 8

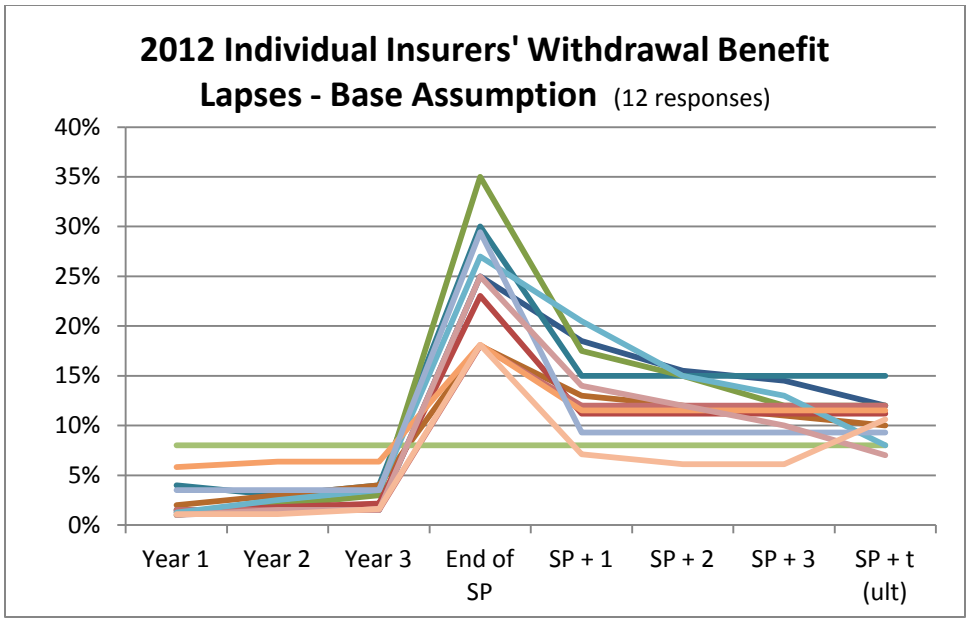

Figure 9

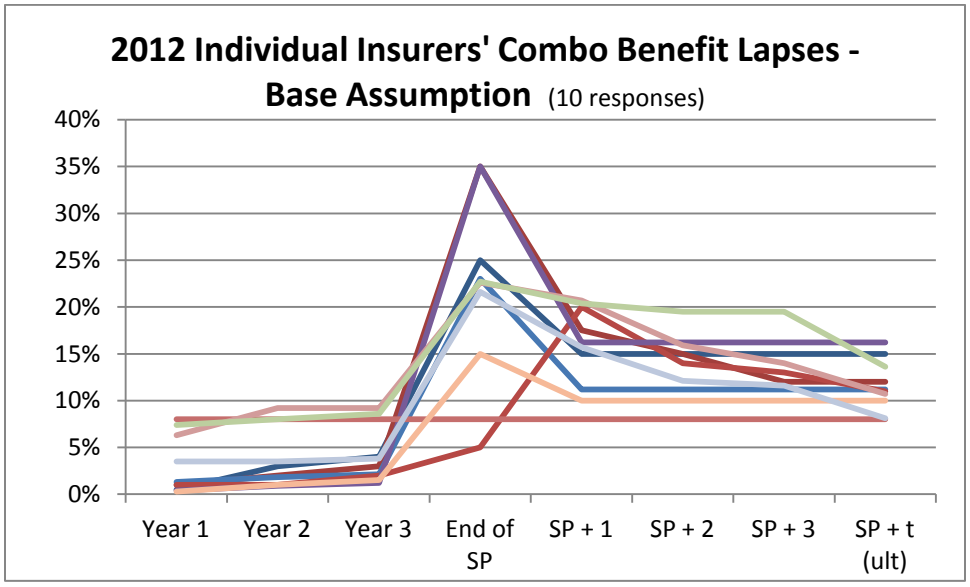

Figure 10

The following graph shows the median lapses by benefit type across all insurers' responses.

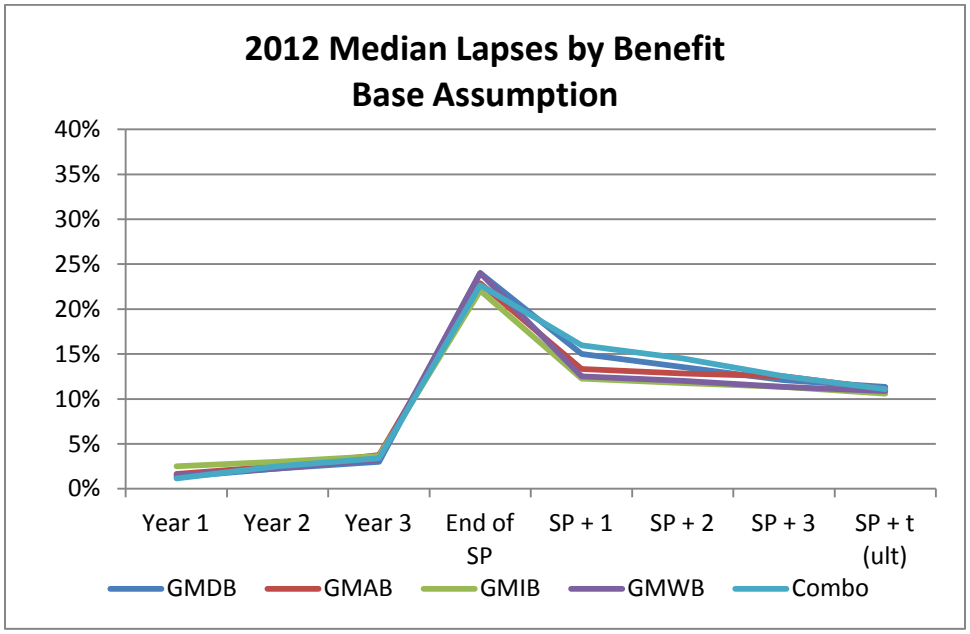

Figure 11

The median base assumption lapse rates show very little difference across benefit types.

Note that the median lapse rates do not reflect any one individual insurer's array (by duration) of lapse rates, but rather reflect the median across all insurers at the given duration. Thus, the median rate used for duration 2 may be from Insurer A while the rate used for duration 3 would be from Insurer B if that is the median data point given for duration 3.

The following tables compare median lapse rates by benefit type for 2009 through 2012. Pages 13-14 illustrates the lapse rates by survey year. Page 14 also focuses on the two benefit types for which the most responses were received and makes it easier to review benefit specific assumptions across survey years. The variation across survey years of the median lapse rates at the end of the surrender charge period continues to oscillate.

2009 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	2.0%	1.5%	1.5%	2.0%	1.0%
2	3.0%	3.0%	3.0%	3.0%	2.0%
3	4.0%	4.0%	3.0%	3.5%	2.2%
SP	20.5%	16.9%	21.6%	15.0%	23.0%
SP+1	13.7%	10.5%	17.0%	10.5%	12.1%
SP+2	13.2%	10.5%	15.0%	10.5%	10.6%
SP+3	12.8%	10.5%	15.0%	10.0%	10.4%
SP+t	11.6%	12.5%	13.5%	10.0%	9.8%
Responses	18	9	7	13	5

2010 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	1.2%	1.0%	1.3%	1.2%	1.5%
2	2.2%	2.0%	1.8%	2.0%	2.1%
3	3.1%	3.0%	2.5%	2.9%	2.3%
SP	24.0%	23.0%	27.0%	24.0%	23.0%
SP+1	12.8%	13.5%	13.5%	13.0%	13.8%
SP+2	12.8%	11.5%	11.2%	12.0%	13.3%
SP+3	11.9%	11.7%	11.2%	11.3%	11.7%
SP+t	12.0%	11.5%	11.2%	11.8%	11.6%
Responses	14	9	7	10	8

2011 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	1.1%	1.0%	1.5%	1.0%	2.0%
2	2.0%	2.0%	2.0%	2.0%	2.3%
3	3.0%	2.5%	2.1%	2.5%	3.0%
SP	16.4%	11.7%	15.0%	16.0%	22.6%
SP+1	13.5%	18.2%	17.9%	12.5%	20.0%
SP+2	12.5%	15.0%	15.0%	12.0%	15.5%
SP+3	12.5%	14.3%	14.5%	11.0%	14.5%
SP+t	12.0%	12.0%	12.0%	11.0%	12.0%
Responses	16	8	7	11	9

2012 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	1.3%	1.7%	2.5%	1.5%	1.2%
2	2.3%	2.5%	3.0%	2.3%	2.5%
3	3.0%	3.8%	3.7%	3.3%	3.4%
SP	24.0%	22.9%	22.1%	24.0%	22.7%
SP+1	15.0%	13.3%	12.3%	12.5%	16.0%
SP+2	13.6%	12.8%	11.8%	12.0%	14.5%
SP+3	12.1%	12.5%	11.3%	11.3%	12.5%
SP+t	11.3%	11.1%	10.6%	10.9%	11.1%
Responses	18	10	10	12	10

