Survey Highlights

- 2010 marks the first year that every respondent indicated that at least 1,000 scenarios were used.
- 83% of respondents indicated they changed assumptions since the last survey; up from 55% last year.
- Fewer insurers reported using dynamic utilization for income benefits and withdrawal benefits than in previous years.
- A majority of insurers indicated that company experience was one of the sources for tail lapse assumptions in responses to a new question in 2010.
- There is a very wide variation in the description of the least tail scenario across insurers. The least tail scenario is defined on page 2 of this document.
- The median cumulative return, measured across the least tail scenarios, provided by respondents, resembles the 10th percentile of the AAA pre-packaged scenarios over the first 17 projection years.
- Less than 40% of respondents use dynamic lapses for death benefits.
- Over 80% of respondents use dynamic lapses for living benefits. Nearly all of those described their function as one sided.
- 96% respondents projected results over at least 30 years.
- Company experience studies continue to be the most popular source for assumption setting.
- Most companies that perform experience studies perform them annually.

Acknowledgements
The Society of Actuaries' Policyholder Behavior in the Tail (PBITT) working group gratefully acknowledges Stephen Hodges and Brian Grinnell for all of their efforts in analyzing the survey data and drafting the results 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.

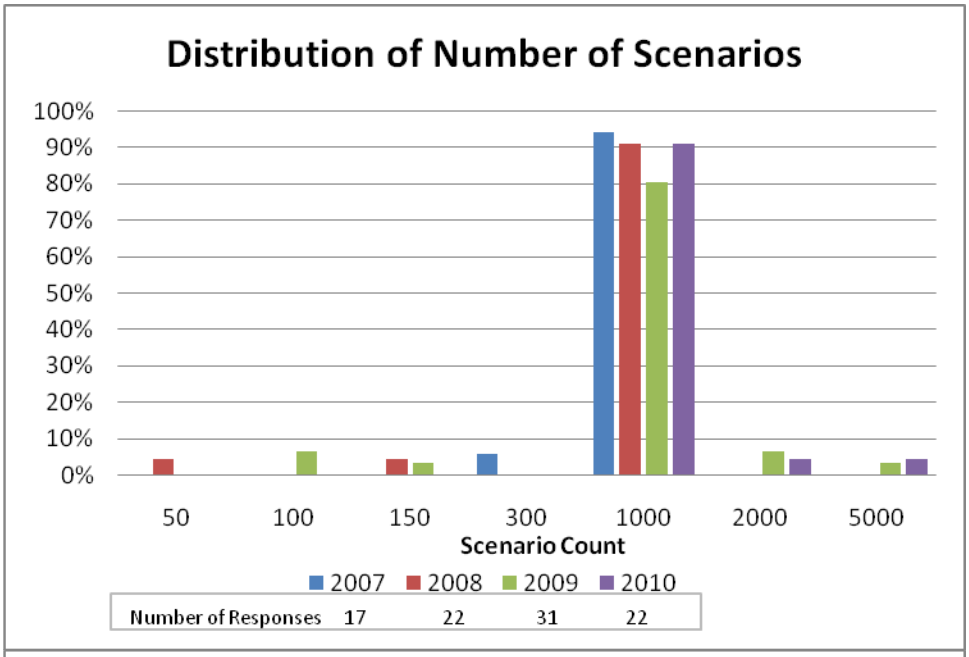
The Policyholder Behavior in the Tail group is interested in comments on the survey and results. Please e-mail comments to either Jim Reiskytl, Chair of the Policyholder Behavior in the Tail group, at jimreiskytl@wi.rr.com or Steve Siegel, Society of Actuaries Research Actuary at ssiegel@soa.org.

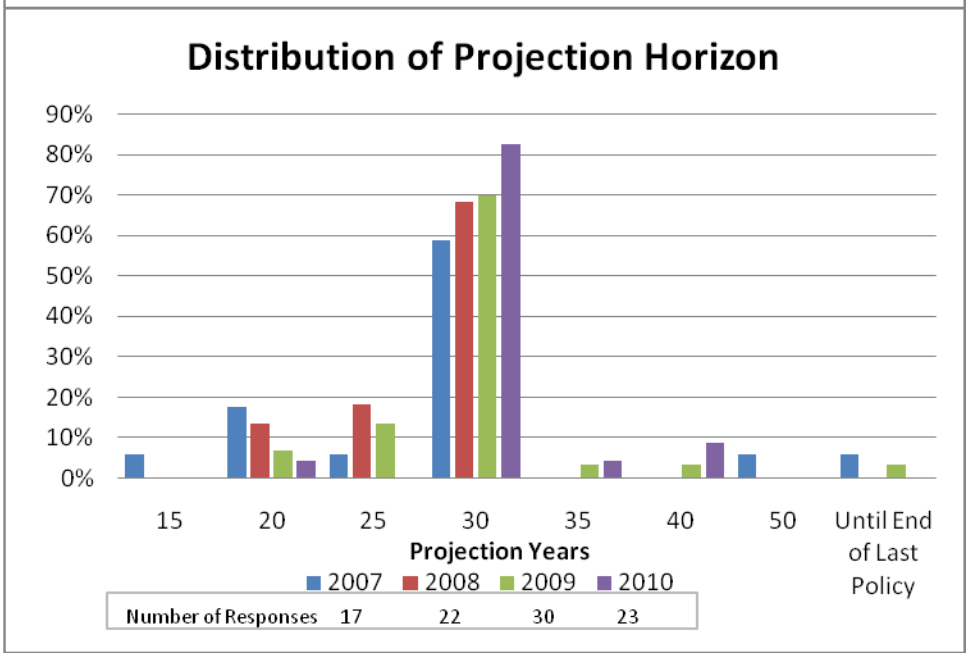
Background

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 C3 Phase II calculation. This survey was also issued in 2007, 2008, 2009 and again in 2010. Each version of the survey has had approximately 20-30 responses; however not every company responded to every question. The following sections highlight responses from 2010 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.

Specifics of C3 Phase II Calculation

Insurers were asked to provide details of their C3 Phase II calculation such as the number of scenarios used, and the length of projection horizon. 2010 marks the first year where every respondent indicated that at least 1,000 scenarios were used. The percentage of companies indicating that more than 1,000 scenarios were used remained about the same as 2009. Almost all 2010 respondents indicated they projected results over at least 30 years.

