POLICYHOLDER BEHAVIOR IN THE TAIL
VARIABLE ANNUITY GUARANTEED BENEFITS SURVEY
2011 RESULTS

Survey Highlights

Five Year Results

- For the last 5 years, 85% or more of the companies indicated that company experience studies were used for setting base case assumptions. (Figure 27 on Page 25)

- For the last 5 years, the vast majority of companies have analyzed 1,000 or more scenarios. (Figure 1 on Page 5)

- Over the last 5 years, the percentage of respondents who vary GMWB utilization dynamically has dropped from 67% in 2007 to 36% in 2011. (Figure 22 on Page 21)

One Year Results

- The latest survey reflects a different response group from that in the prior survey, so 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 10 new respondents, 13 continuing respondents (to both surveys), and 10 prior respondents that did not participate in the latest survey.

- There is a very wide variation in the description of the least tail scenario across insurers. (Figure 3 on Page 7) The least tail scenario is defined in the *Tail Scenario* section (Page 6) of this document. This survey has always used this definition of the Tail Scenario.

- The median cumulative return, measured across the least tail scenarios, provided by respondents, is much lower than the 10th percentile of the AAA pre-packaged scenarios. Relative to previous years, 2011 participants indicate their companies can sustain significantly worse equity performance without needing additional assets. (Figure 5 on Page 8)

1

- 63% of respondents indicated they changed assumptions since the last survey; down from 82% last year. (Figure 32 on Page 29)

- The median base assumption lapse rate at the end of the surrender charge period dropped dramatically from 2010 to 2011. (Table on Page 15)

- The number of companies using industry experience for base case assumptions increased from 9.1% to 17.4% this year. (Figure 27 on Page 25)

- Nearly 60% of respondents use dynamic lapses for death benefits. (Figure 17 on Page 18)

- Over 80% of respondents use dynamic lapses for living benefits. Nearly all of those described their function as one-sided. (Figure 18 and Figure 19 on Pages 19 and 20, respectively)

- 91% of respondents projected results over at least 30 years. (Figure 2 on Page 6)

- The companies participating in the survey this year have generally larger account values than prior years' studies. (Figure 36 on Page 31)

- A majority of insurers indicated that best estimates were used as one of the sources for tail lapse assumptions. Company experience was also used by a significant number of companies. (Figure 30 on Page 28)

- Most companies that perform experience studies perform them annually, but companies are shifting toward doing quarterly studies. (Figure 28 on Page 26)

It is our hope that with the publication of the 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.

Table of Contents

Acknowledgements

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 C3 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 2011 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 each survey year.

The latest survey reflects a different response group from that in the prior survey, so 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 10 new respondents, 13 continuing respondents (to both surveys), and 10 prior respondents that did not participate in the latest survey.

Specifics of C3 Phase II Calculation

Insurers were asked to provide details on their C3 Phase II calculation such as the number of scenarios used, and the length of projection horizon. In contrast to 2010, where every respondent indicated that at least 1,000 scenarios were used, 2011 had two respondents using less than 1,000 scenarios. The percentage of companies indicating that 1,000 scenarios were used remained about the same as 2010. However in 2011, there were no respondents using more than 1,000 scenarios. Almost all 2011 respondents indicated they projected results over at least 20 years, with most respondents projecting results 30 years or more. The rest of the durations that companies are projecting are dispersed over 20 - 50 years.
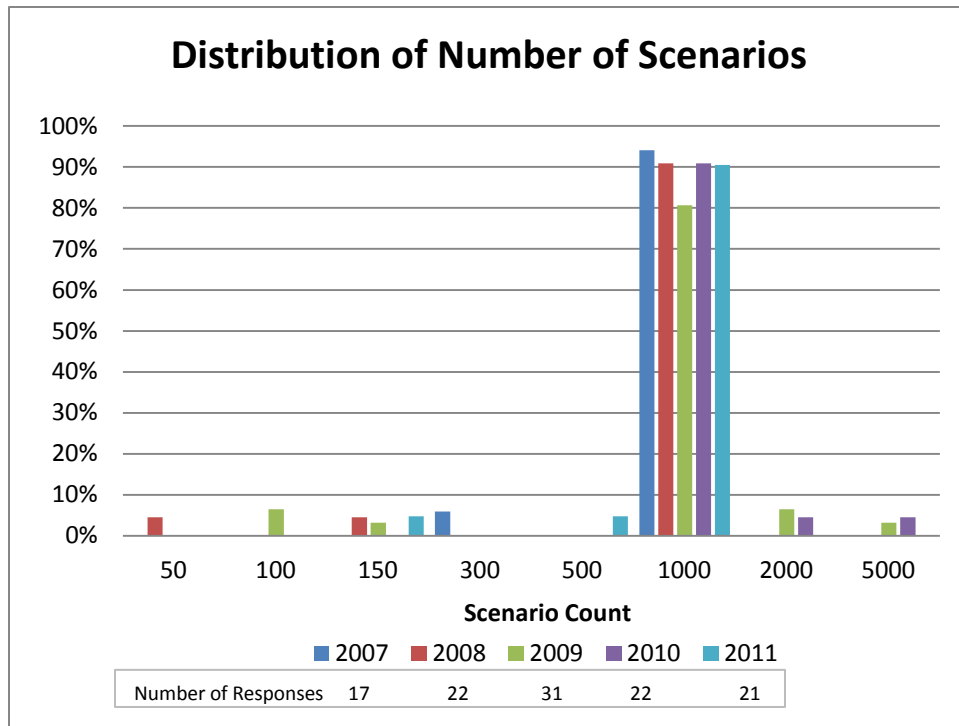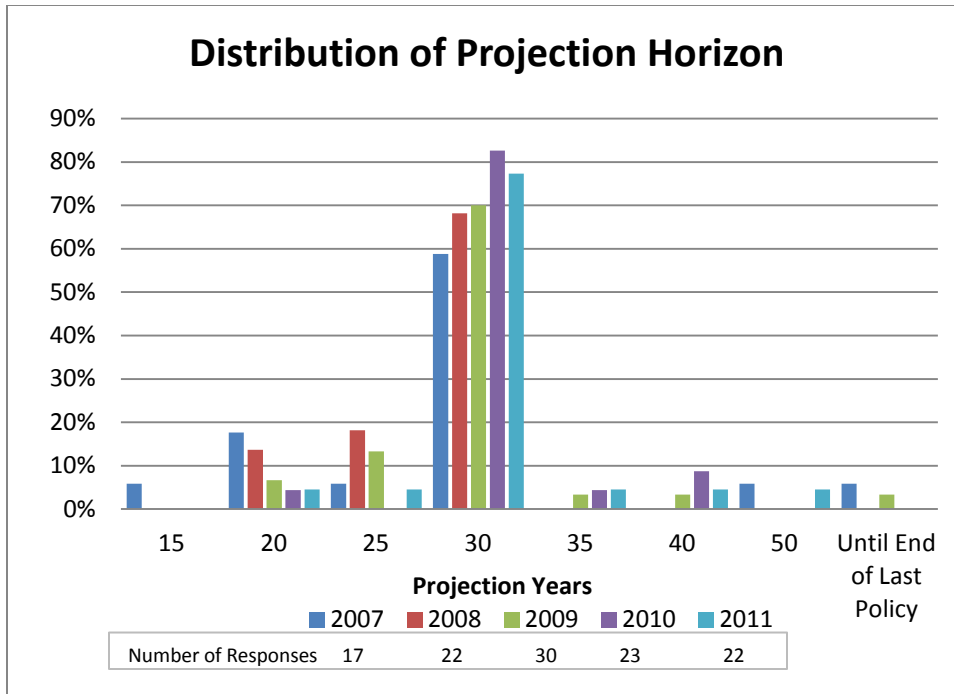

Figure 1

Distribution of Projection Horizon

| Number of Responses | 17 | 22 | 30 | 23 | 22 |

Figure 2

Tail Scenario

Insurers were asked to describe the tail scenario that gives the least positive Additional Asset Requirement (AAR). For example, if the sorted AARs 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 an AAR of 15.

Responses varied widely across insurer regarding the description of the tail scenario. The chart below shows each insurer's description of the equity performance in their tail scenario on a cumulative basis. Of the 18 responses, seven had negative cumulative returns in 90% of the projection years. Four of the reported returns had small negative cumulative returns in the early years followed by large positive cumulative returns. The rest of the reports were mixed positive and negative cumulative returns.
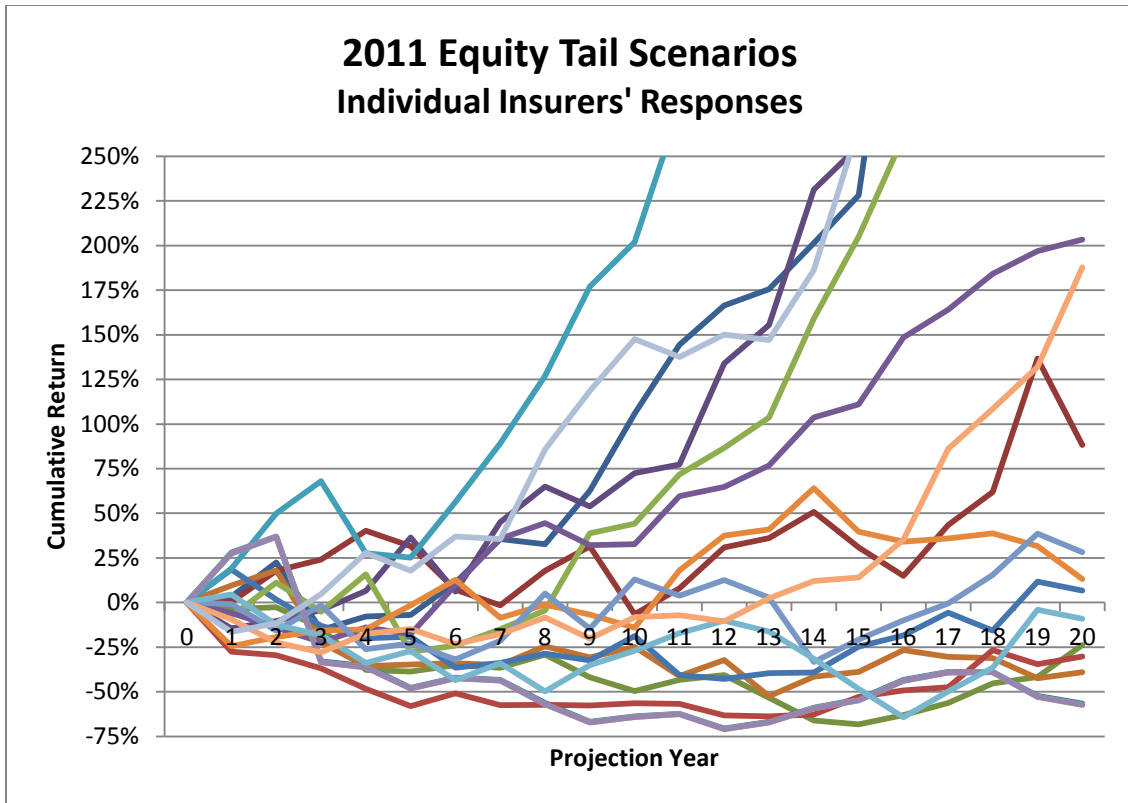
6