Median Lapse Rates by Year

	GMDB				GMWB			
Duration	2009	2010	2011	2012	2009	2010	2011	2012
1	2.0%	1.2%	1.1%	1.3%	2.0%	1.2%	1.0%	1.5%
2	3.0%	2.2%	2.0%	2.3%	3.0%	2.0%	2.0%	2.3%
3	4.0%	3.1%	3.0%	3.0%	3.5%	2.9%	2.5%	3.3%
SP	20.5%	24.0%	16.4%	24.0%	15.0%	24.0%	16.0%	24.0%
SP+1	13.7%	12.8%	13.5%	15.0%	10.5%	13.0%	12.5%	12.5%
SP+2	13.2%	12.8%	12.5%	13.6%	10.5%	12.0%	12.0%	12.0%
SP+3	12.8%	11.9%	12.5%	12.1%	10.0%	11.3%	11.0%	11.3%
SP+t	11.6%	12.0%	12.0%	11.3%	10.0%	11.8%	11.0%	11.1%
Responses	18	14	16	18	13	10	11	12

Lapses in the Tail

Insurers were asked to list the lapse rate assumption as applied in the tail scenario for Death, Accumulation, Income, Withdrawal and Combination benefits. As described on Page 6 in the *Tail Scenario* section, the tail scenario is defined as the scenario that gives the first negative result of their modified 90 CTE calculation when rank ordered. The following charts show tail lapse rates by benefit type for years 1 through 20.

Individual company assumptions can be volatile if the underlying tail scenario is volatile and the company assumes a dynamic policyholder response.

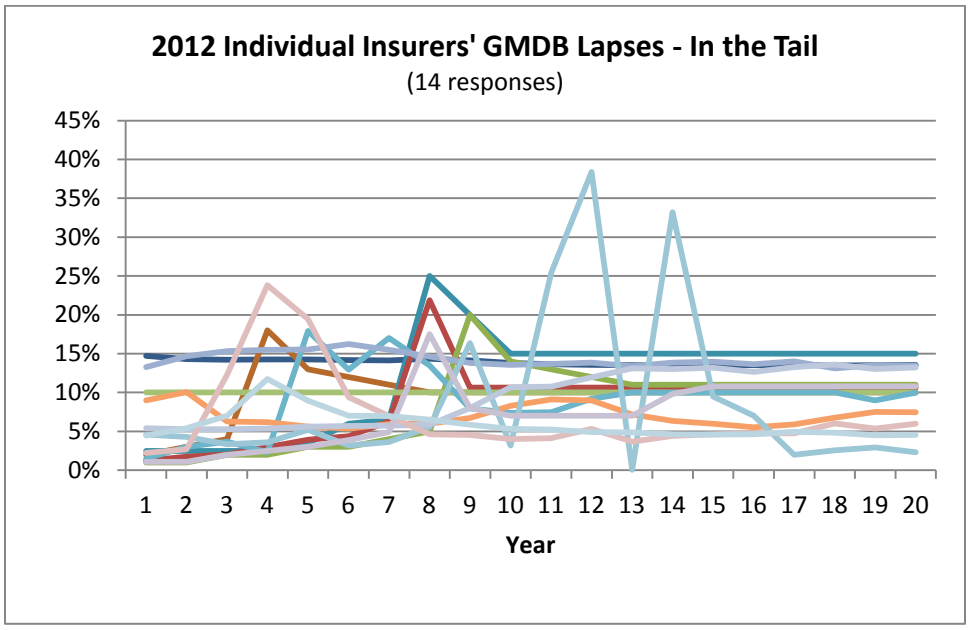

Figure 12

The spike shaped response that has a lapse rate reaching nearly 40% in Year 12 in Figure 12 (above) is the result of a very volatile economic scenario combined with a dynamic policyholder behavior function based on in-the-moneyness. In Figure 13 (below), the lapse rate in the tail reported by one company (in green) reflects the use of the benefit after year 10. The large increase in "lapse" activity reflects a contractual requirement to terminate the contract in order to be paid the guaranteed minimum accumulation benefit available after the tenth year in that particular tail scenario.