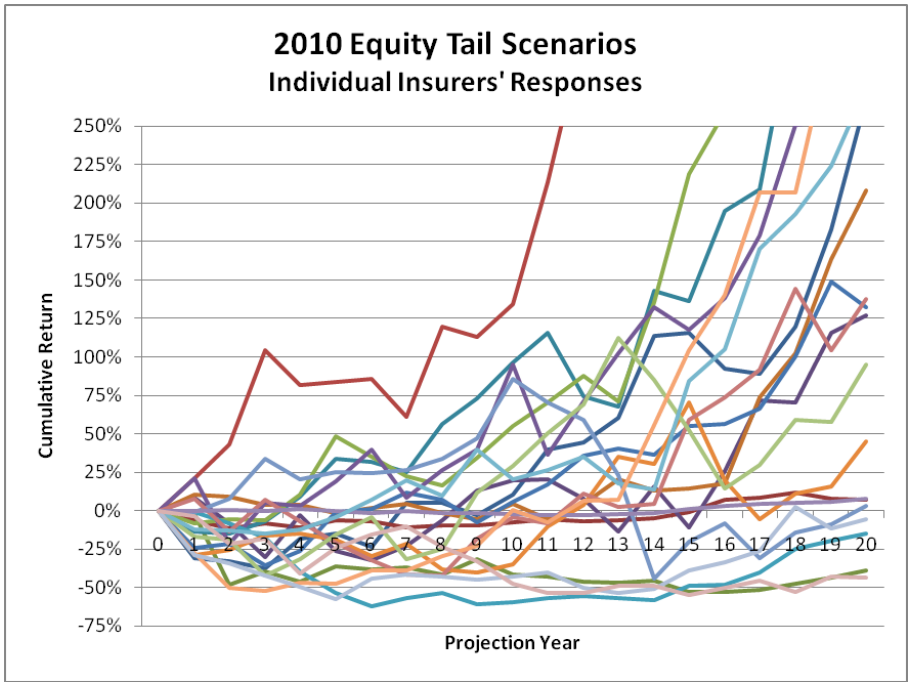




Tail Scenario

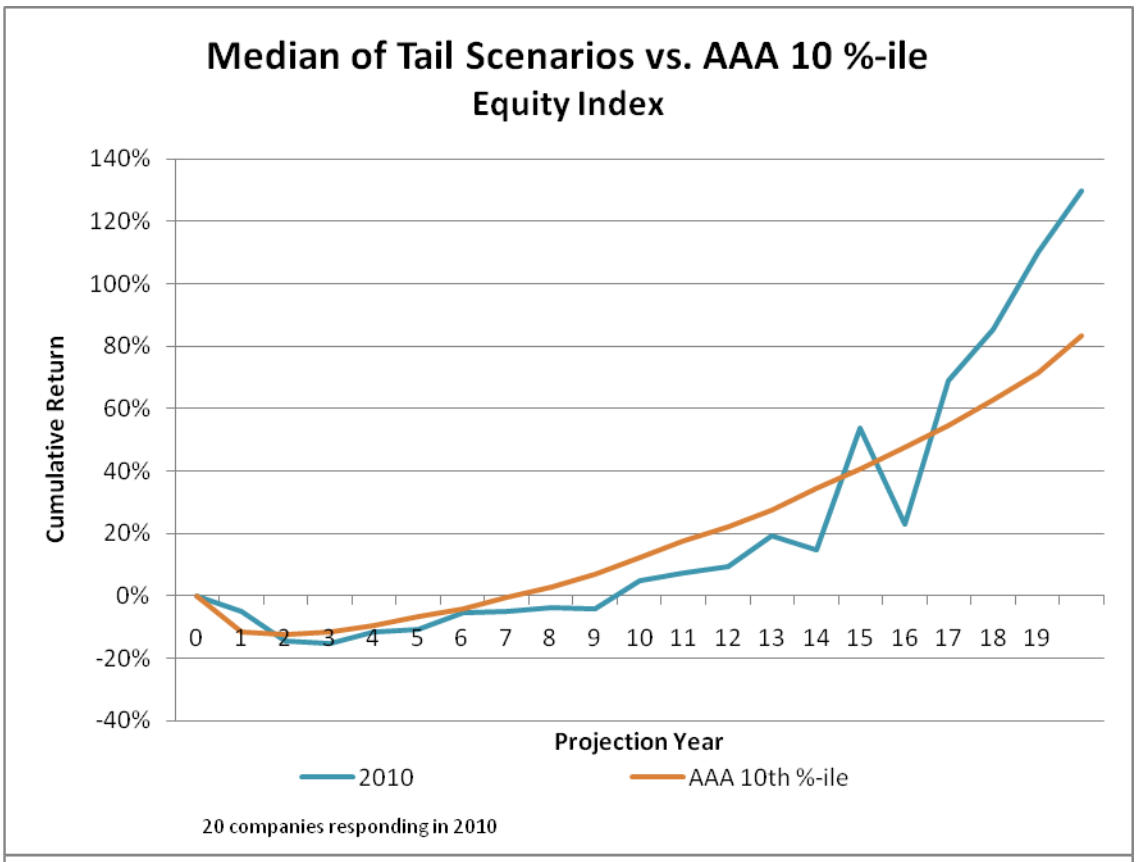
Insurers were asked to describe the tail scenario that gives the least positive Additional Asset Requirement (AAR). For example, if the sorted AARs for each scenario in the tail were 100, 90, 50, 30, 15, -5, -20, …, the scenario the insurer would provide would be the one that produced an additional asset requirement of 15.

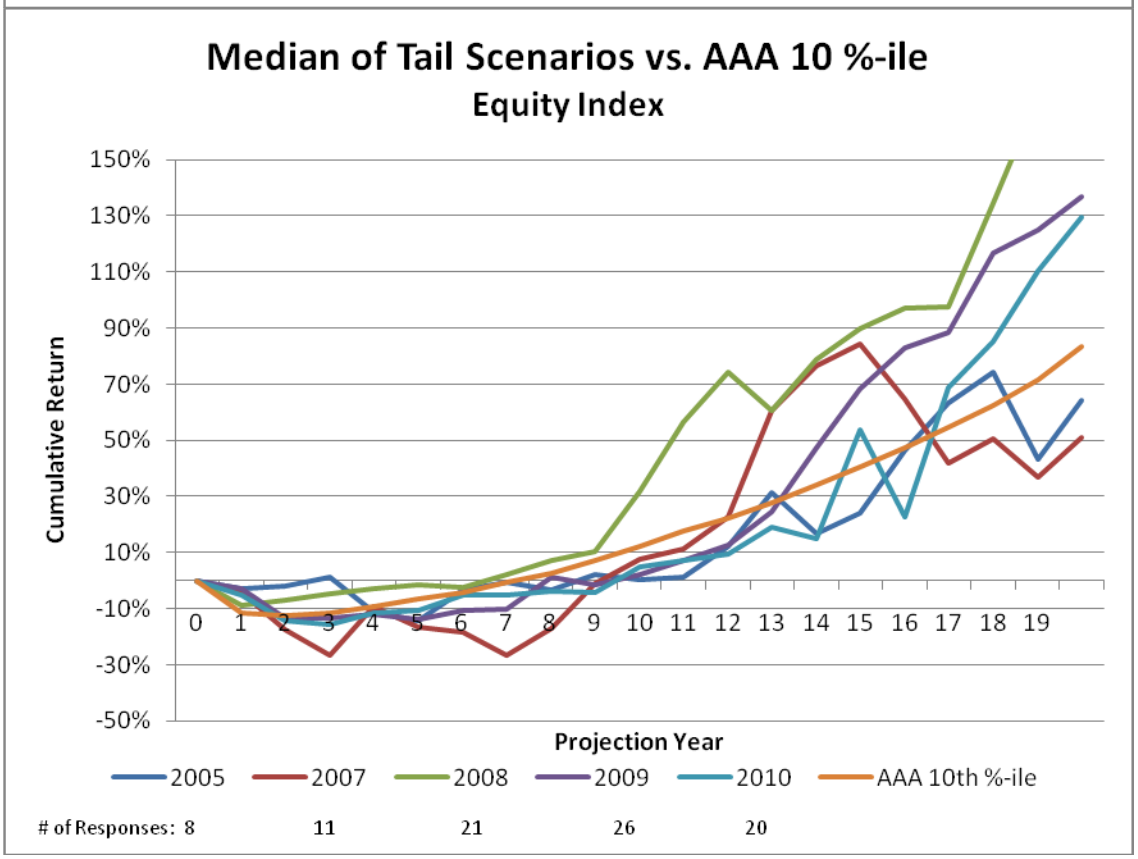
Responses varied widely across insurer regarding the description of the tail scenario. The chart below shows each insurer's description of the equity performance in their tail scenario on a cumulative basis. In the majority of cases, these (least) tail scenarios show negative cumulative returns for approximately 10 years and then turn moderately positive by the 15th to 20th year.