2011 Equity Tail Scenarios
Individual Insurers' Responses

Figure 3

In Figure 4, the median of the lines in the 2011 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 2011 show a distinct difference between the median of insurers' responses and the 10th percentile of the AAA pre-packaged scenarios.
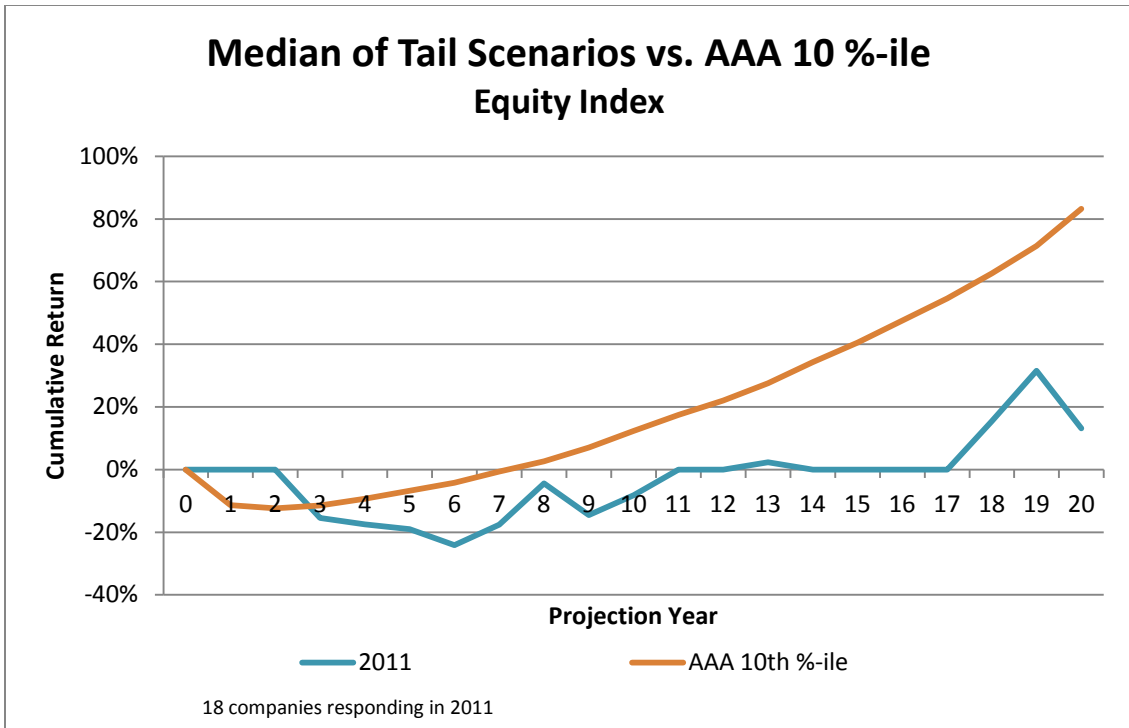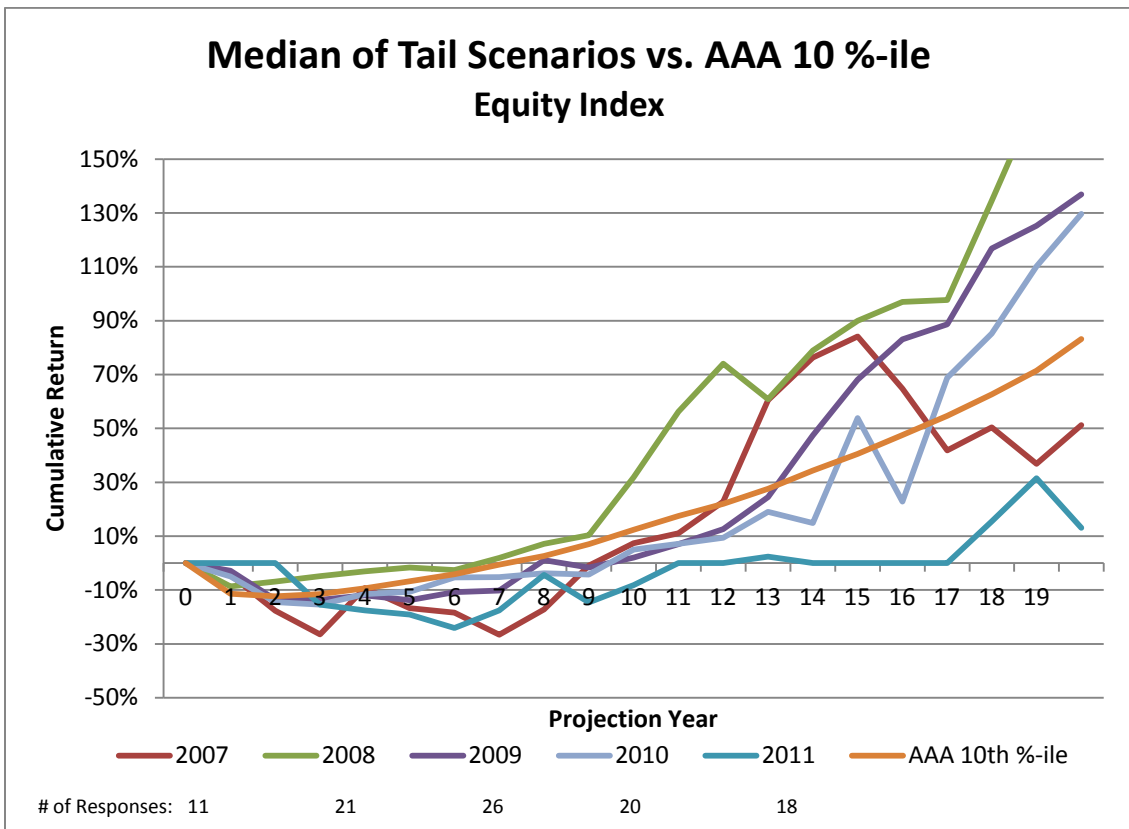
Figure 4

Figure 5

The median response has been fairly stable over the years, particularly in the first 5 projection years. In contrast to 2009 and 2010, where the median response was very close to the 10th percentile of the AAA scenario set, the median of 2011 responses had a cumulative return much lower than that of the AAA scenario set. Relative to previous years, 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. Responses were categorized by benefit type into Death Benefits (GMDB), Accumulation Benefits (GMAB), Income Benefits (GMIB), Withdrawal Benefits (GMWB), and Combination Benefits (Combo). In the following graphs some participants indicate a spike in lapses at the end of the surrender charge period. Others indicate a spike in the year after the end of the surrender charge period. It is likely that there were two interpretations of this question. Future surveys will attempt to eliminate any ambiguity.

The following charts list each insurer's response for base lapses for each benefit type.
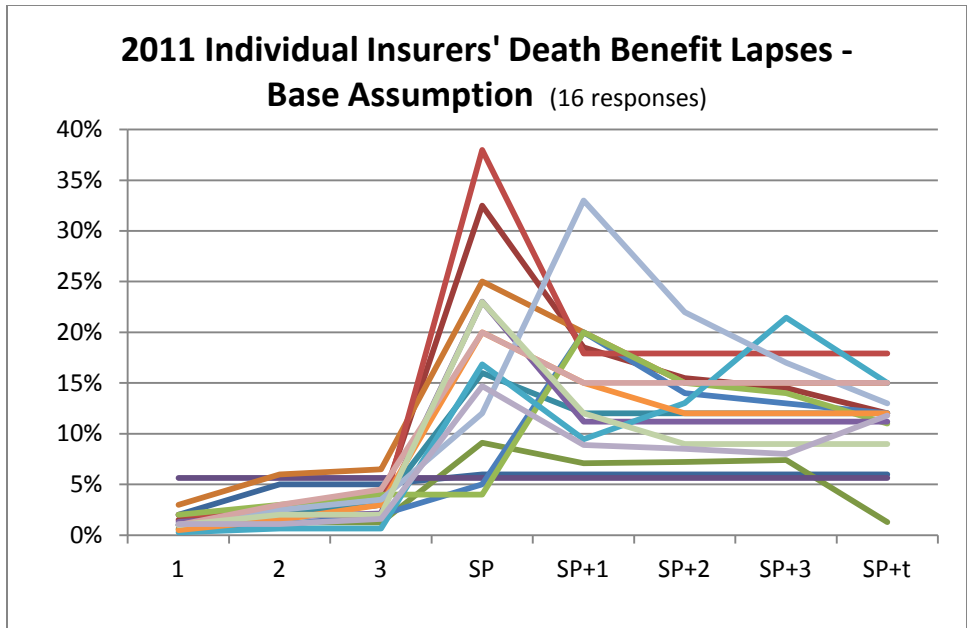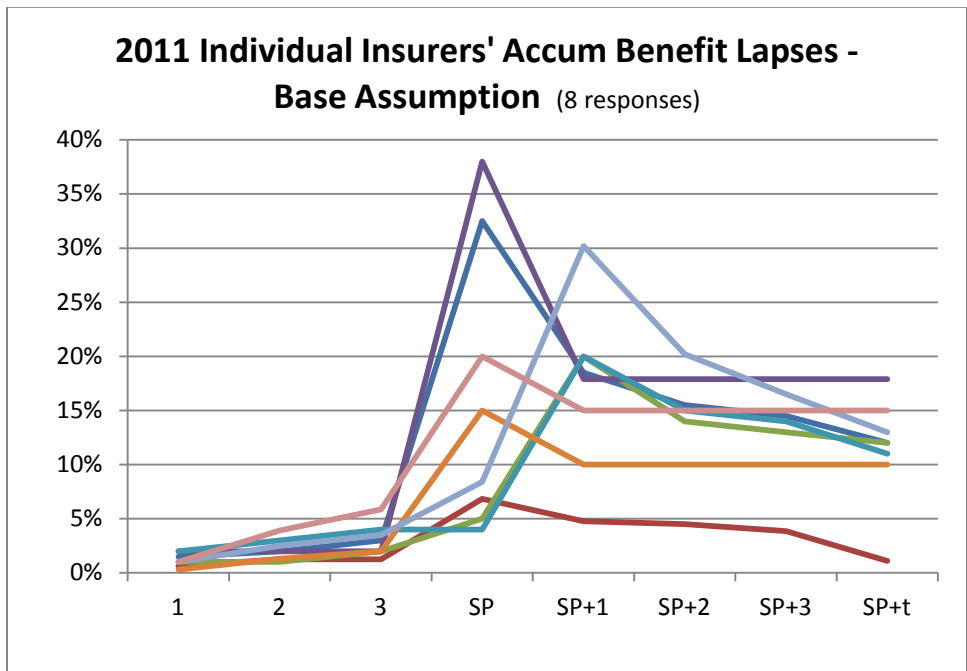
Figure 6