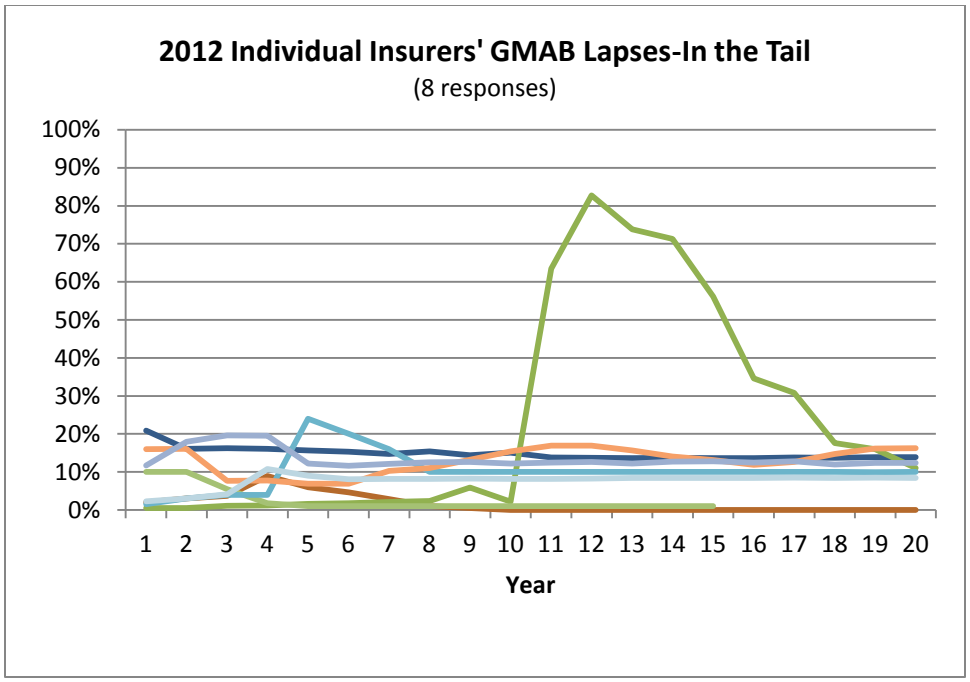

Figure 13

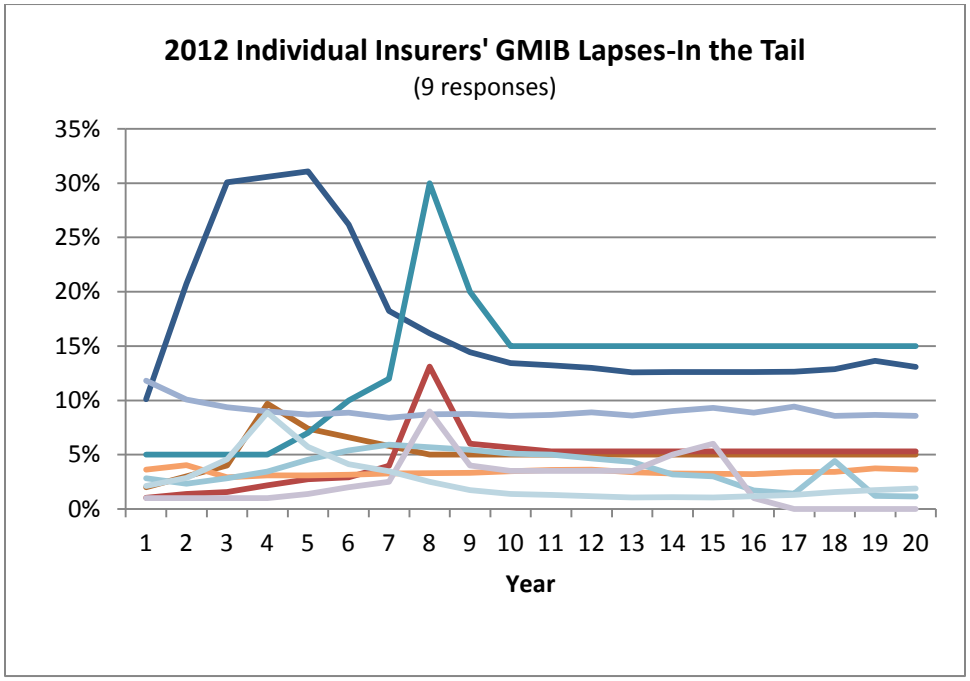

Figure 14

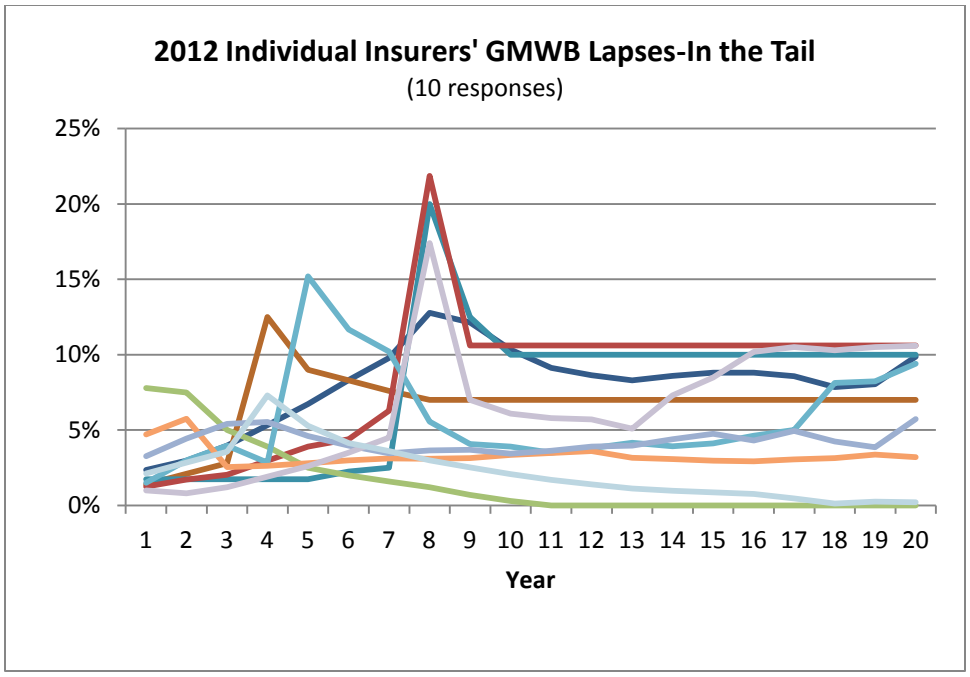

Figure 15

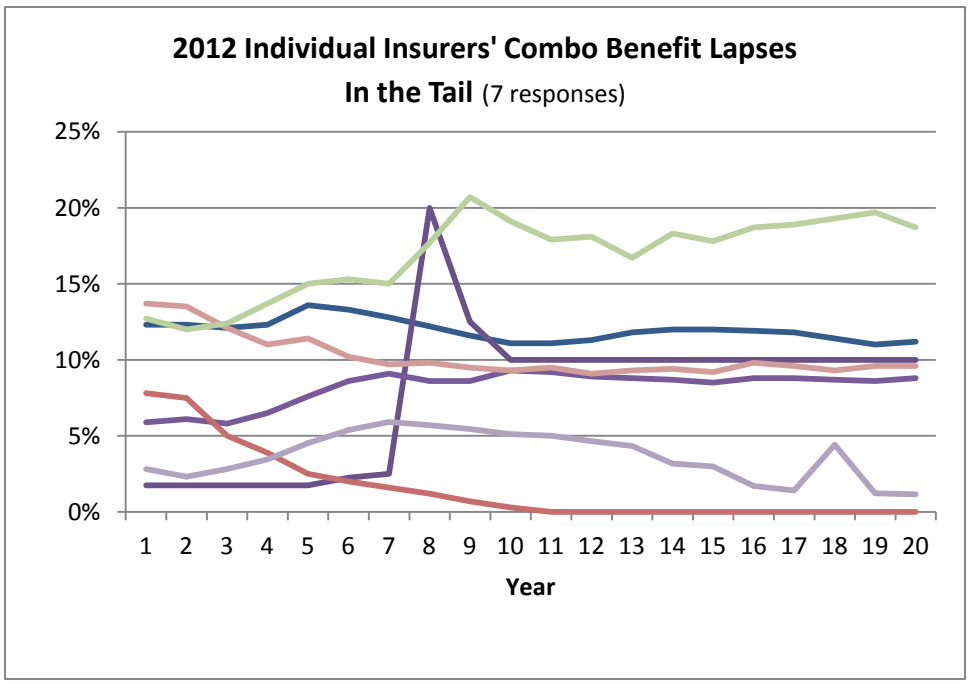

Figure 16

Dynamic Lapses

The following charts show the percentage of insurers that use dynamic lapses for variable annuities with death benefits and for variable annuities with living benefits.

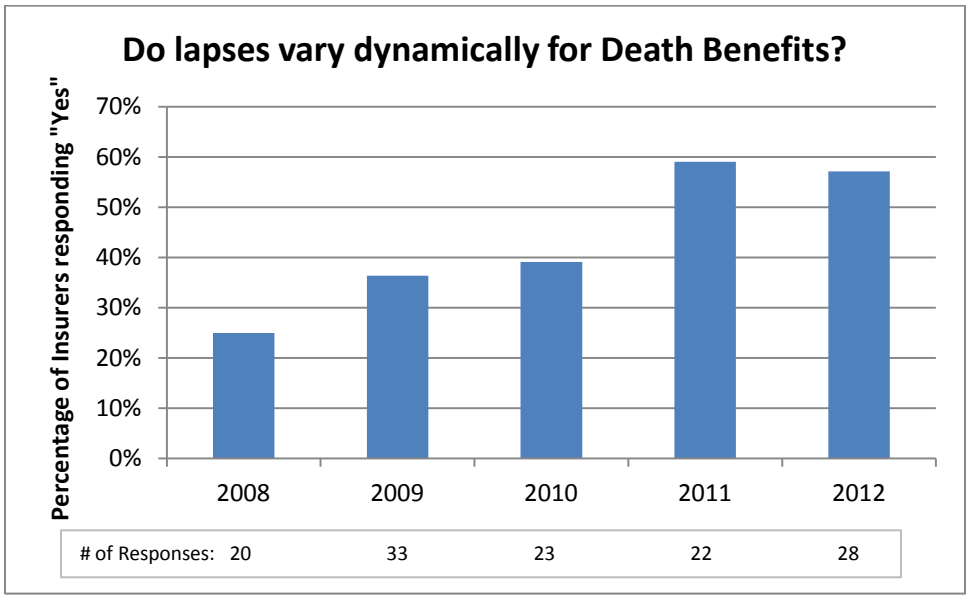

Figure 17

For the second consecutive year, the percentage of the insurers responding "yes" was greater than 55%, meaning that more insurers are using dynamic lapse functions for GMDBs than not. Of the 16 insurers answering in the affirmative, 14 provided at least a brief description of their dynamic lapse function for GMDB. All respondents varied the base lapses by applying a scalar to reduce lapses when policies were in-the-money (ITM). Three respondents also vary the scalar by duration, while one had dynamic lapses that varied by ITM-ness and age.

Five of these fourteen companies described lapses that began to reduce from the base level once the ITM-ness exceeded 10%. The other companies either did not list their threshold or had thresholds on either side of 10% – some began reducing lapses at 25% ITM-ness and others began reducing lapses at 0% ITM-ness.

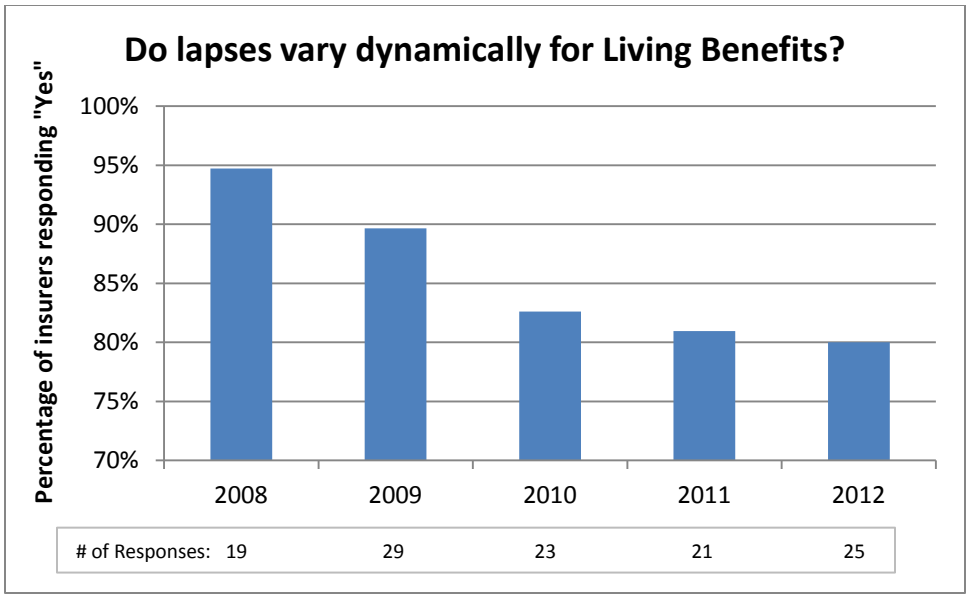

Figure 18

A solid majority of insurers vary lapses dynamically for variable annuities with guaranteed minimum living benefits. The percentage doing so has remained relatively stable in the range of 80-95% for the past five years, but the trend has been moving downward since 2008.

Insurers were also asked to describe their living benefit dynamic lapse function. This question yielded a wide variety of responses; however, most insurers described a 1-sided dynamic function that only slows lapses when the guarantee becomes in-the-money. A very small number of insurers described a two sided dynamic function, where lapses also accelerate when guarantees are out-of-the-money as represented in Figure 19 below.