In the chart below, the median of the lines above is plotted against the 10th percentile of the equity returns from the American Academy of Actuaries pre-packaged scenario set (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. 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, rather than representing a particular scenario.

Responses from 2010 show that the median of insurers' responses is very similar to the 10th percentile of the AAA pre-packaged scenarios.

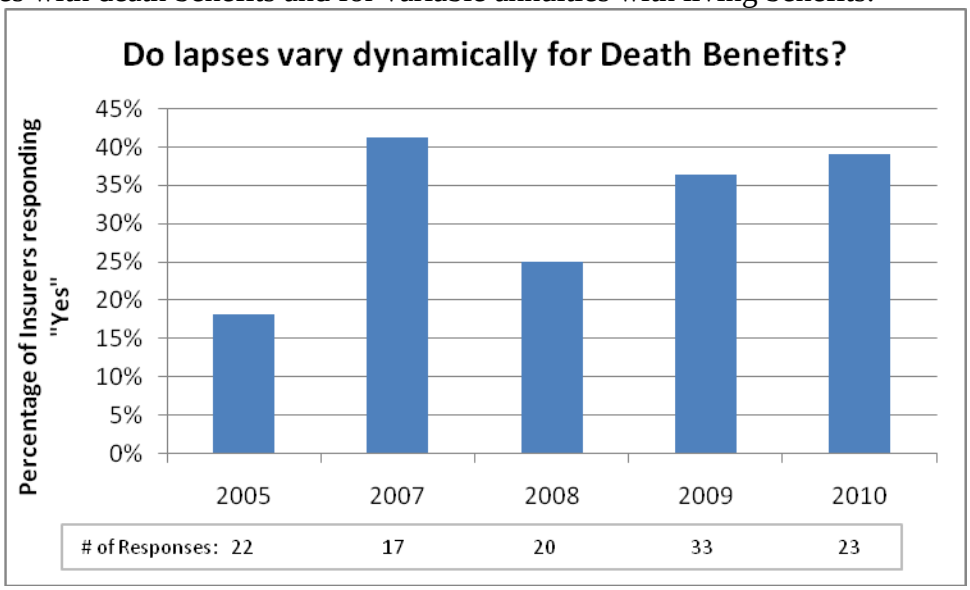

Median of Tail Scenarios vs. AAA 10 %-ile
Equity Index
Cumulative Return
140%
120%
100%
80%
60%
40%
20%
0%
-20%
-40%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Projection Year
2010
AAA 10th %-ile
20 companies responding in 2010


Median of Tail Scenarios vs. AAA 10 %-ile
Equity Index
Cumulative Return
150%
130%
110%
90%
70%
50%
30%
10%
-10%
-30%
-50%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Projection Year
2005
2007
2008
2009
2010
AAA 10th %-ile
# of Responses: 8 11 21 26 20

The median response has been fairly stable over the years, particularly in the first five projection years. As in 2010, the median of 2009 responses was quite similar to the 10th percentile of the AAA scenario set.

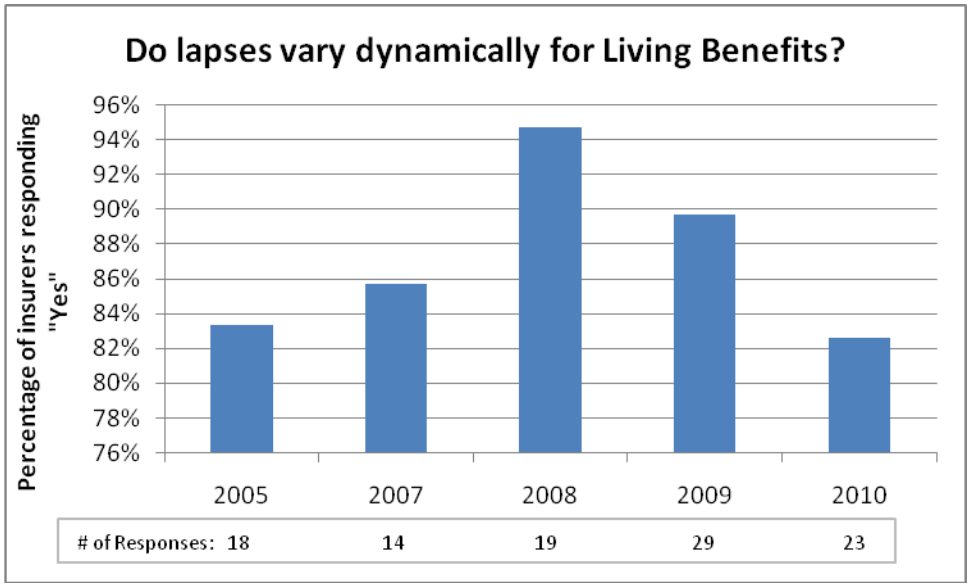
Dynamic Lapses

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



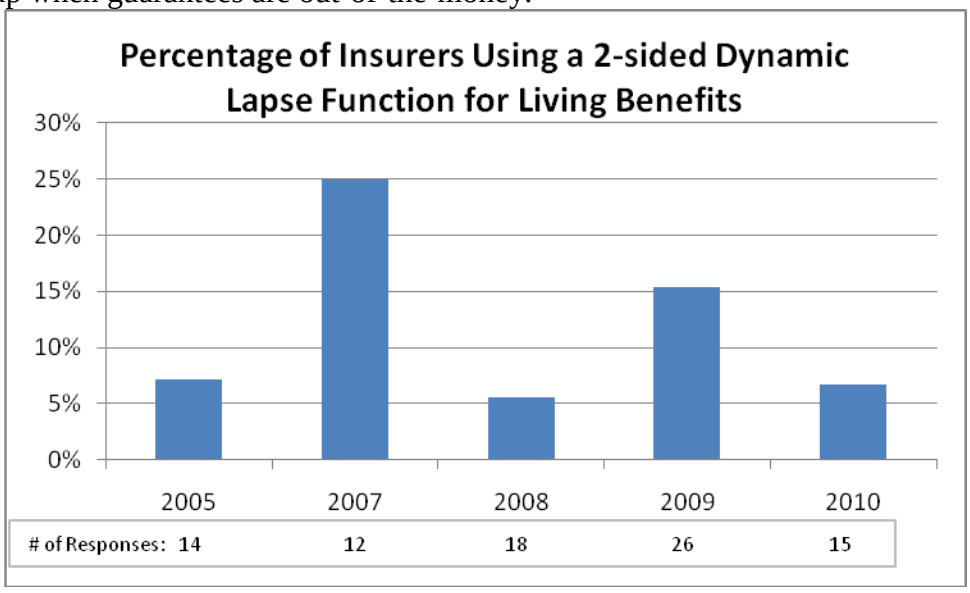
The prevalence of dynamic lapse functions for GMDBs continues to increase slowly. With the exception of 2007-2008, incidence has increased every year. Eight of the insurers who answered in the affirmative provided descriptions of their dynamic lapse function for GMDB. All eight varied the base lapses by applying a scalar to reduce lapses when policies were in-the-money (ITM). Of those eight, seven varied the scalar by ITM-ness only, while the other had it vary by ITM-ness and age.