Figure 7

2011 Individual Insurers' Income Benefit Lapses - Base Assumption (7 responses)

Figure 8

2011 Individual Insurers' Withdrawal Benefit Lapses - Base Assumption (11 responses)

Figure 9

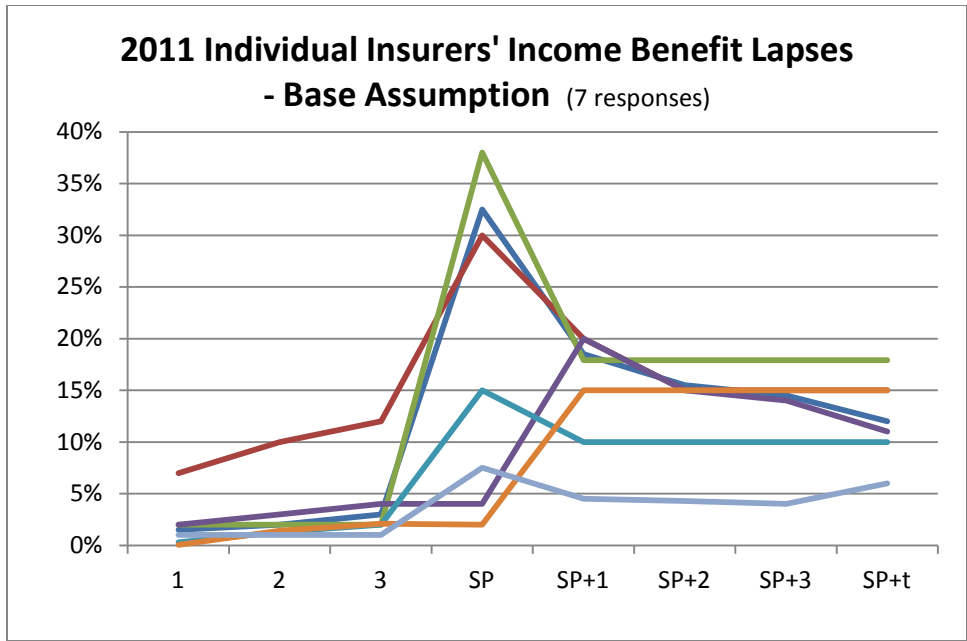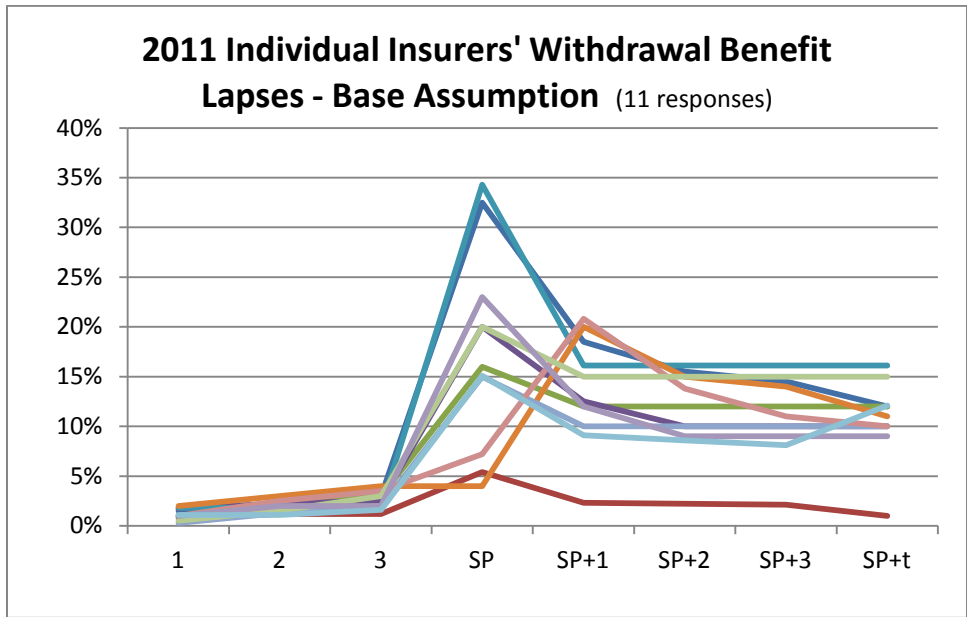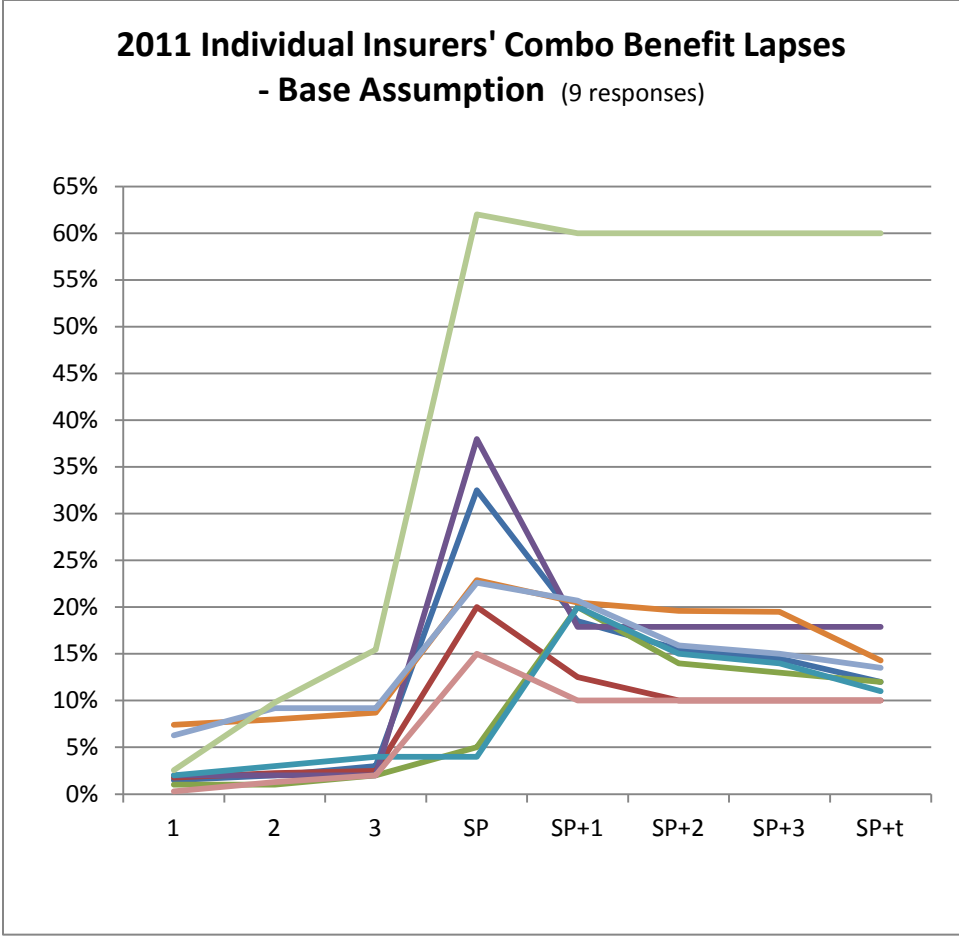**2011 Individual Insurers' Combo Benefit Lapses - Base Assumption** (9 responses)

Figure 10

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

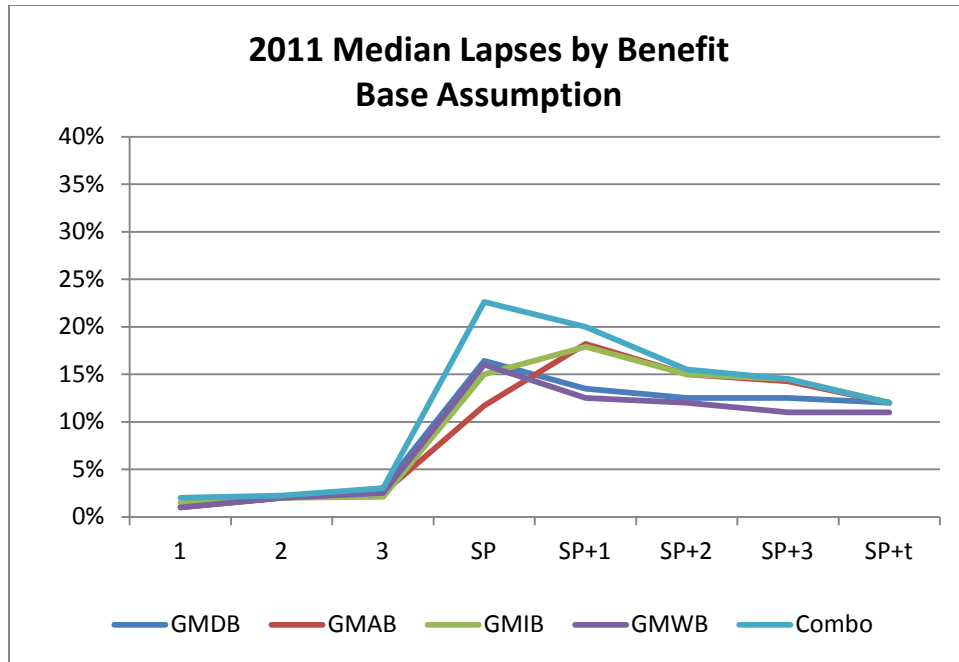**2011 Median Lapses by Benefit Base Assumption**

Figure 11

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 2011. Page 14 illustrates the lapse rates by survey year. Page 15 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 was somewhat unexpected.