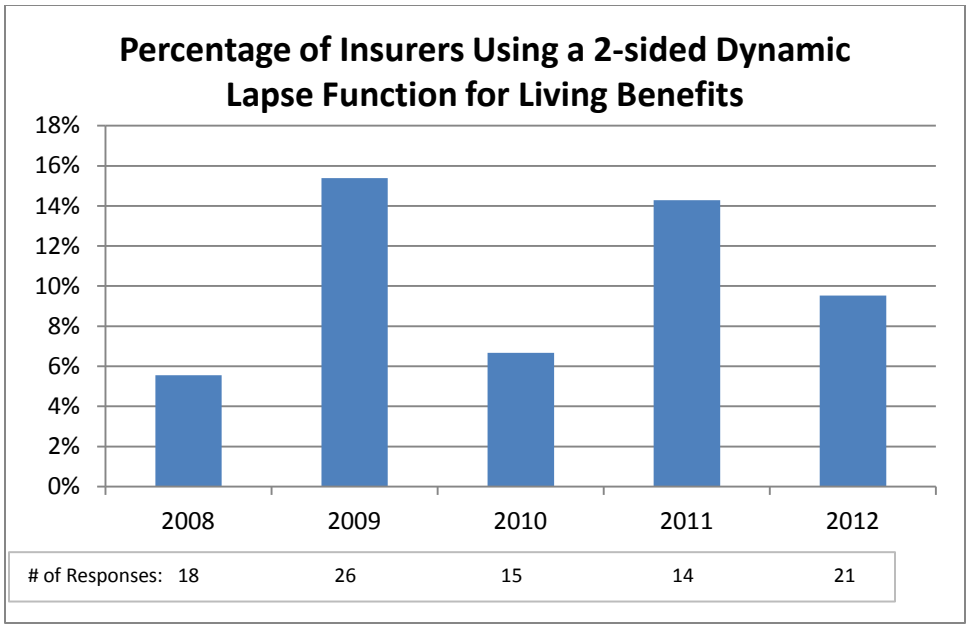

Figure 19

Many insurers described their dynamic lapse function for living benefits in sufficient detail to determine the minimum lapse rate the function would produce, as a percentage of the base lapse rate. Most insurers floor the dynamic lapse function at 0%-25% of base lapses as shown in Figure 20.

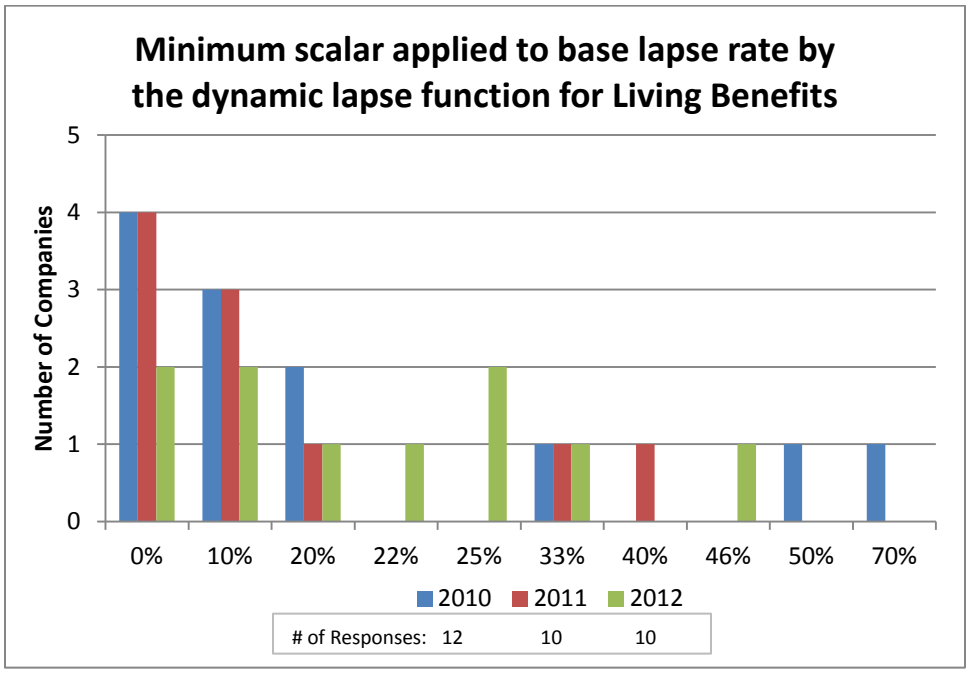

Figure 20

Dynamic Utilization

The following charts show the percentage of insurers who use dynamic utilization functions for Income Benefits and for Withdrawal Benefits.

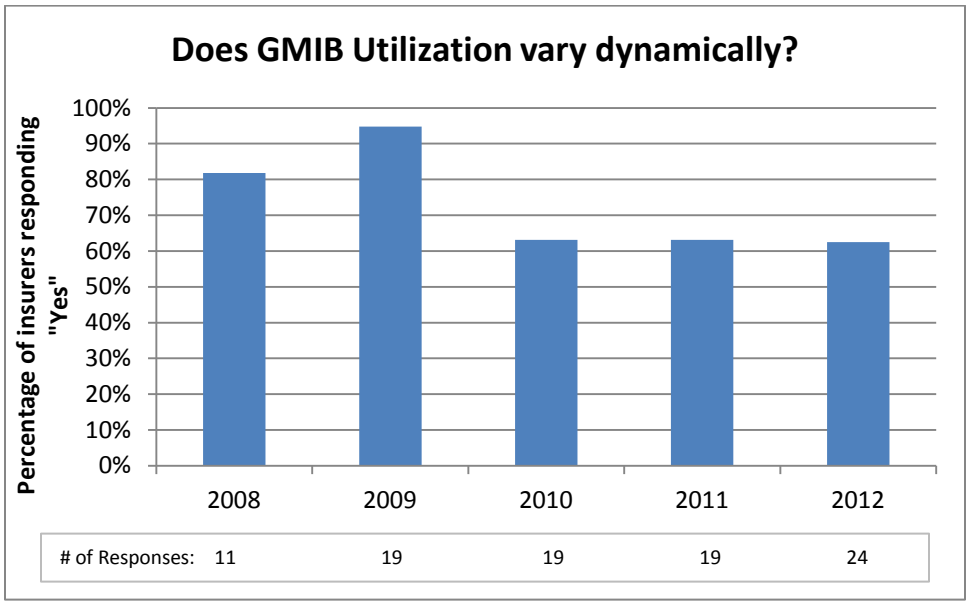

Figure 21

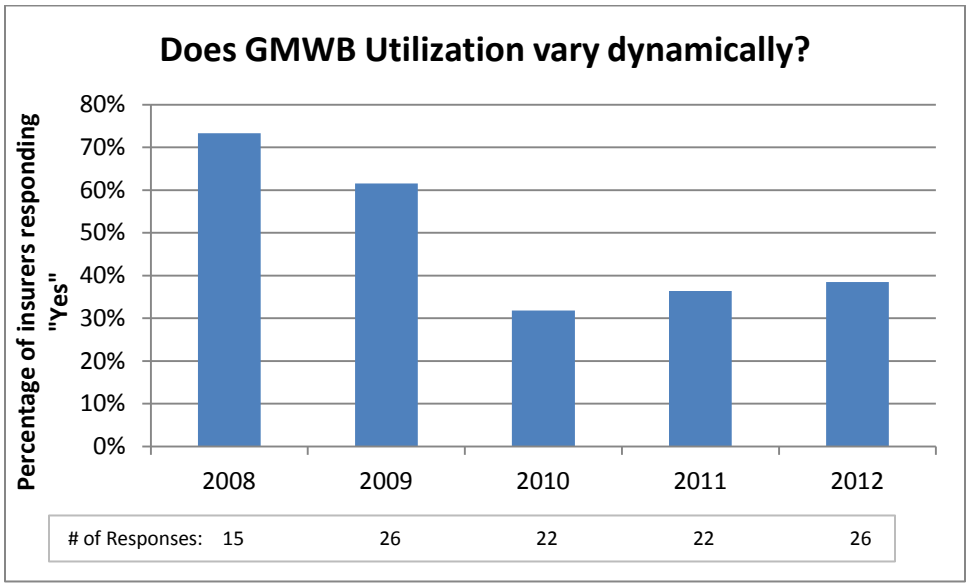

Figure 22

Dynamic Utilization for GMWBs was reported in 2010 to be significantly lower than in any previous year, declining from 2009 by about half. The levels have risen slightly in 2011 and 2012 but remain significantly less than the 2009 results.

Income and Withdrawal Utilization

Insurers were also asked to describe their Income and Withdrawal utilization assumptions. As in 2011, in-the-moneyness, or the relationship of the account value to the guaranteed value, was used as a parameter of GMIB utilization functions for less than 100% of insurers. Insurers were able to list more than one factor so the percentages will not sum to 100%.