Five of the eight companies which described their GMDB dynamic lapse function began to reduce lapses from the base level once ITM-ness exceeded 10%. Two of the companies had thresholds on either side of this, one began reducing lapses at 15% ITM-ness, and the other began reducing lapses at 0% ITM-ness.

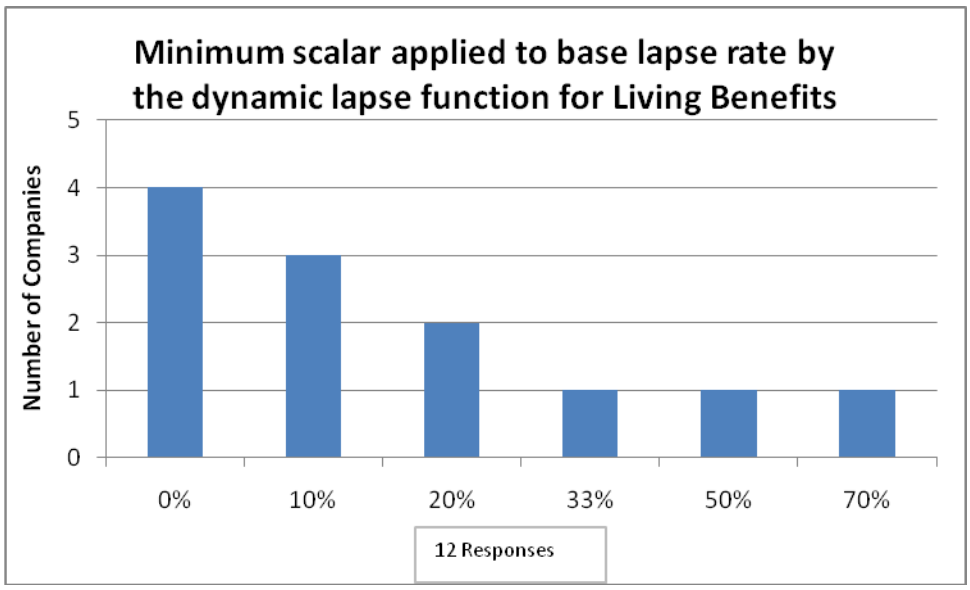


A solid majority of insurers vary lapses dynamically for living benefits. The percentage doing so has remained relatively stable in the range of 80-95% for the past five years.

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 speed up when guarantees are out-of-the-money.

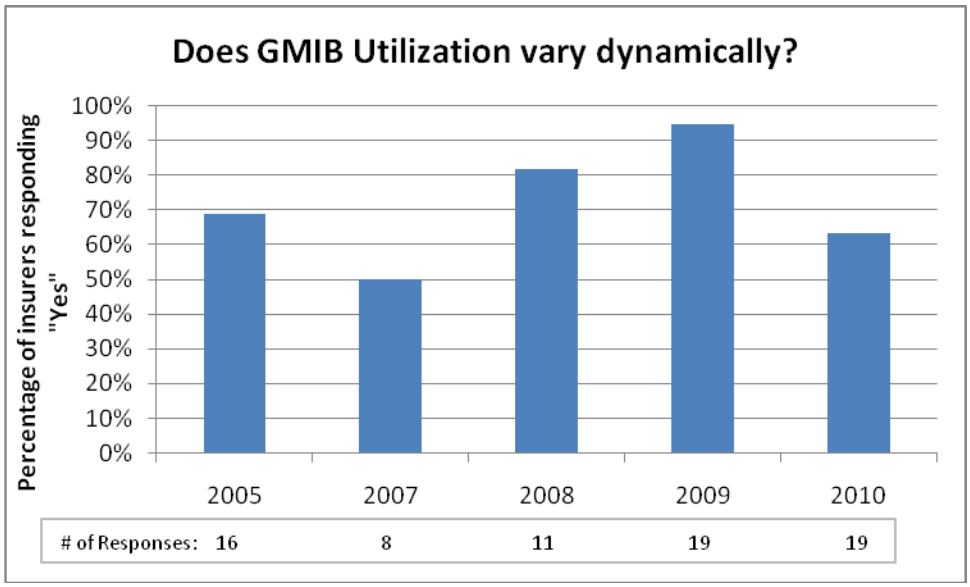


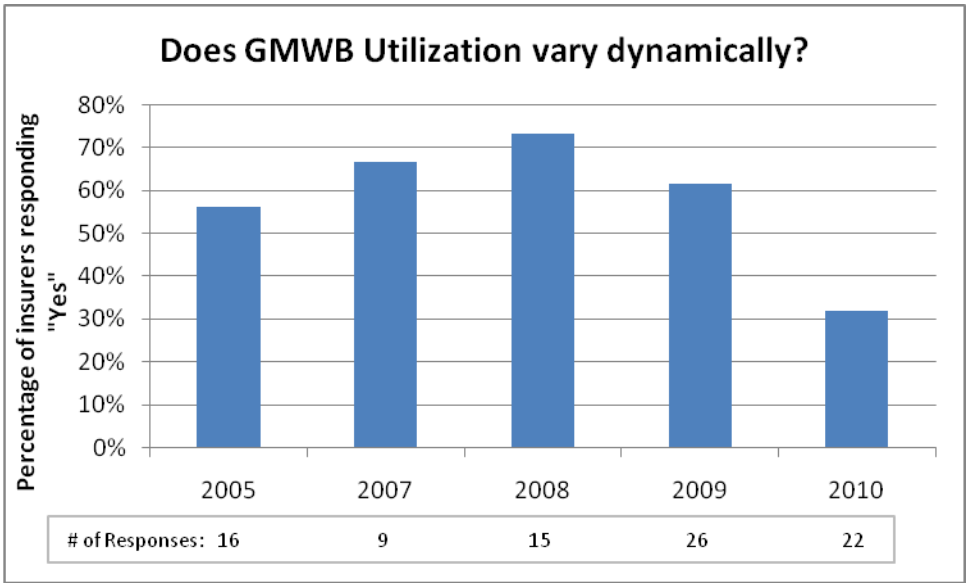
Additionally, many insurers described their dynamic lapse function for living benefits in sufficient detail to determine the minimum lapse rate the function would produce, as a percentage of the base lapse rate. Most insurers floor the dynamic lapse function at 0%-10% of base lapses as shown in the chart below.