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

Median Lapse Rates by Year

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

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 least positive Additional Asset Requirement. The following charts show tail lapse rates by benefit type for years 1 through 25.
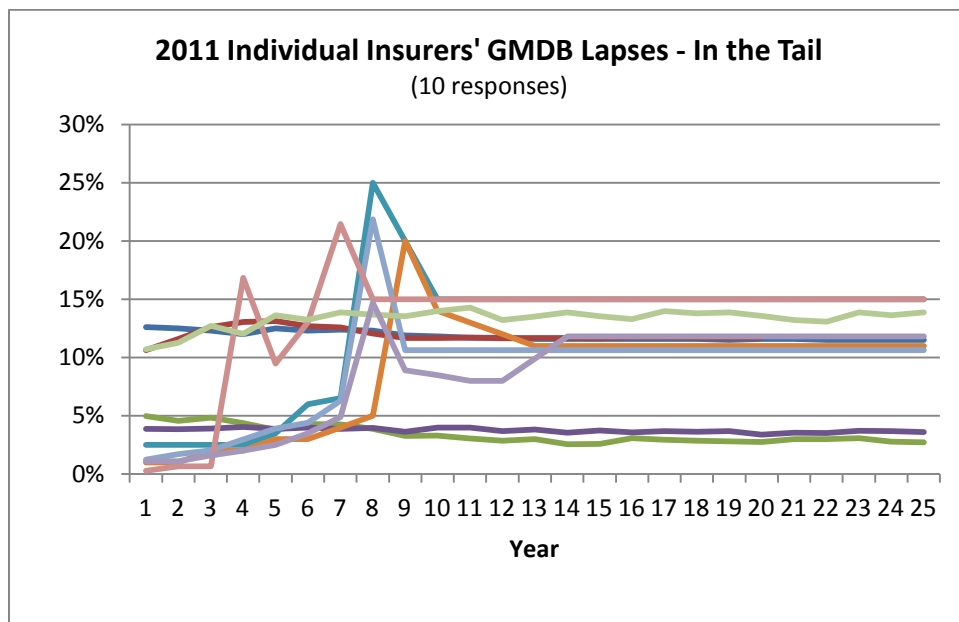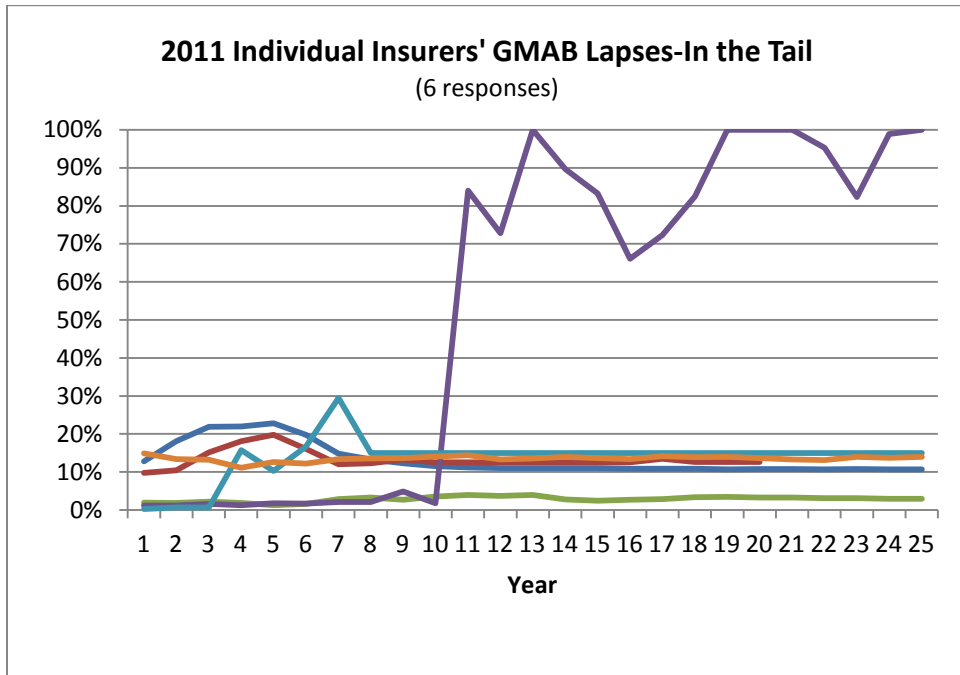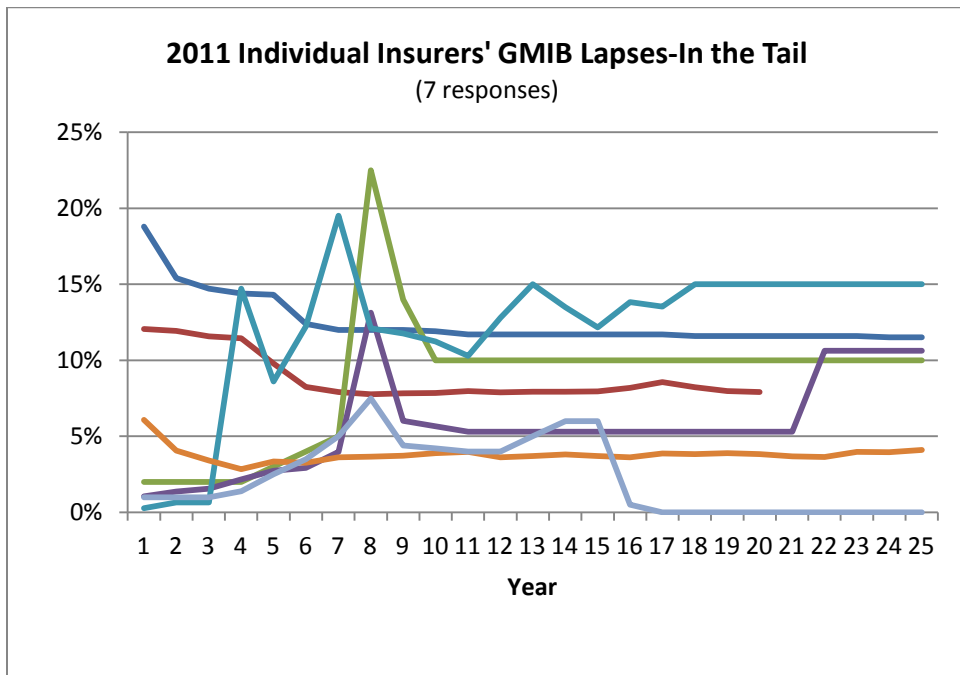

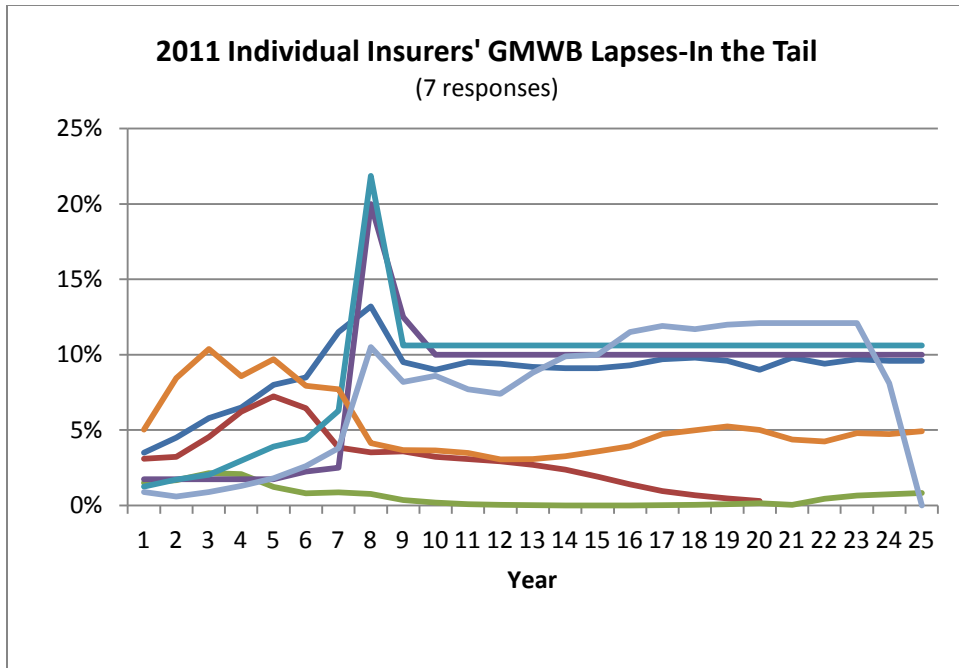**Figure 12**

Figure 13

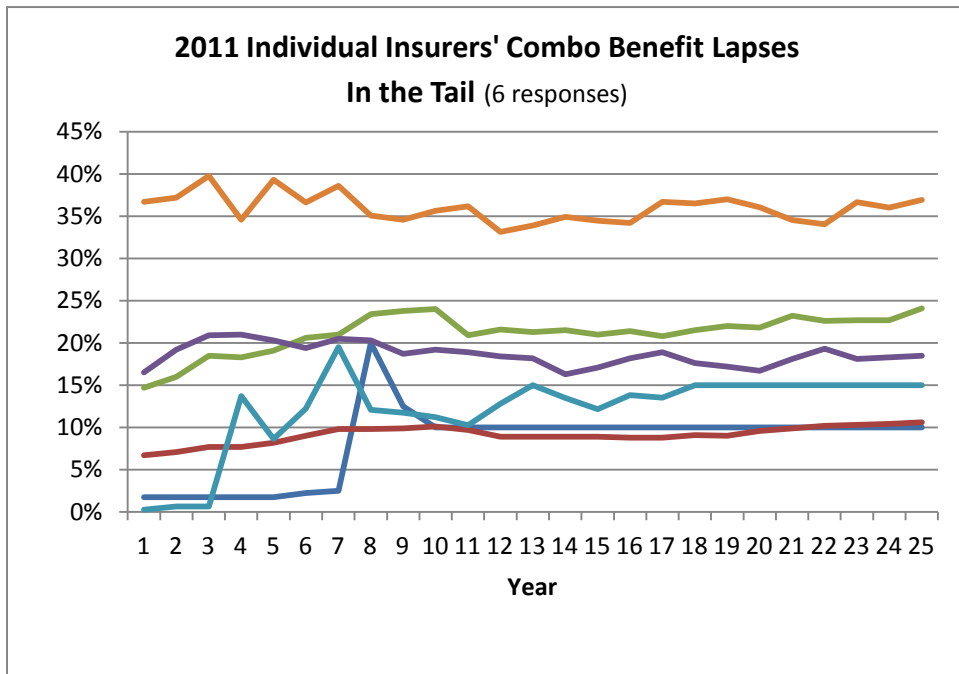**Figure 14**

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.
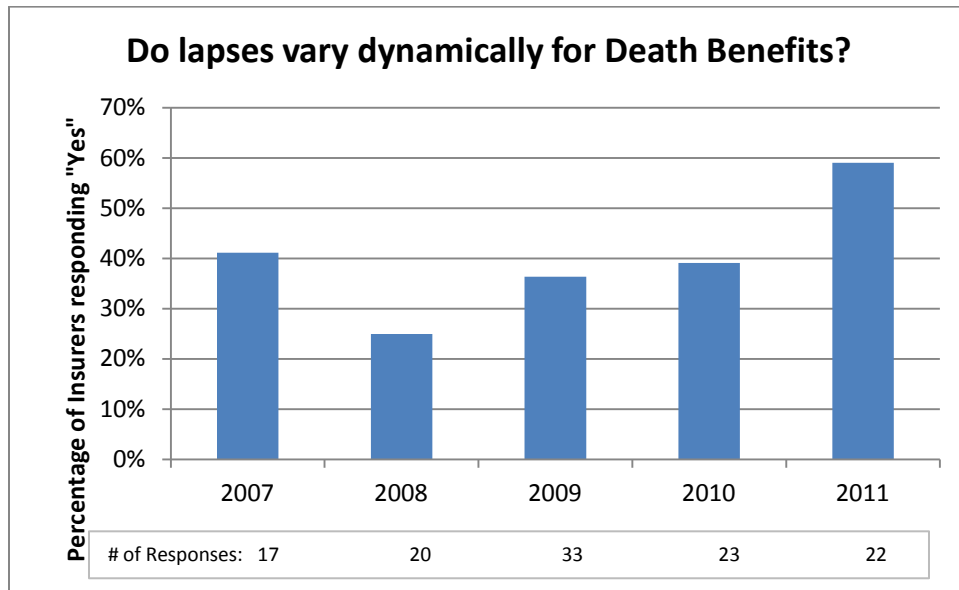
Do lapses vary dynamically for Death Benefits?