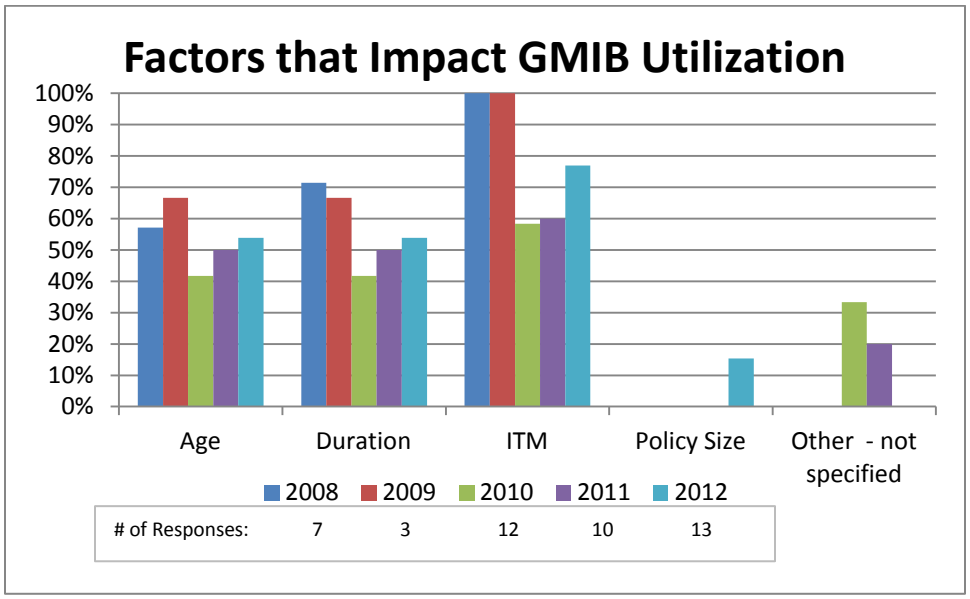

Figure 23

Age and duration continue to be the most common factors used to vary GMWB utilization assumptions. Both age and duration saw increases of greater than 30% compared to 2011 results. However, much of that can be explained through the data collection process. Although they did not specifically indicate age or duration as factors that impact GMWB utilization, several respondents provided written comments that included utilization factors that vary by age and/or duration.

The ITM-ness parameter remained at an extremely low level compared to the other factors. Three respondents specifically mentioned that they also vary withdrawal rates by Tax Status. As a result, "Tax Status" has been added as a new category as opposed to being grouped with "Other". We did not redistribute "Tax Status" for prior years' responses in Figure 24. Of the insurers responding "Other", two indicated that GMWB Utilization is impacted by whether or not the policy was previously taking withdrawals and two others mentioned that the withdrawal rates vary by GMWB design. Insurers were able to list more than one factor so the percentages will not sum to 100%.

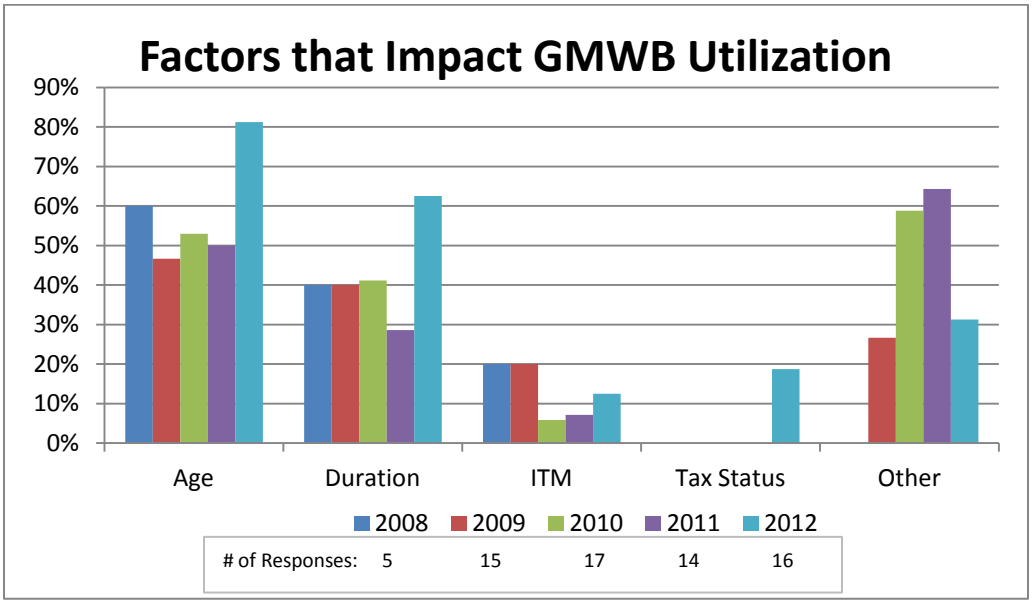

Figure 24

Lapses by Distribution

Insurers were asked several questions about their distribution channels. Nearly 70% of responses (16 of 23) said that their products were sold through multiple distribution channels. Of those respondents, 60% use three or four distribution channels.

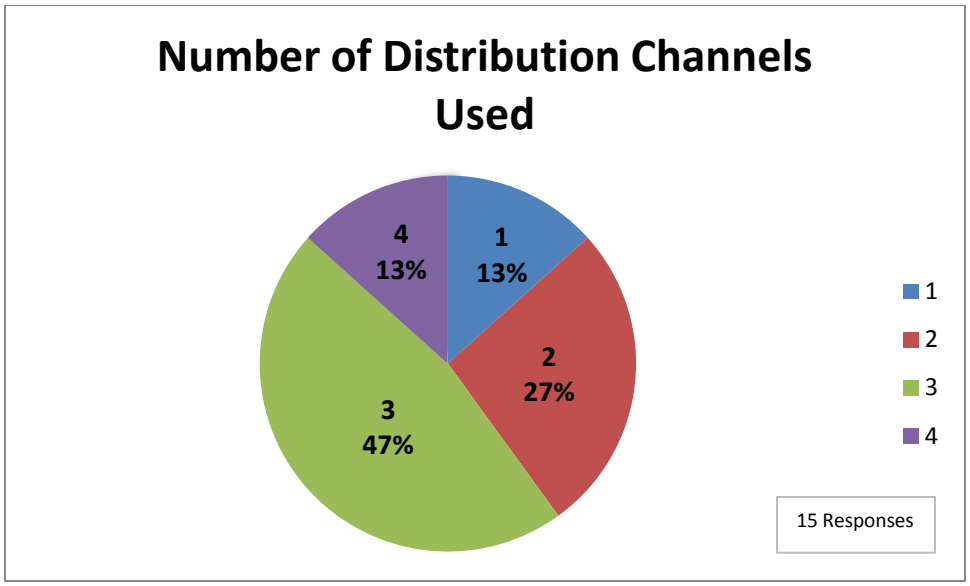

Figure 25

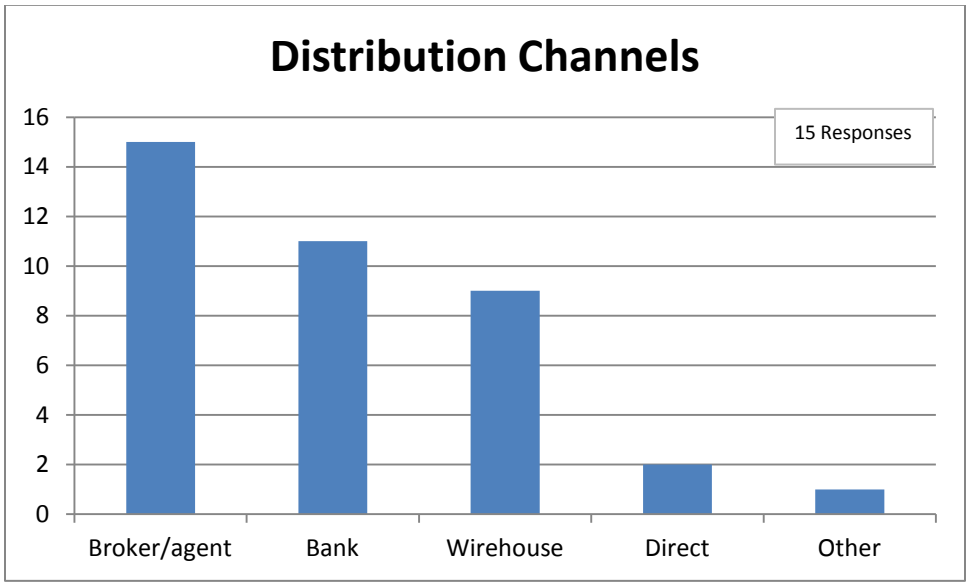

Figure 26

Insurers were asked if their lapses varied by distribution channel. Only 12% (2 of 17) indicated a difference, this number has been similar for the past 4 years. However, many more insurers are measuring lapse experience by distribution channel. In 2012, 44% (7 of 16) indicated that they measure by distribution channel compared to only 23% (3 of 13) in 2011. One insurer commented that lapses from the agent channel are generally lower than those from the bank channel.

Source of Assumptions

Insurers were asked to provide the source they used for their expected lapse assumptions and the frequency of lapse studies performed in the company. However, given recent investment market volatility, some companies have had the opportunity to actually observe policyholder behavior "in the tail" and sharpen their thinking about assumptions "in the tail." Therefore, a follow up question was asked specifically about "in the tail" assumptions.