Dynamic Utilization

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



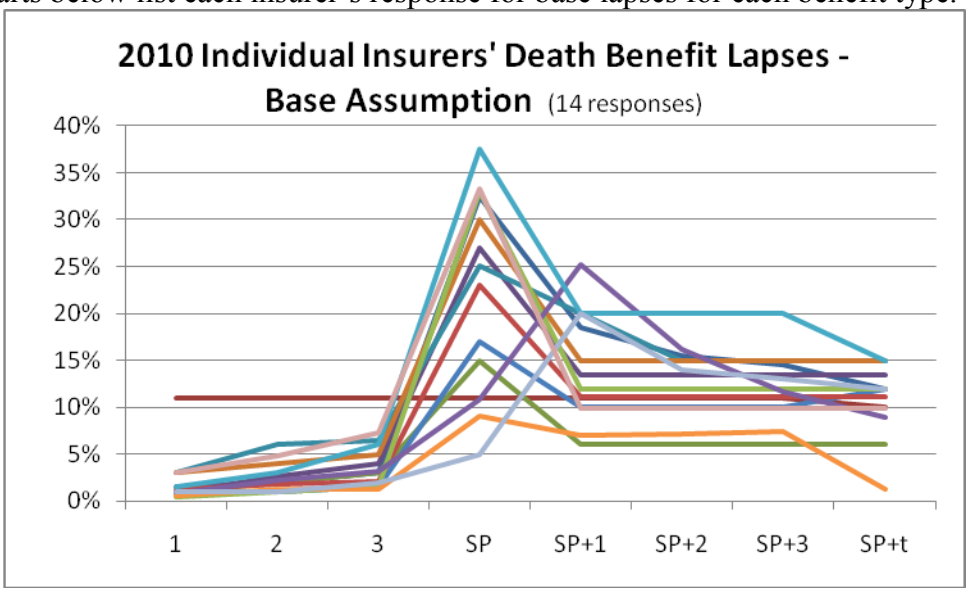


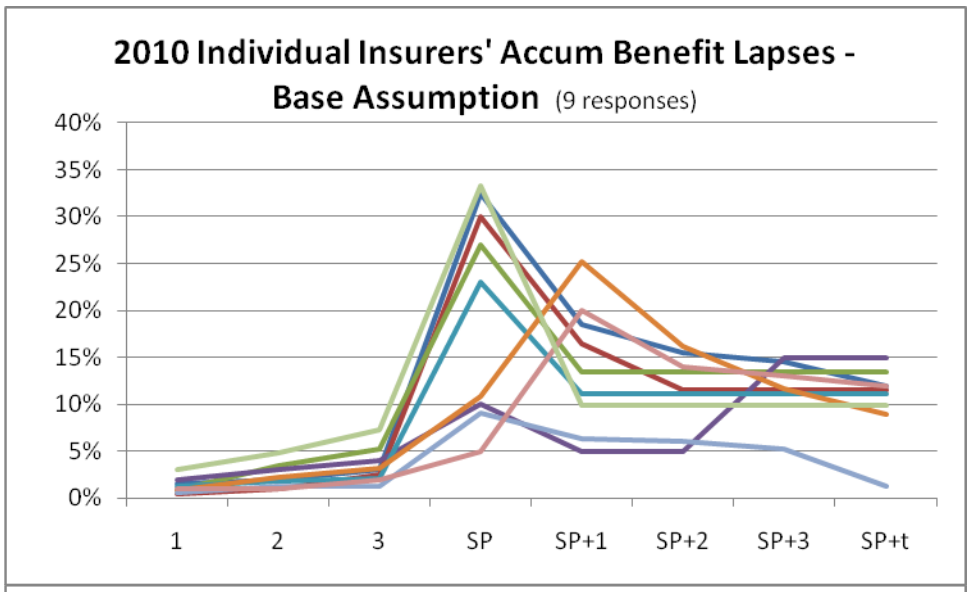
Dynamic Utilization for GMWBs was reported to be significantly lower than in any previous year, declining from 2009 by about half.

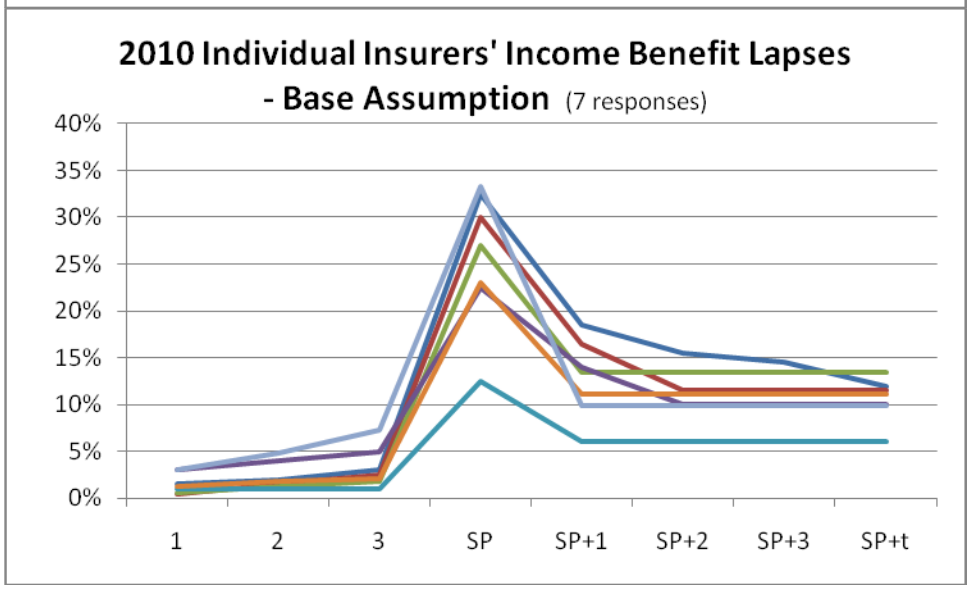
Base Lapse Assumptions

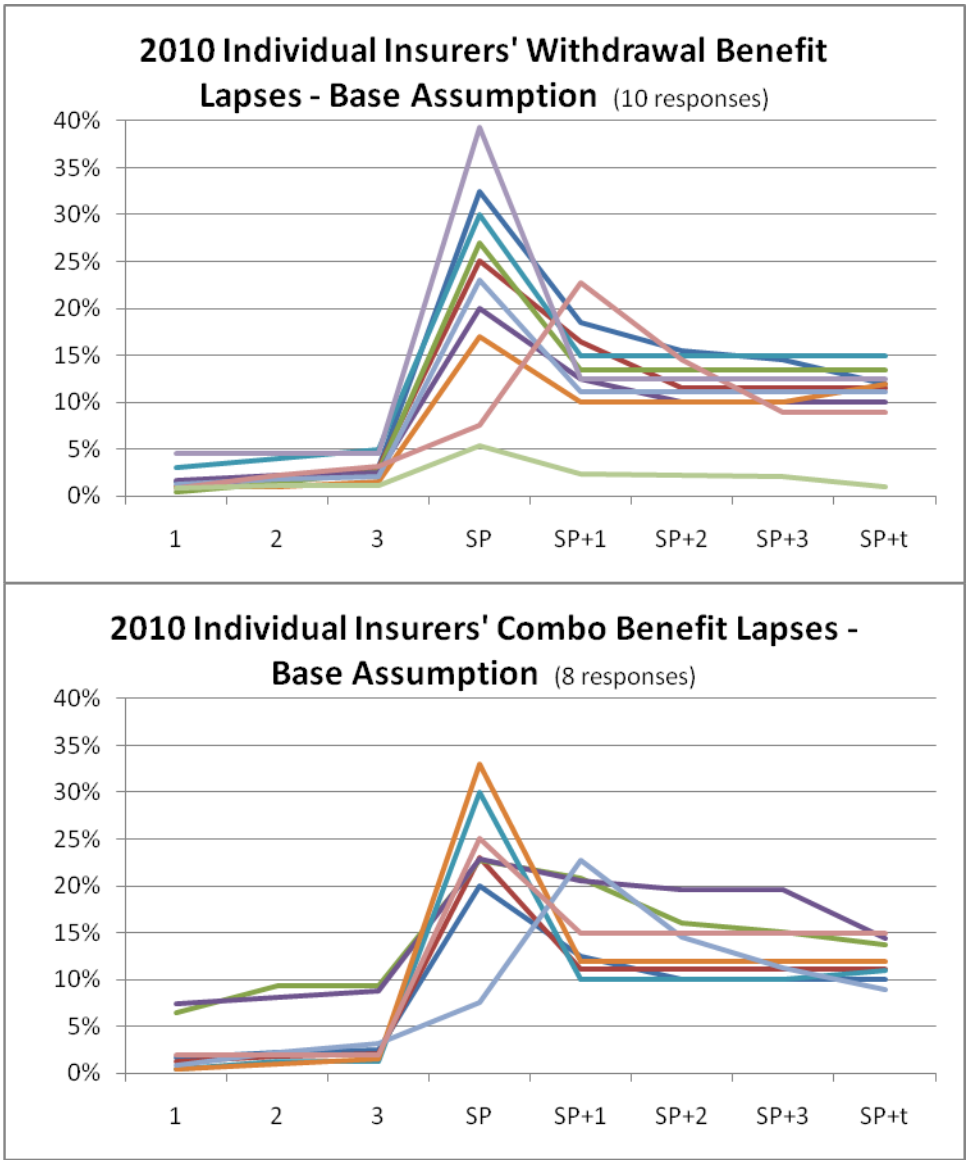
Insurers were asked to list their base lapse assumption (non-dynamic) at policy years 1, 2, and 3, as well as several durations following the surrender charge period. Responses were broken down by benefit type into Death Benefits (GMDB), Accumulation Benefits (GMAB), Income Benefits (GMIB), Withdrawal Benefits (GMWB), and Combination Benefits.