# of Responses:	17	20	33	23	22
	2007	2008	2009	2010	2011

Figure 17

The prevalence of dynamic lapse functions for GMDBs continues to increase slowly. With the exception of 2007 and 2008, incidence has increased every year. For the first time, the percentage of the insurers responding "yes" was greater than 50%, meaning that more insurers are using dynamic lapse functions for GMDBs than not. Of the 13 insurers answering in the affirmative, all 13 provided descriptions 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). All but two varied the scalar by ITM-ness only, while the other two had dynamic lapses that varied by ITM-ness and age.

Five of these thirteen companies described lapses that began to reduce from the base level once the ITM-ness exceeded 10%. The other companies had thresholds on either side of this threshold – some began reducing lapses at 25% ITM-ness and others began reducing lapses at 0% ITM-ness.
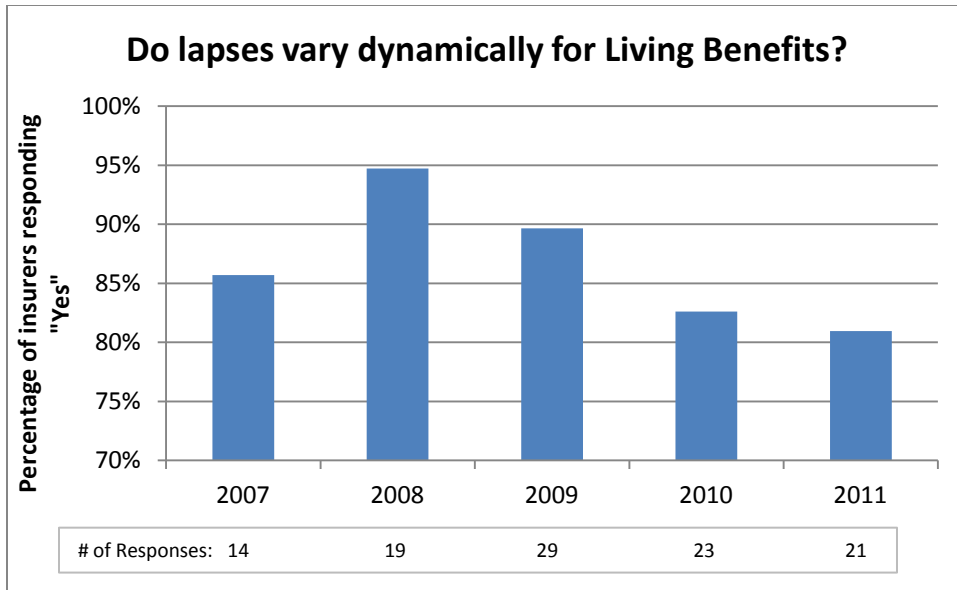
Figure 18

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

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.
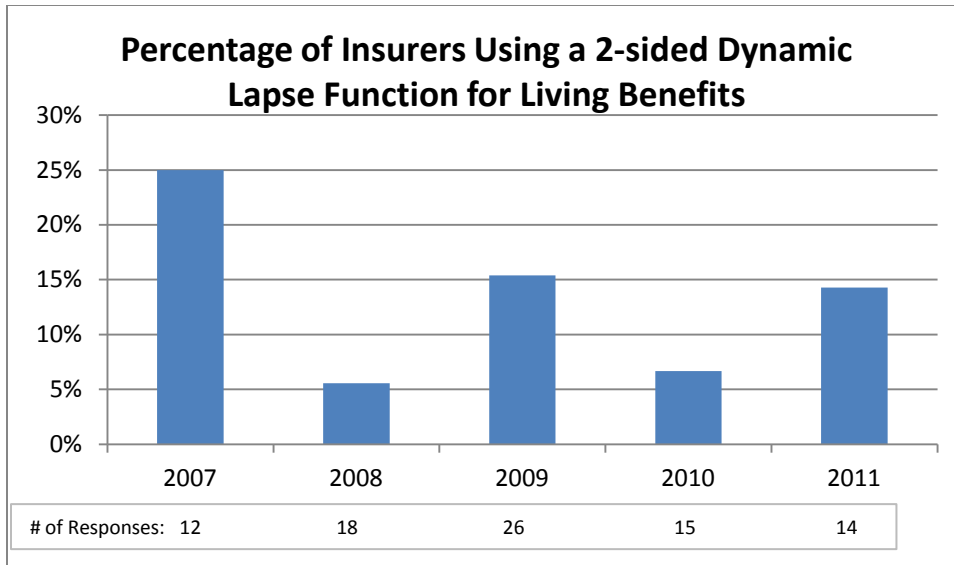
Percentage of Insurers Using a 2-sided Dynamic Lapse Function for Living Benefits

# of Responses:	12	18	26	15	14
	2007	2008	2009	2010	2011

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%-10% of base lapses as shown in Figure 20. The 2011 results are similar to 2010 results.
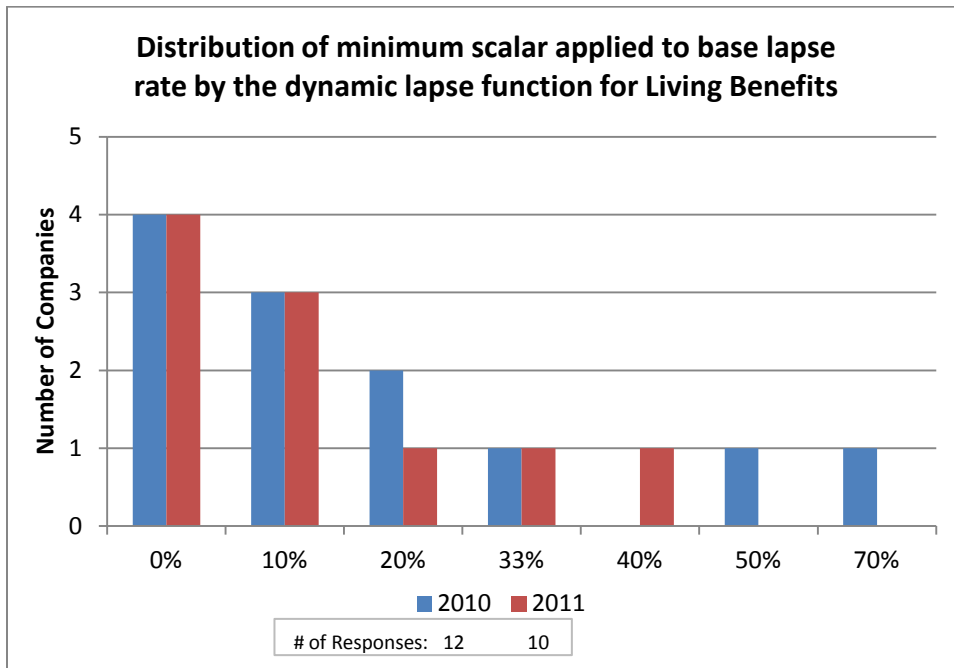
Distribution of minimum scalar applied to base lapse rate by the dynamic lapse function for Living Benefits

2010 ■ 2011

# of Responses:	12	10

Figure 20

Dynamic Utilization

The following charts show the percentage of insurers who use dynamic utilization functions for Income Benefits and for Withdrawal Benefits.
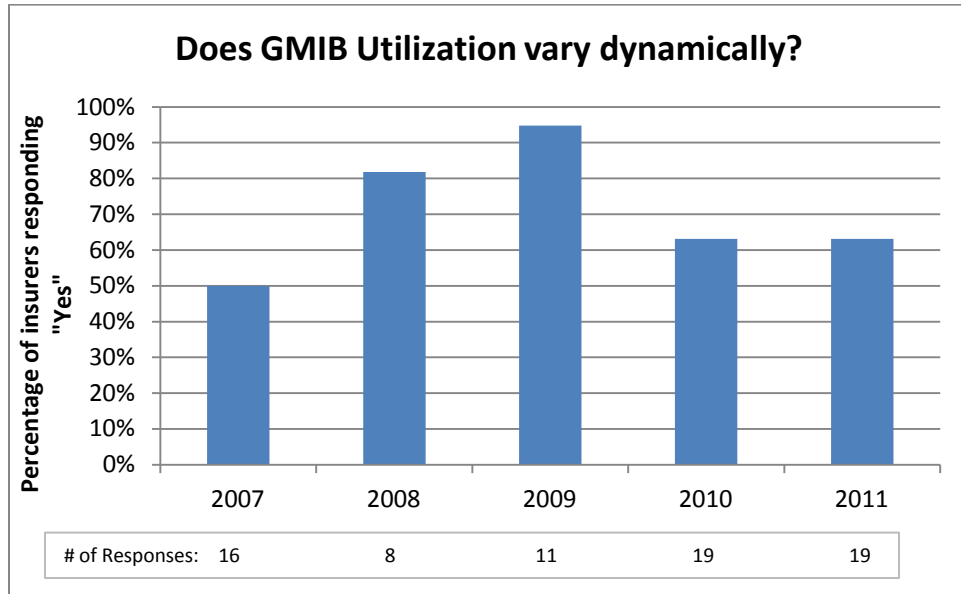
Does GMIB Utilization vary dynamically?

# of Responses:	16	8	11	19	19
	2007	2008	2009	2010	2011

Figure 21

Does GMWB Utilization vary dynamically?