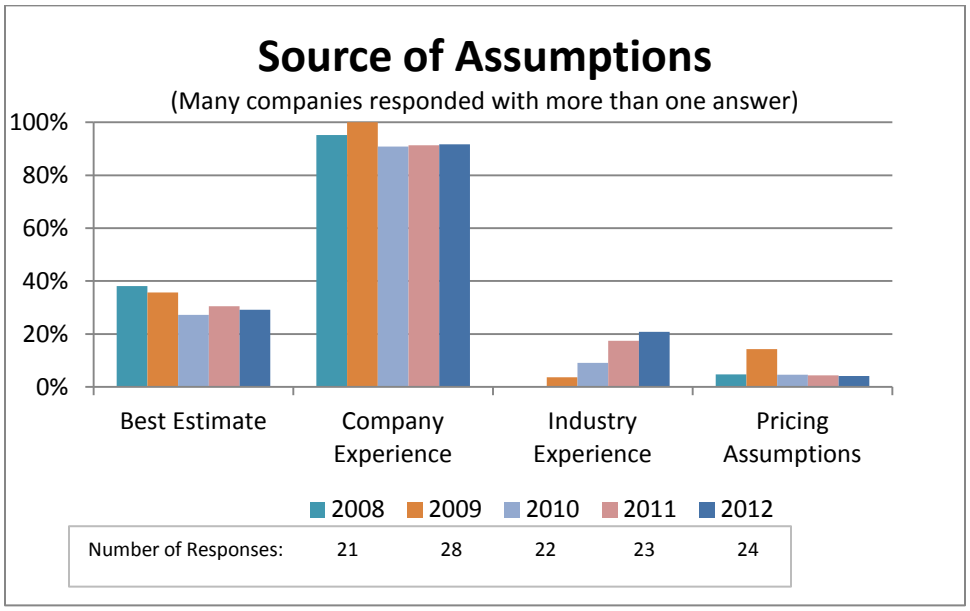

Figure 27

The survey responses show that "company experience studies" continue to be the most popular source of base case assumptions (see Figure 27). Over the past years, very few companies indicated the use of industry experience in setting assumptions although it has grown in each of the past four years. The number of companies using industry experience in 2012 increased to 21% (5 of 24). Most companies that perform experience studies perform them annually. In 2011, we saw a shift from performing annual experience studies to quarterly studies but the shift reverted back to annual studies for 2012 (see Figure 28). In fact, 83% (20 of 24) respondents perform annual experience

studies and 96% (23 of 24) perform experience studies on an annual or more frequent basis.

It is our hope that with the publication of the different forms that assumptions take, we will continue to expand and improve the range of dynamic functions considered as "expected" by actuaries both (a) as they set assumptions in their own work, and (b) as they set up experience studies to parameterize such dynamic functions, especially from experience gained in "tail" historical periods.

Collection, analysis, and publication of industry experience would be valuable as a supplement to any company 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.

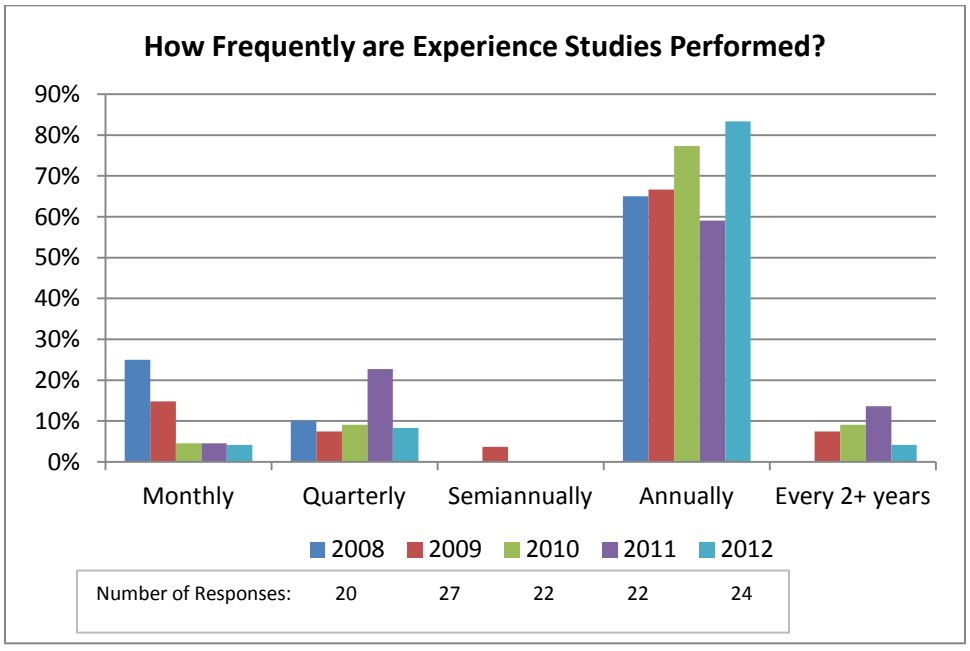

Figure 28

Insurers were asked how many years of data were used in their latest lapse study.

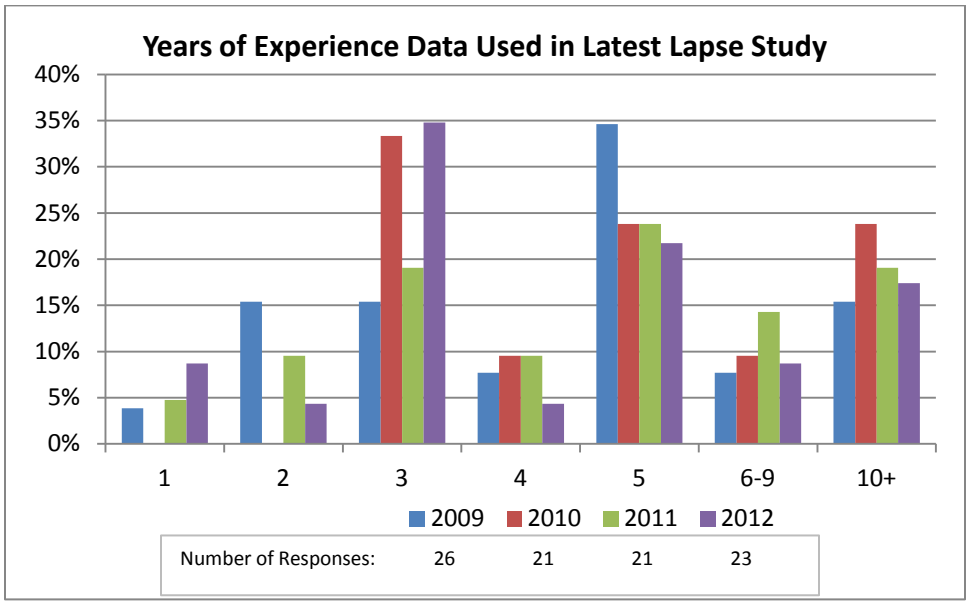

Figure 29

Two new questions regarding "in the tail" lapse rate assumptions were initially asked in 2010. The first regarded the source of assumptions for "in the tail" lapsation. Insurers were able to include more than one category in their responses. Over 60% of respondents in 2012 continued to indicate that best estimates was one of the sources for tail lapse assumptions, while less than half (48%) incorporated company experience (see Figure 30). These results are very similar to the responses given in 2011. Only two companies (9%) relied in part or in full on industry experience. Three companies (13%) referenced their pricing assumptions and one respondent specifically mentioned prior VA surveys.