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

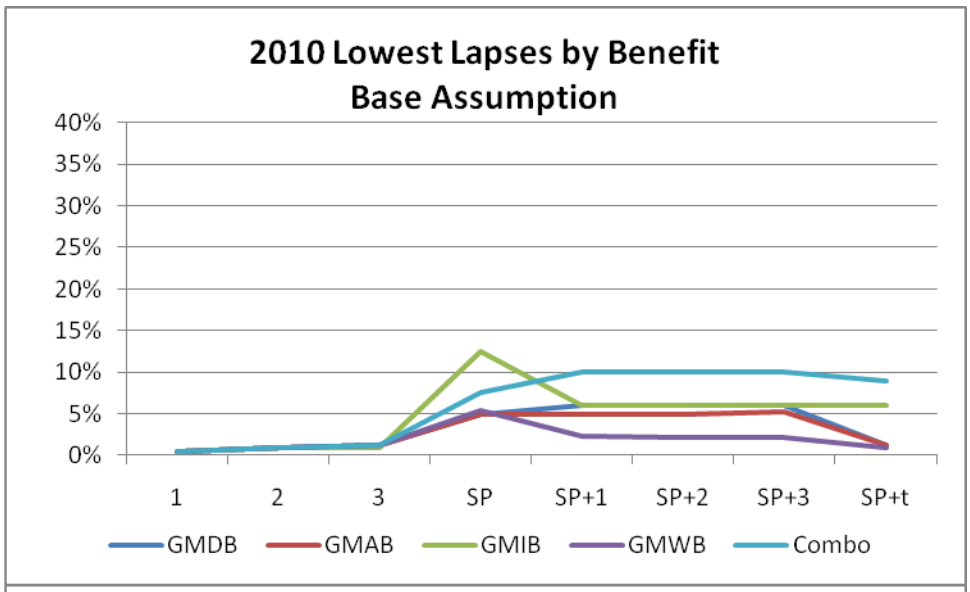


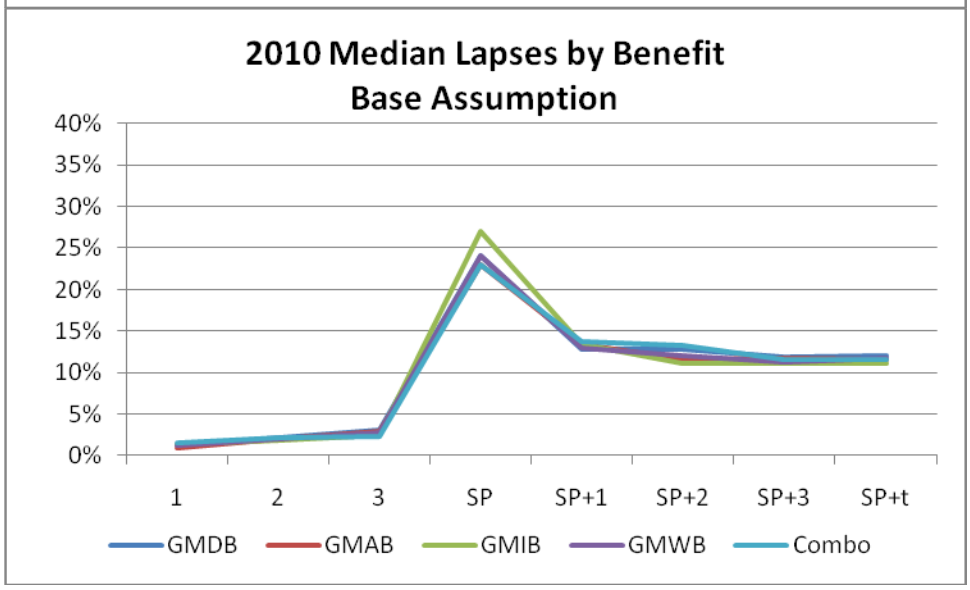

2010 Individual Insurers' Accum Benefit Lapses - Base Assumption (9 responses)
40%
35%
30%
25%
20%
15%
10%
5%
0%
1
2
3
SP
SP+1
SP+2
SP+3
SP+t

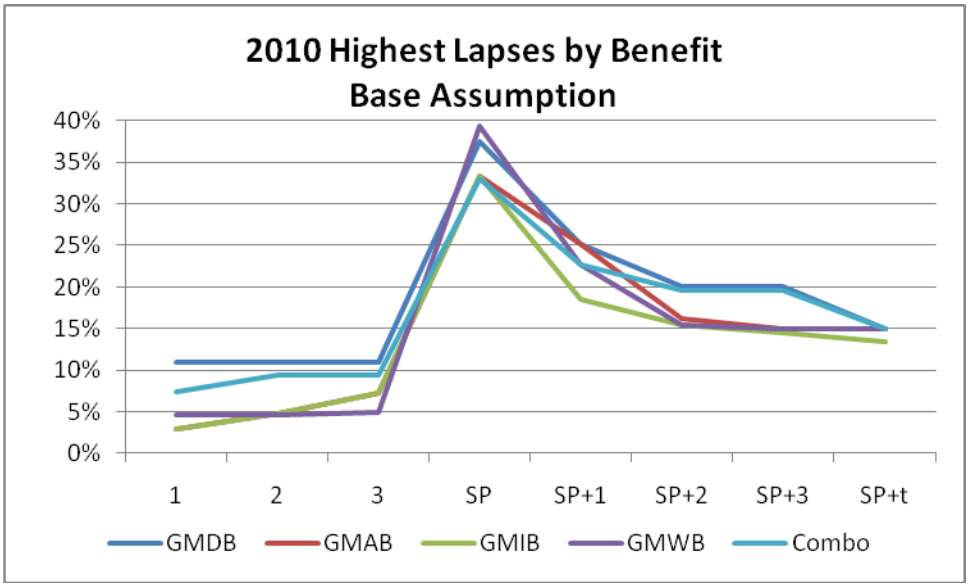

2010 Individual Insurers' Income Benefit Lapses - Base Assumption (7 responses)
40%
35%
30%
25%
20%
15%
10%
5%
0%
1
2
3
SP
SP+1
SP+2
SP+3
SP+t



The following graphs show the lowest, median, and highest lapses by benefit type across all insurers' responses.