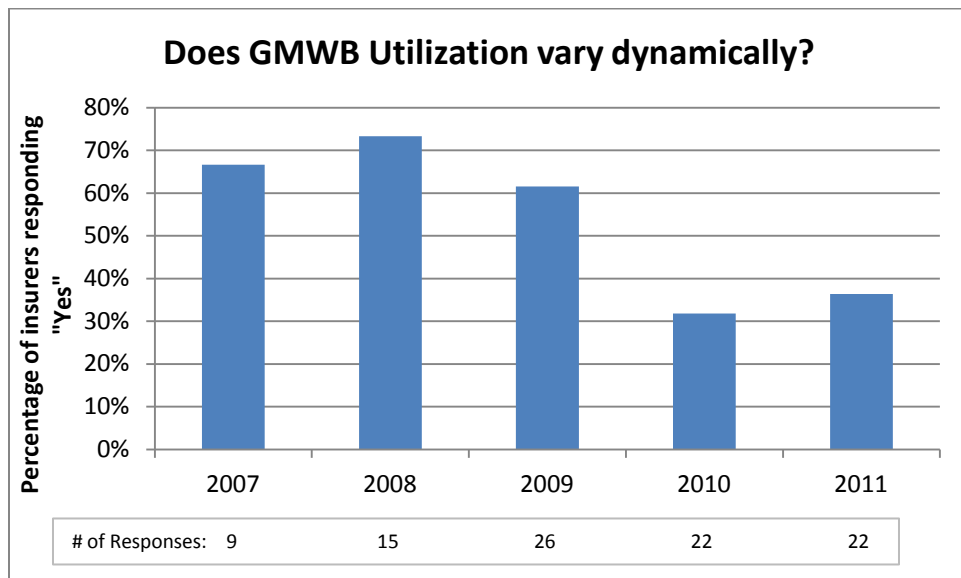| # of Responses:	9	15	26	22	22
	2007	2008	2009	2010	2011

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. In 2011, the percentage remained similar to the 2010 level.

Income and Withdrawal Utilization

Insurers were also asked to describe their Income and Withdrawal utilization assumptions. As in 2010, 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%.
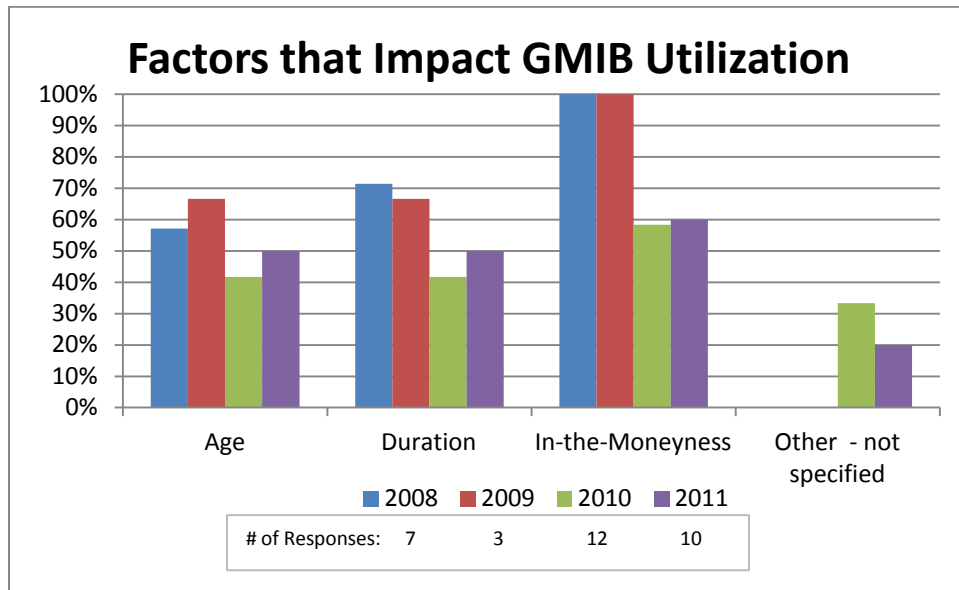

Figure 23

Regarding the GMWB Utilization function, age and duration continue to be commonly used parameters, and while age did not significantly change in frequency from previous years, duration had a 12% drop from 2010 levels. The ITM-ness parameter remained at an extremely low level compared to the other factors. Of the insurers responding "Other", two indicated that GMWB Utilization is impacted by whether or not the policy was previously taking withdrawals, and three responded that the utilization varied by

GMWB design. Insurers were able to list more than one factor so the percentages will not sum to 100%.
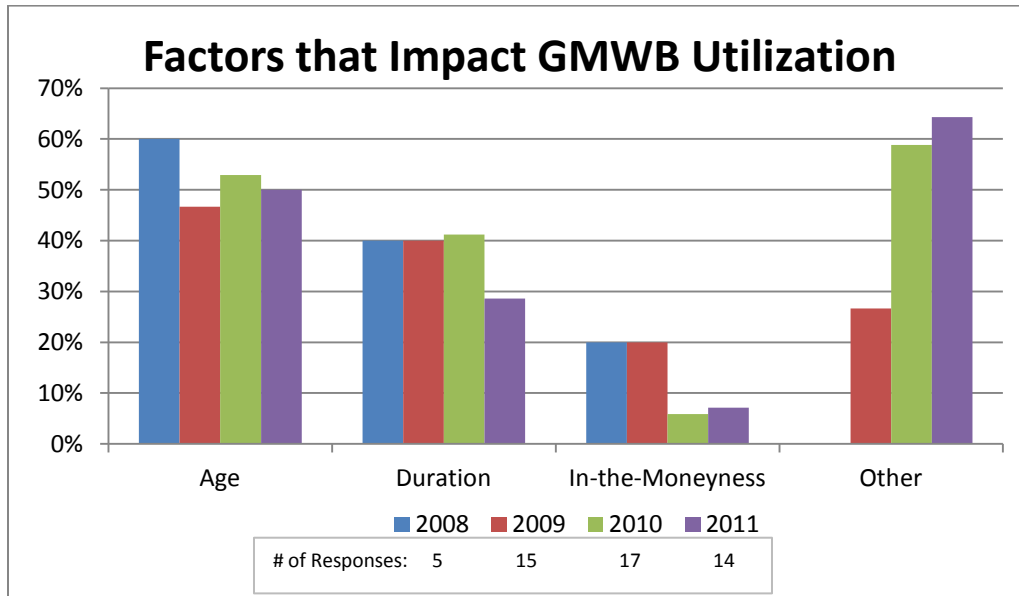
Factors that Impact GMWB Utilization

Figure 24

Lapses by Distribution

Insurers were asked several questions about their distribution channels. Nearly 60% of responses (14 of 24) said that their products were sold through multiple distribution channels. Of those respondents, 70% use three or four distribution channels.
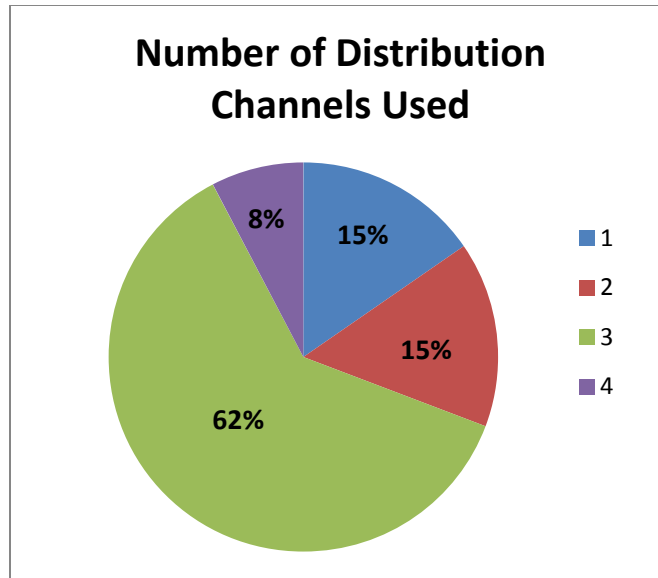
Number of Distribution Channels Used

■	1
■	2
■	3
■	4

15%
15%
62%
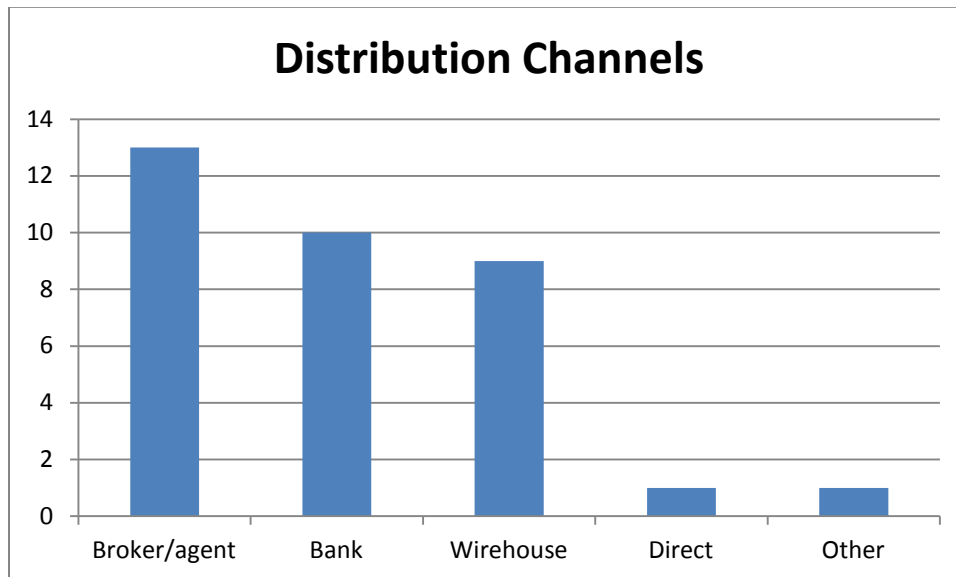8%

Figure 25

Distribution Channels

Figure 26

Insurers were asked if their lapses varied by distribution channel. Only 14% (2 of 14) indicated a difference, this number has held constant for the past 3 years. However, only 3 of 13 respondents actually measures lapse experience by distribution channel. One insurer said 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 observe policyholder behavior "in the tail," and to sharpen their thinking about assumptions "in the tail." Therefore, a follow up question was asked specifically about "in the tail" assumptions.
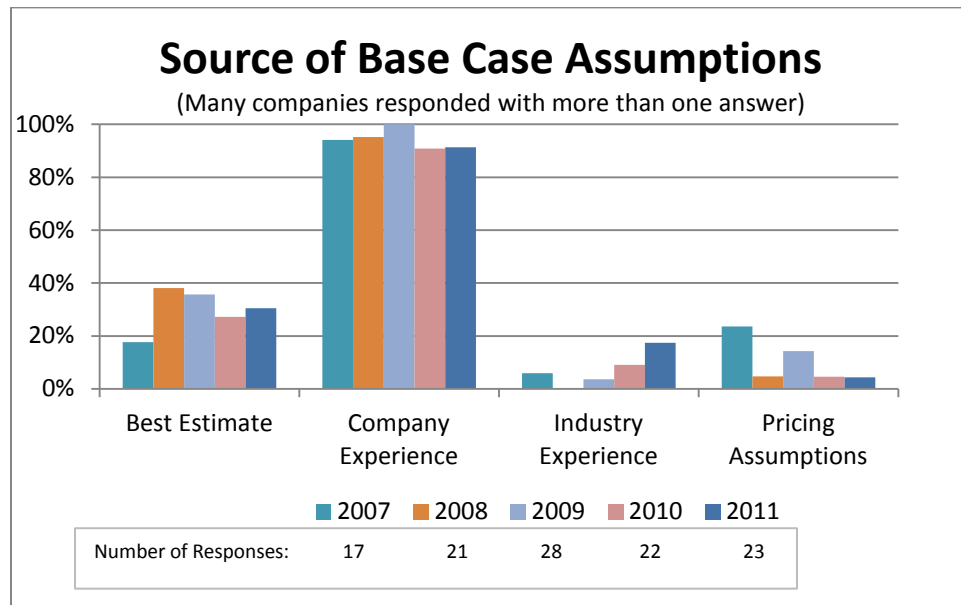