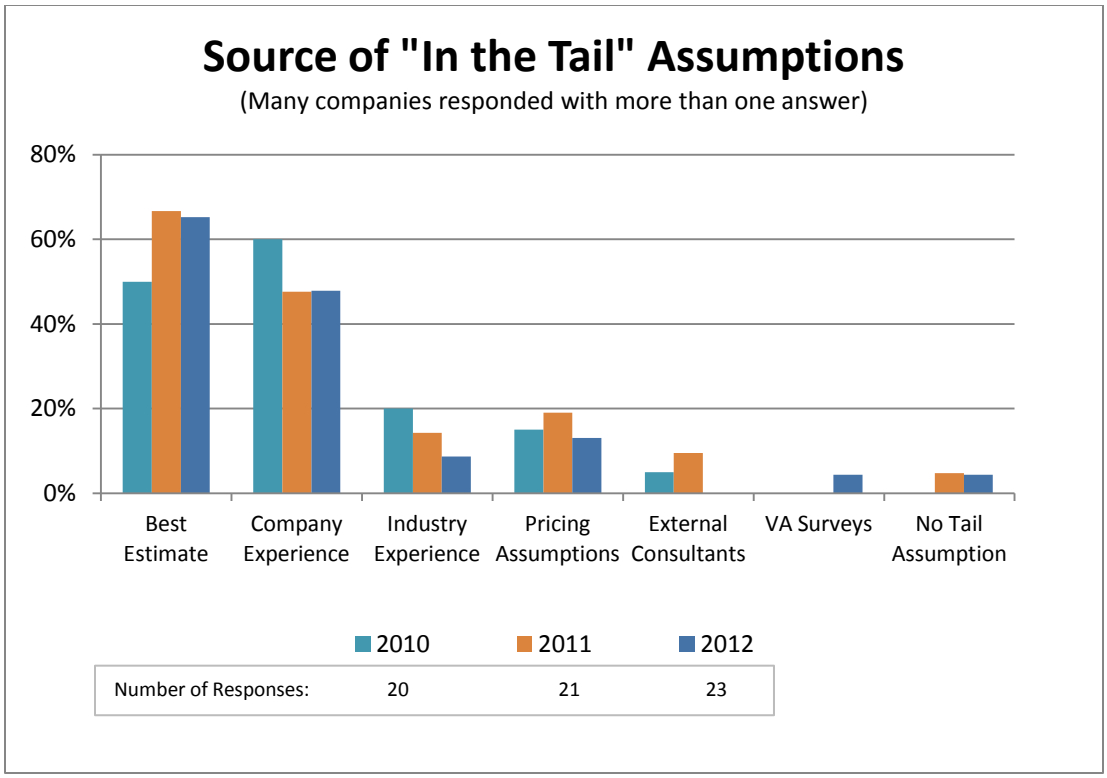

Figure 30

Insurers were also asked, if they were using company experience as a source for "in the tail" lapse rate assumptions, what years were used. Eight of the eleven insurers who included company experience as a basis responded, five of them indicating the calendar years of experience that were used. Most included the most recent exposure year and all eight responding used at least three calendar years of experience. Figure 31 compares the source of base assumptions with the "In the Tail" assumptions for 2012.

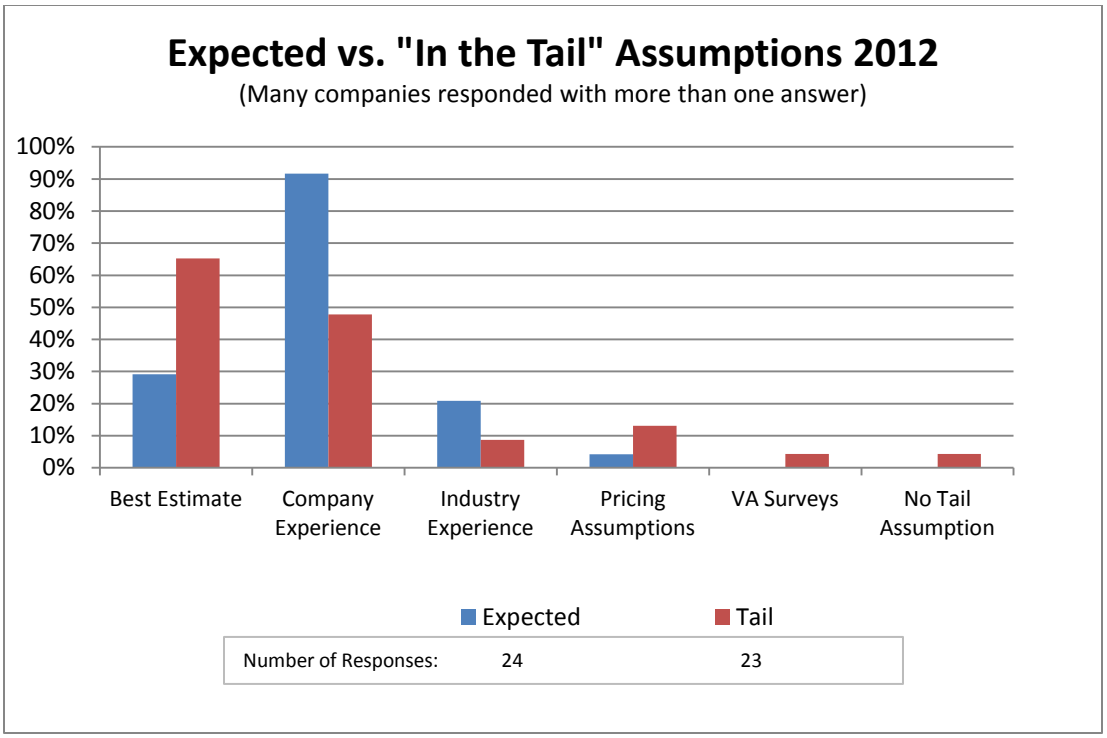

Figure 31

The source of base lapse assumptions differs significantly from the source of "in the tail" assumptions. As one would expect, more reliance is placed on company experience with base assumptions than with assumptions "in the tail." This would be primarily due to most of the actual experience of companies not being in a tail scenario. Lapse assumptions in the tail require more judgement from the actuary. There is a greater reliance on best estimates as well as the use of pricing assumptions and external surveys to set the "in the tail" assumptions.

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 remained about the same in 2012 (60%; 15 of 25) as 2011 (63%; 15 of 24).

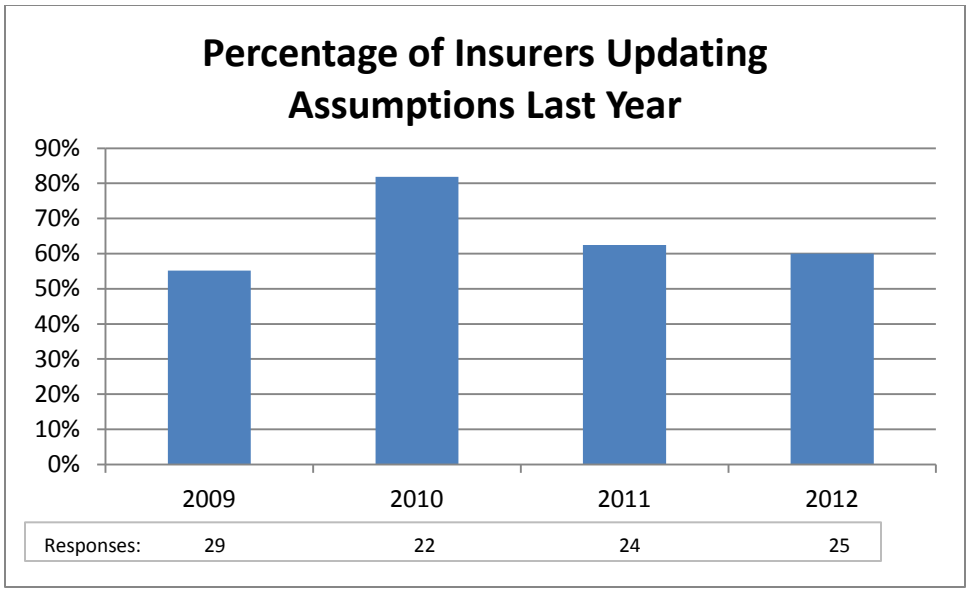

Figure 32

The question went further to ask insurers to describe what was changed in each of three categories: death benefit lapses, living benefit lapses, and living benefit utilization. The charts below (see Figures 33-35) show the percentages of those changing, as allocated among the types of responses. Insurers continued to make changes to their dynamic functions for living benefits in 2012. Two-thirds (6 of 9) of respondents made changes due to updated experience while over 50% (5 of 9) changed their dynamic function for living benefit lapse rates. In addition, 80% (4 of 5) of respondents made changes to their living benefit utilization rates due to updated experience.