2010 Lowest Lapses by Benefit Base Assumption
40%
35%
30%
25%
20%
15%
10%
5%
0%
1
2
3
SP
SP+1
SP+2
SP+3
SP+t
GMDB
GMAB
GMIB
GMWB
Combo


2010 Median Lapses by Benefit Base Assumption
40%
35%
30%
25%
20%
15%
10%
5%
0%
1
2
3
SP
SP+1
SP+2
SP+3
SP+t
GMDB
GMAB
GMIB
GMWB
Combo



Note that the lowest, median, and highest lapse rates do not reflect any one individual insurer's array (by duration) of lapse rates, but rather reflect the lowest, e.g., across all insurers at the given duration. Thus, the 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 lowest value given for duration 3.

The following tables compare median lapse rates by benefit type for 2009 and 2010. From 2009 to 2010 lapse rate assumptions were decreased for GMDB and GMIB at all durations except for the end of the surrender charge period, where they were raised for most benefit types.

2009 Median Lapse Rates by Benefit Type – Base Assumption

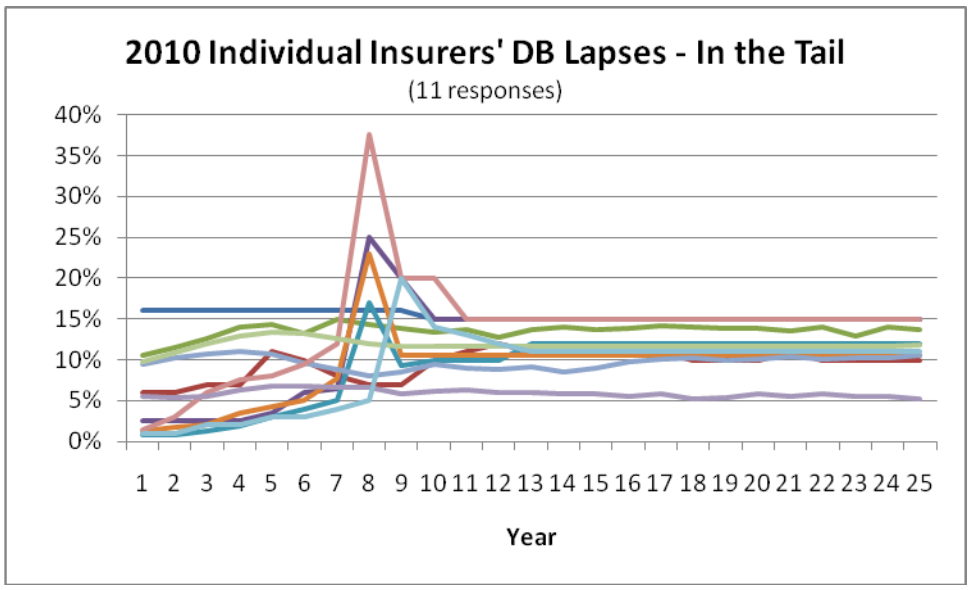
Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	2.0%	1.5%	1.5%	2.0%	1.0%
2	3.0%	3.0%	3.0%	3.0%	2.0%
3	4.0%	4.0%	3.0%	3.5%	2.2%
SP	20.5%	16.9%	21.6%	15.0%	23.0%
SP+1	13.7%	10.5%	17.0%	10.5%	12.1%
SP+2	13.2%	10.5%	15.0%	10.5%	10.6%
SP+3	12.8%	10.5%	15.0%	10.0%	10.4%
SP+t	11.6%	12.5%	13.5%	10.0%	9.8%
Responses	18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

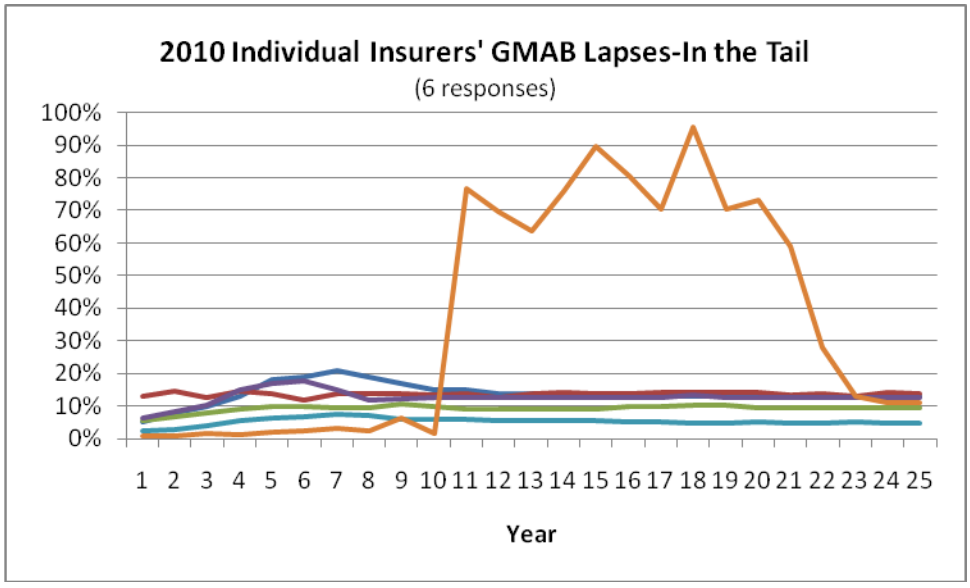
2010 Median Lapse Rates by Benefit Type – Base Assumption

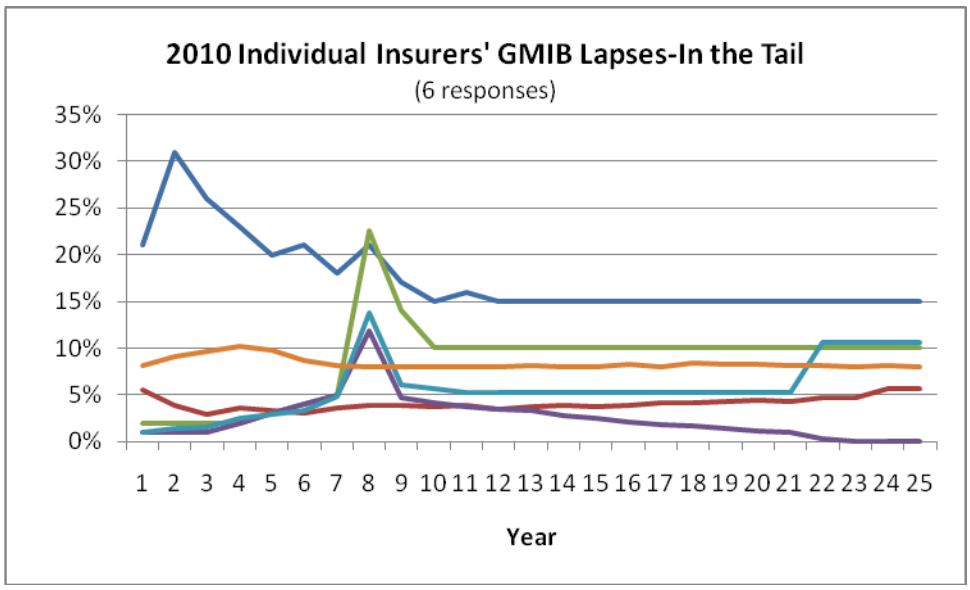
Duration	GMDB	GMAB	GMIB	GMWB	Combo
1	1.2%	1.0%	1.3%	1.2%	1.5%
2	2.2%	2.0%	1.8%	2.0%	2.1%
3	3.1%	3.0%	2.5%	2.9%	2.3%
SP	24.0%	23.0%	27.0%	24.0%	23.0%
SP+1	12.8%	13.5%	13.5%	13.0%	13.8%
SP+2	12.8%	11.5%	11.2%	12.0%	13.3%
SP+3	11.9%	11.7%	11.2%	11.3%	11.7%
SP+t	12.0%	11.5%	11.2%	11.8%	11.6%
Responses	14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