Figure 27

The survey responses show that "company experience studies" continue to be the most popular source of base case assumptions (see Figure 27). Most companies that perform experience studies perform them annually; however, this year there was a shift from performing annual experience studies to quarterly studies (see Figure 28). Over the past years very few companies indicated the use of industry experience in setting assumptions. The number of companies using industry experience nearly doubled this year (9.1% to 17.4%). Based on the observation of the increased frequency of performing experience studies coupled with the increased use of industry experience in setting assumptions, we

surmise that actuaries believe that there is more volatility in the market and that lapse assumptions are not as stable as previously thought.

It is our hope that with the publication of the 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.
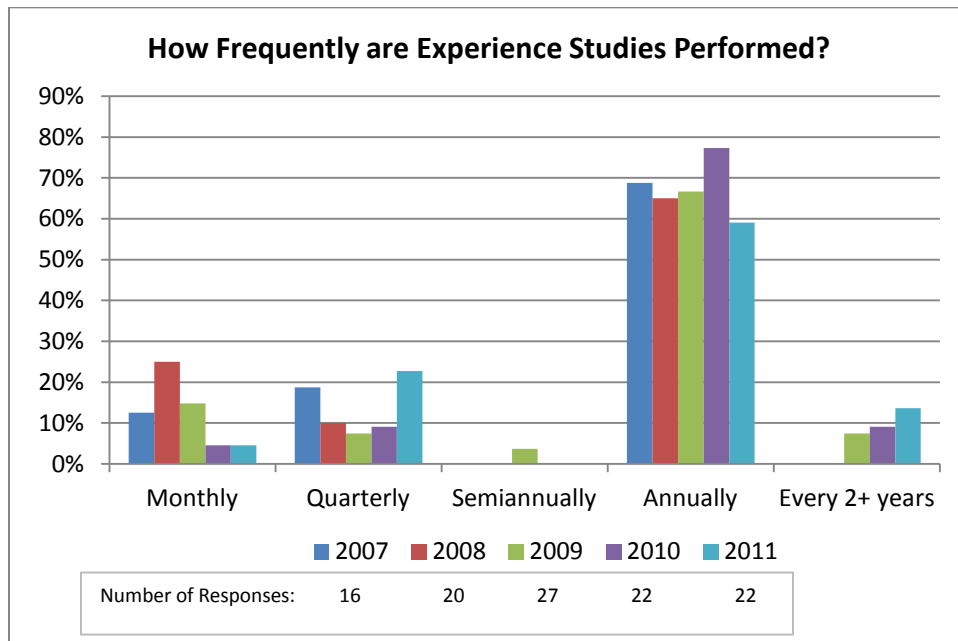
How Frequently are Experience Studies Performed?

Number of Responses:	16	20	27	22	22

Legend: ■ 2007 ■ 2008 ■ 2009 ■ 2010 ■ 2011

Figure 28

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

Years of Experience Data Used in Latest Lapse Study
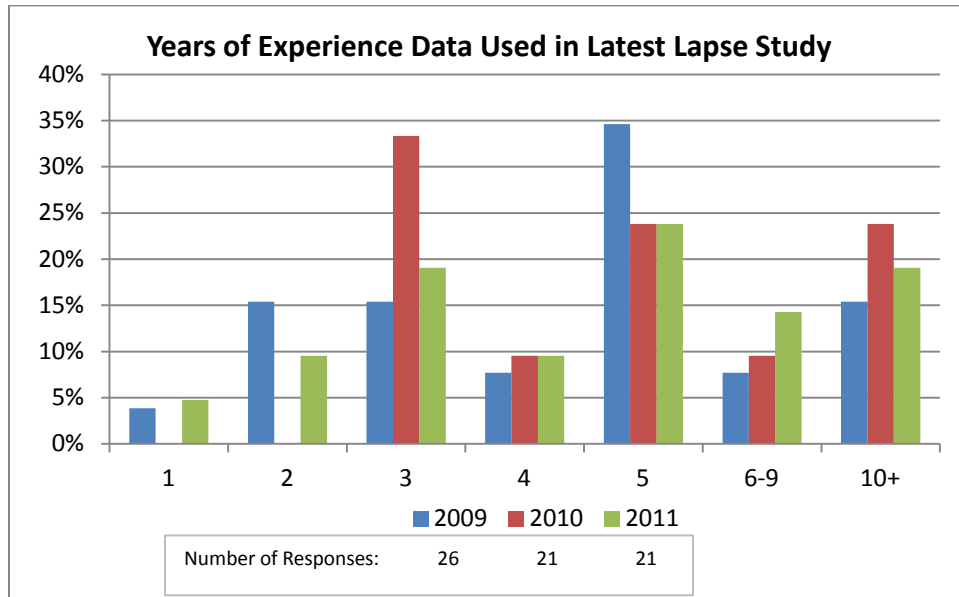
Number of Responses: 26   21   21

Figure 29

Two new questions regarding "in the tail" lapse rate assumptions were initially asked in 2010 and were again asked in 2011. 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 indicated that best estimates was one of the sources for tail lapse assumptions, while less than half (43%) incorporated company experience. This is in contrast to 2010 where the percentages were flipped for those two categories. Only 13% relied in part or in full on industry experience, decreasing from 18% last year. If external consultants are also considered a part of industry experience, then the results from 2010 and 2011 are similar.
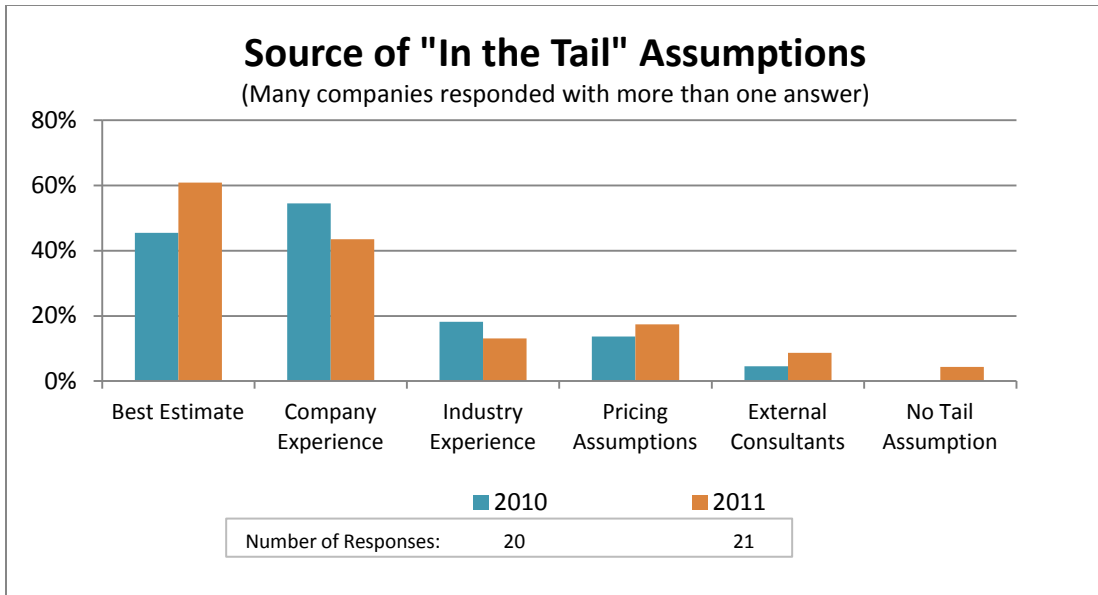
Figure 30

Insurers were also asked, if they were using company experience as a source for "in the tail" lapse rate assumptions, what years were used. Nine of the ten insurers who included company experience responded, six of them indicating the calendar years of experience that were used. Most included the most recent exposure year and seven of the ten used at least three calendar years of experience. Figure 31 compares the source of base assumptions with the "In the Tail" assumptions for 2011.
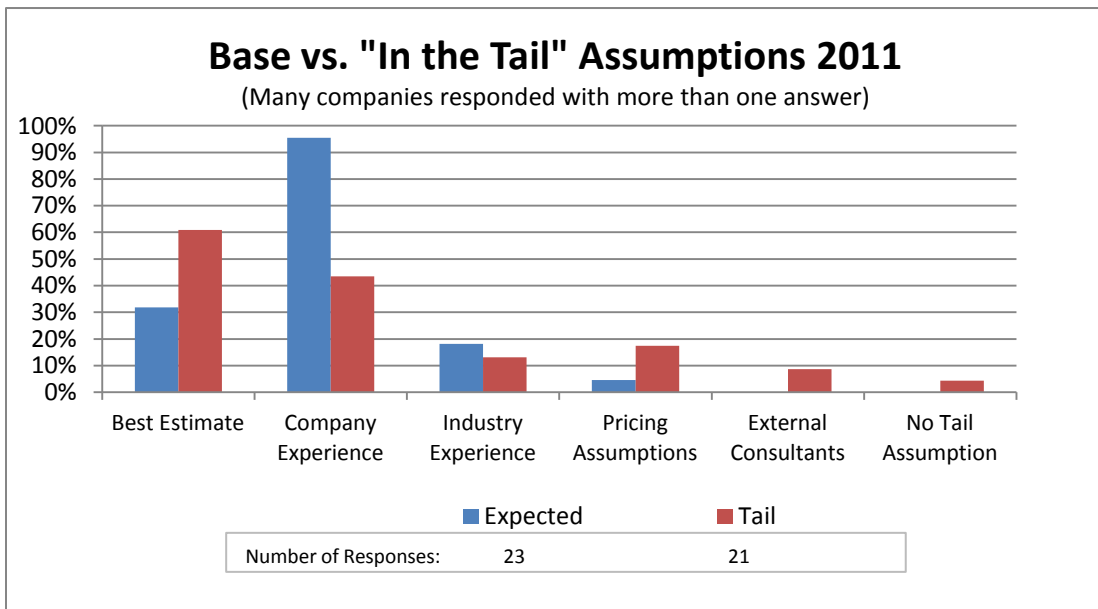