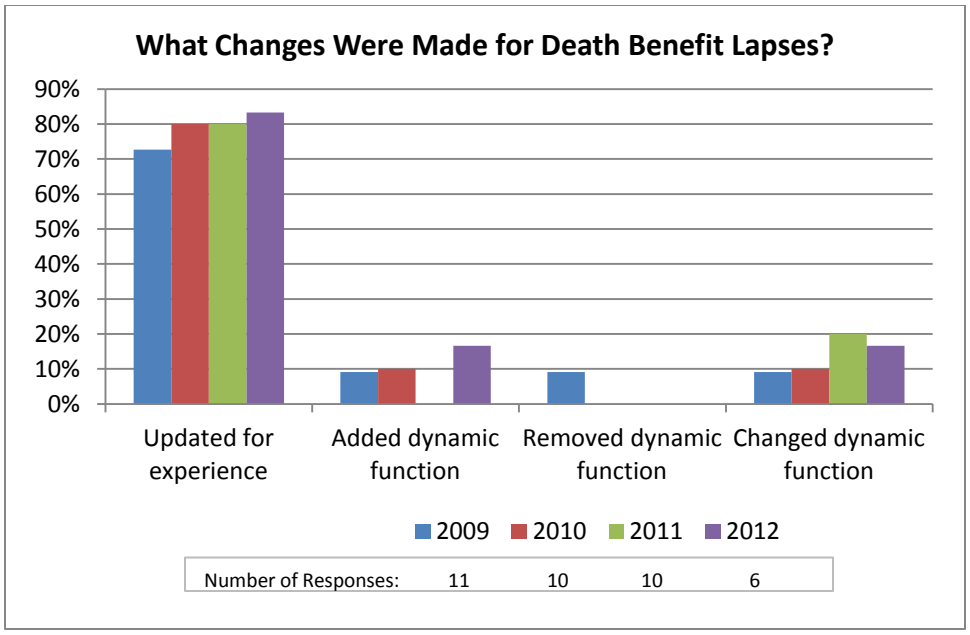

Figure 33

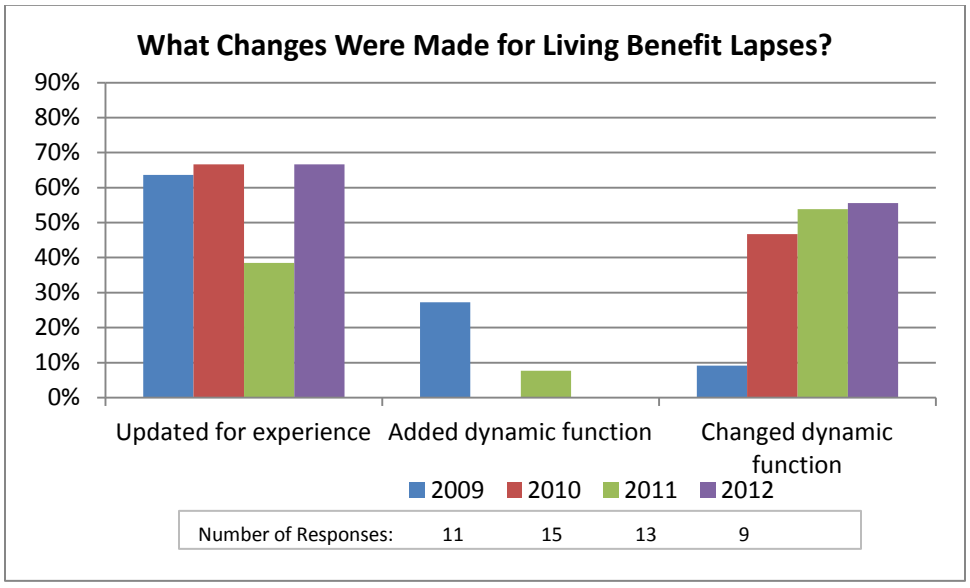

Figure 34

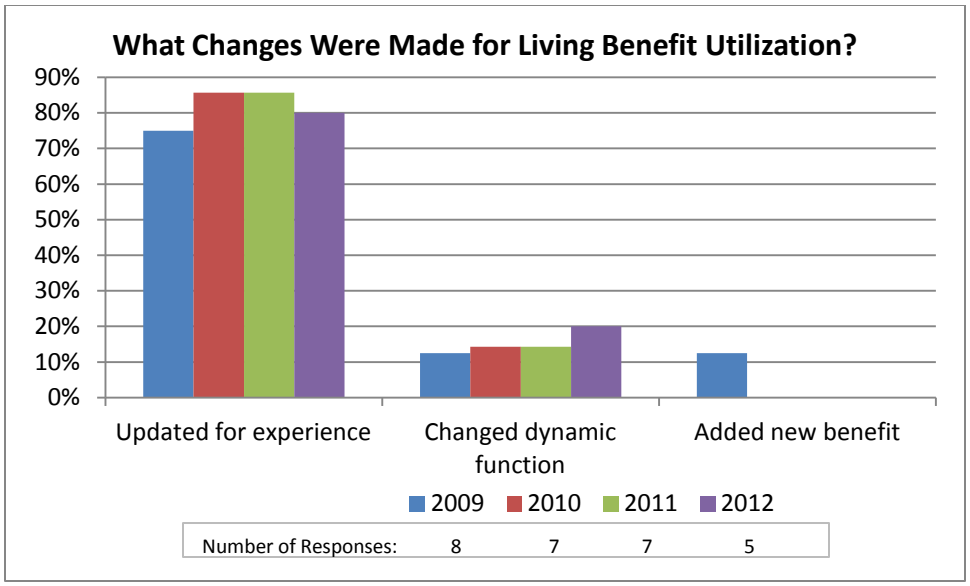

Figure 35

A new question was asked in the 2012 survey. The new question asked if emerging policyholder behavior experience during the past four years (for many, a "tail" environment) caused a revision in policyholder behavior assumptions in the tail. 14 of 22 (64%) respondents indicated that emerging experience did not fit their prior expectations, of which 9 respondents (41%) made changes to their assumptions based on their experience.

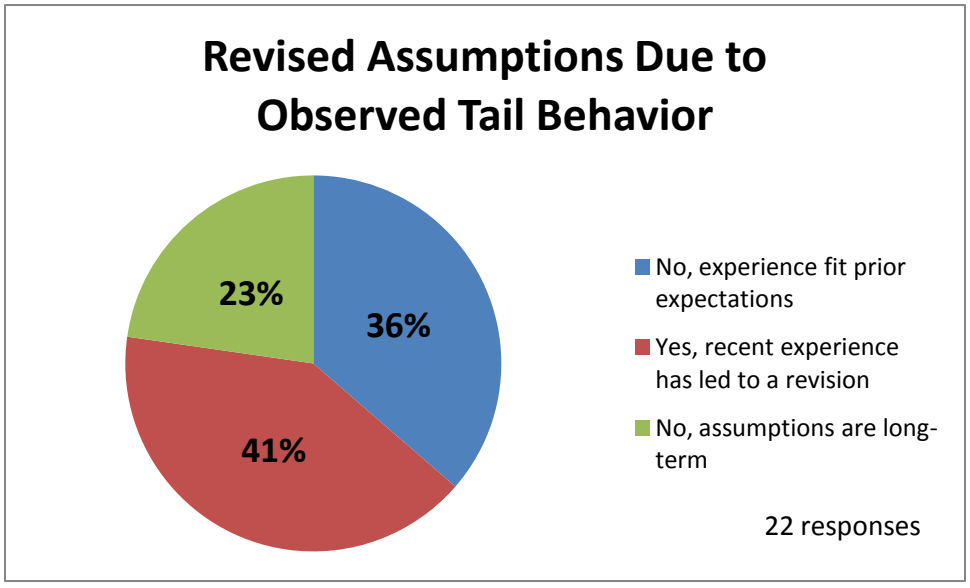

Figure 36

Respondents Profile

The following chart shows the relative size of companies responding to the survey as measured by Total Account Value.

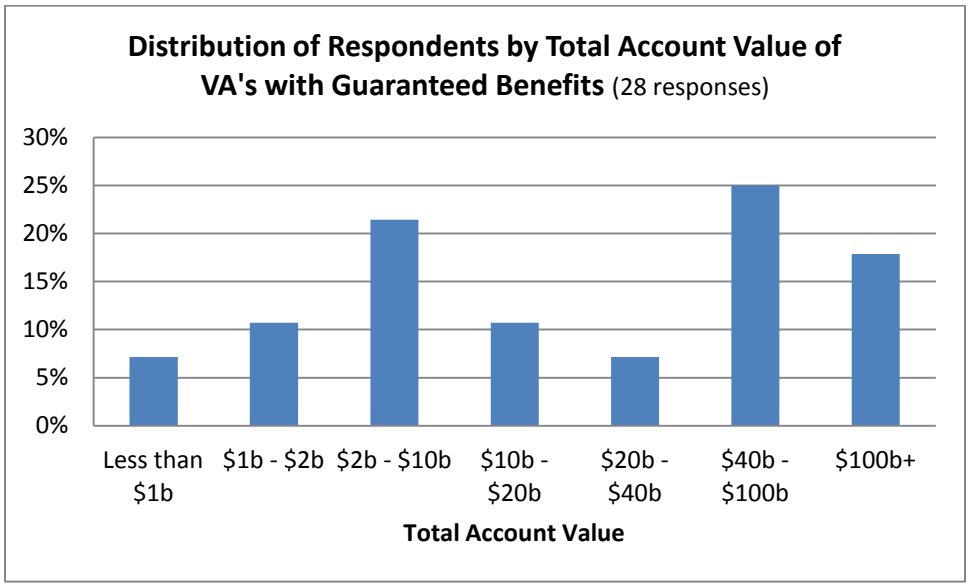

Figure 37

GLOSSARY

- AAA pre-packaged scenarios – 10,000 predetermined scenarios generated by the American Academy of Actuaries for use with C-3 Phase II to assist in calculating the C-3 charge associated with certain products.
- Conditional Tail Expectation (CTE) – an actuarial risk metric that measures the average of all results exceeding a specified percentile.
- Guaranteed Minimum Accumulation Benefit (GMAB) – guarantees a minimum account value at a specified time.
- Guaranteed Minimum Death Benefit (GMDB) – guarantees a minimum account value at death.
- Guaranteed Minimum Income Benefit (GMIB) – guarantees minimum monthly income at annuitization.
- Guaranteed Minimum Withdrawal Benefit (GMWB) – guarantees a minimum stream of income, provided it is withdrawn within specified limits over time.
- In-The-Moneyness (ITM-ness) – the relationship between the option value of a living and/or death benefit and the surrender value of the variable annuity associated with it.