Figure 31

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 consultants 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 decreased from 82% (18 of 22) in 2010 to 63% (15 of 24) in 2011.
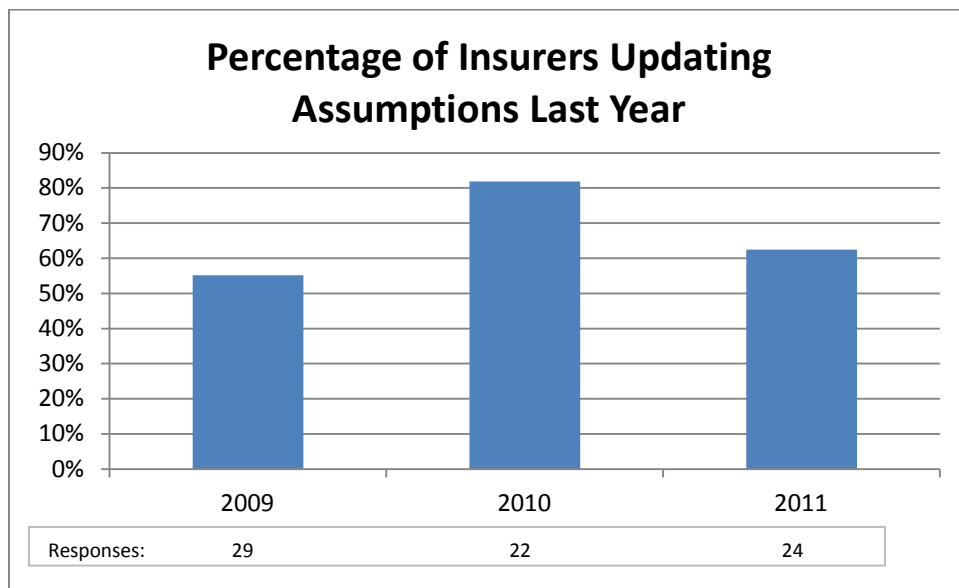

Figure 32

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 show the percentages of those changing, as allocated among the types of

29

responses. Insurers continued to make changes to their dynamic functions for living benefit lapses in 2011, though not as many insurers are updating for experience. This is most likely caused by the relative lower volatility in the markets in the year preceding the survey.
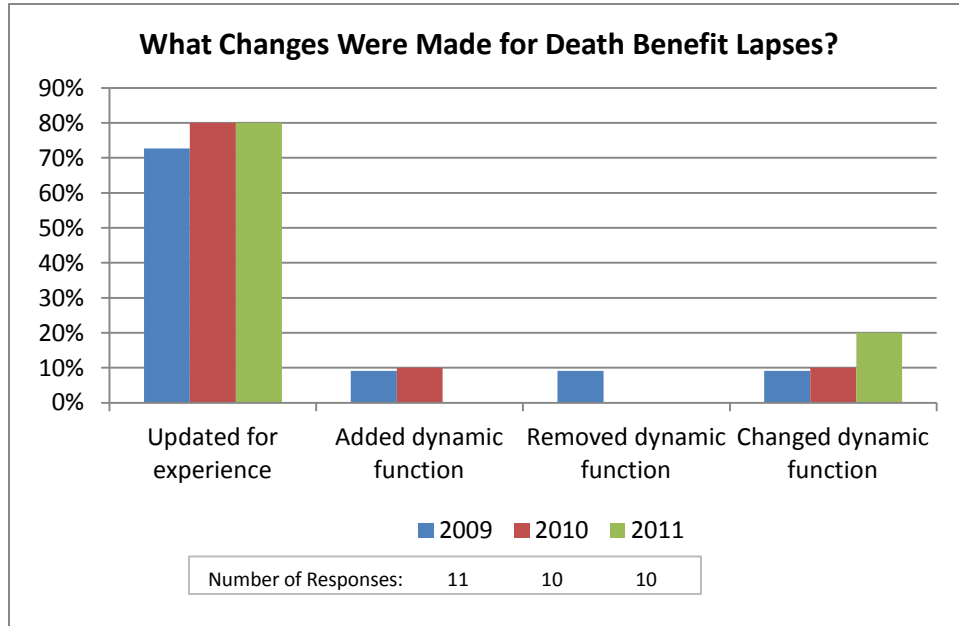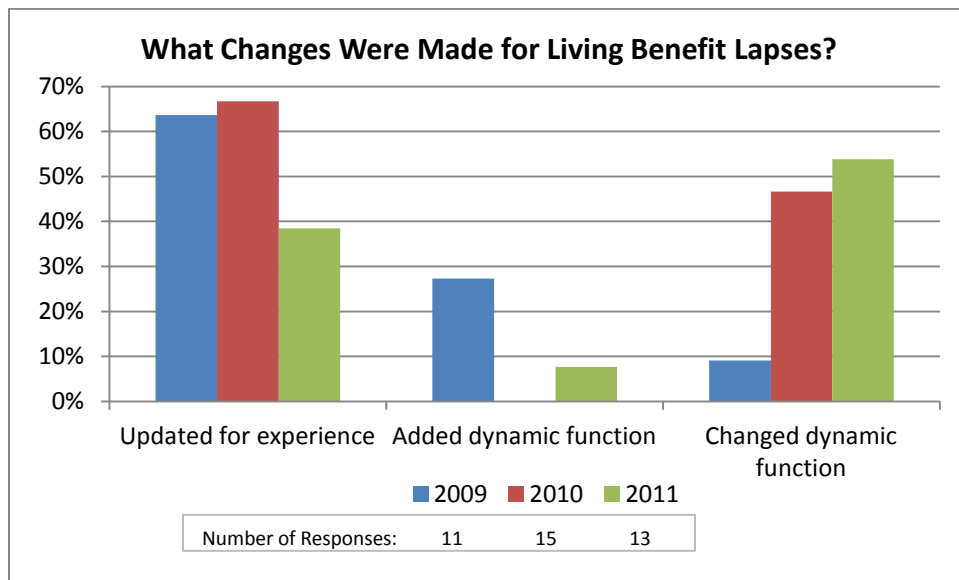

Figure 33

Figure 34

What Changes Were Made for Living Benefit Utilization?

Updated for experience	Changed dynamic function	Added new benefit	

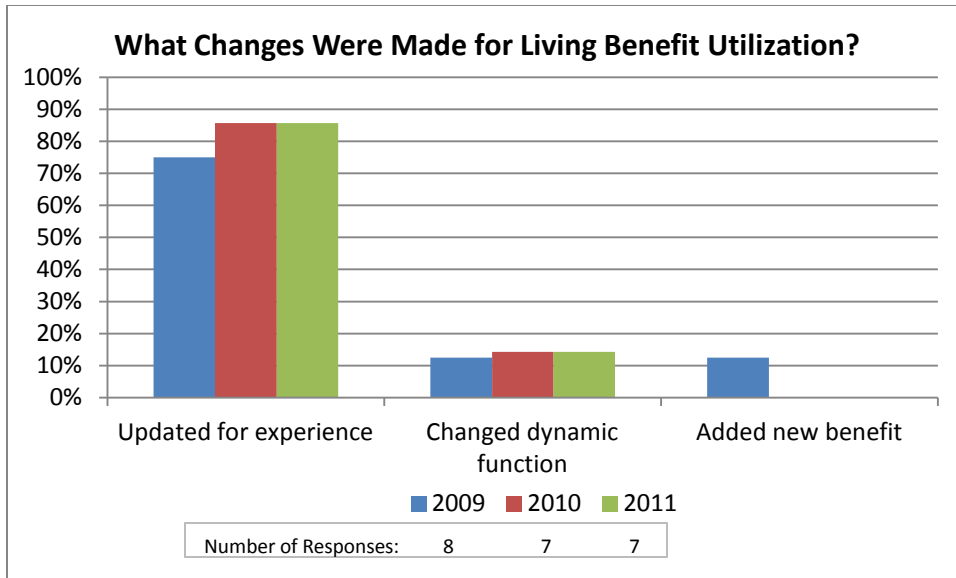■ 2009 ■ 2010 ■ 2011

Number of Responses: 8 7 7

Figure 35

Respondents Profile

The following chart shows the relative size of companies responding to the survey as measured by Total Account Value.
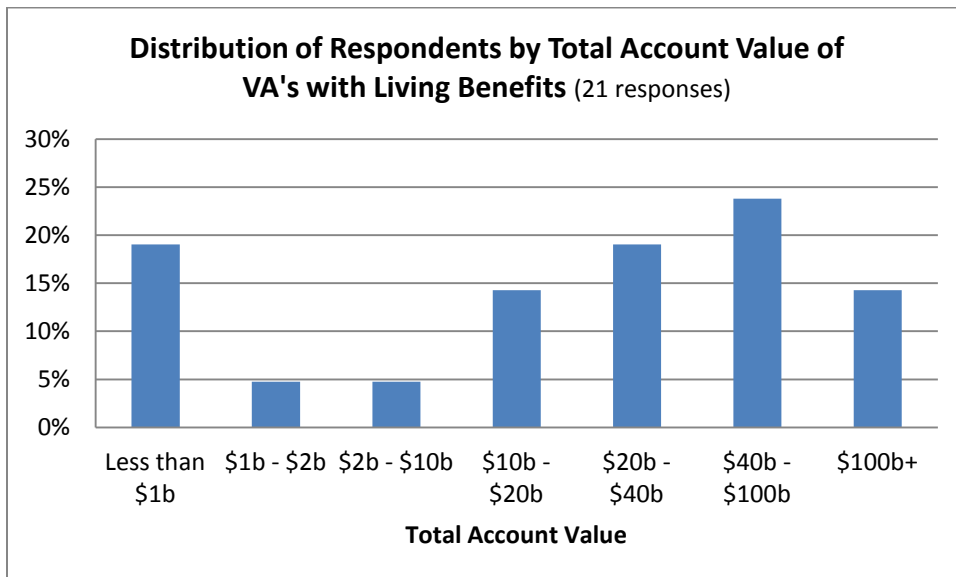
Distribution of Respondents by Total Account Value of VA's with Living Benefits (21 responses)

Total Account Value

Figure 36

31