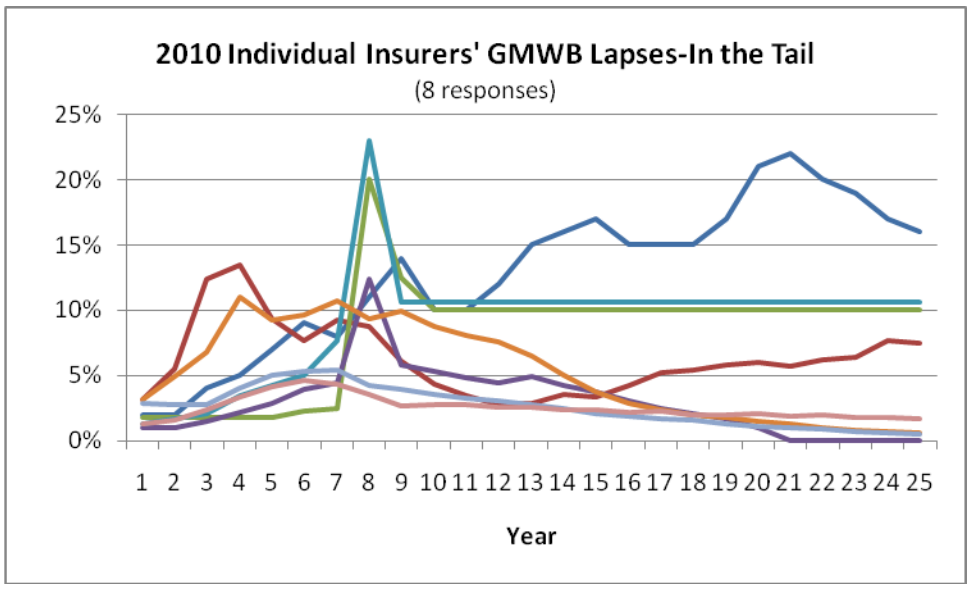
Lapses in the Tail

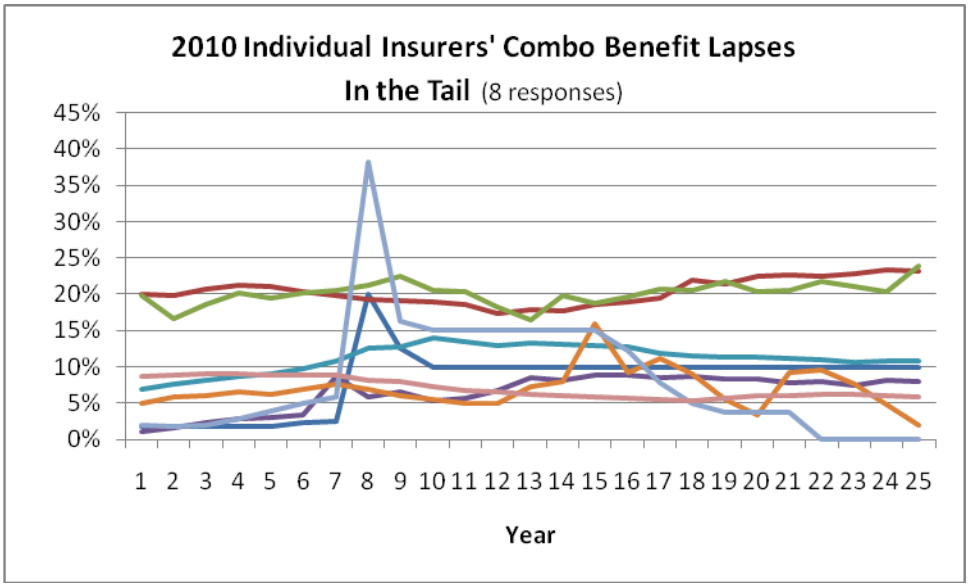
Insurers were asked to list the lapse rate assumption as applied in the tail scenario for Death, Maturity, Income, and Withdrawal benefits. As described on page 2, the tail scenario is defined as the scenario that gives the least positive Additional Asset Requirement. The charts below show tail lapse rates by benefit type for years 1 through 25. It is interesting to observe lapse rate spikes assumed in many cases at the end of the surrender charge period, even though the minimum guarantees are on track to be in the money.


2010 Individual Insurers' DB Lapses - In the Tail
(11 responses)
40%
35%
30%
25%
20%
15%
10%
5%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Year


2010 Individual Insurers' GMAB Lapses-In the Tail
(6 responses)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Year

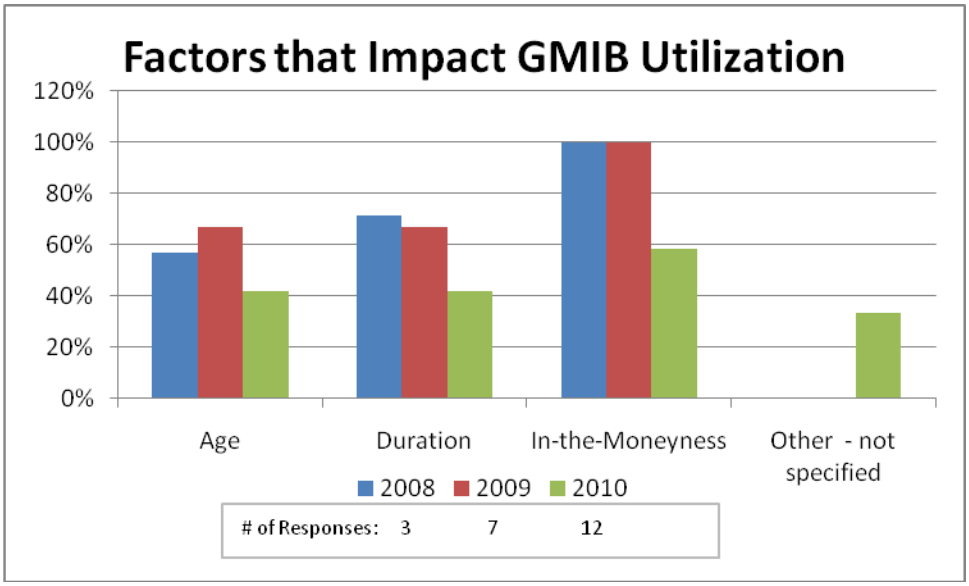

2010 Individual Insurers' GMIB Lapses-In the Tail
(6 responses)
35%
30%
25%
20%
15%
10%
5%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Year


2010 Individual Insurers' GMWB Lapses-In the Tail
(8 responses)
25%
20%
15%
10%
5%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Year



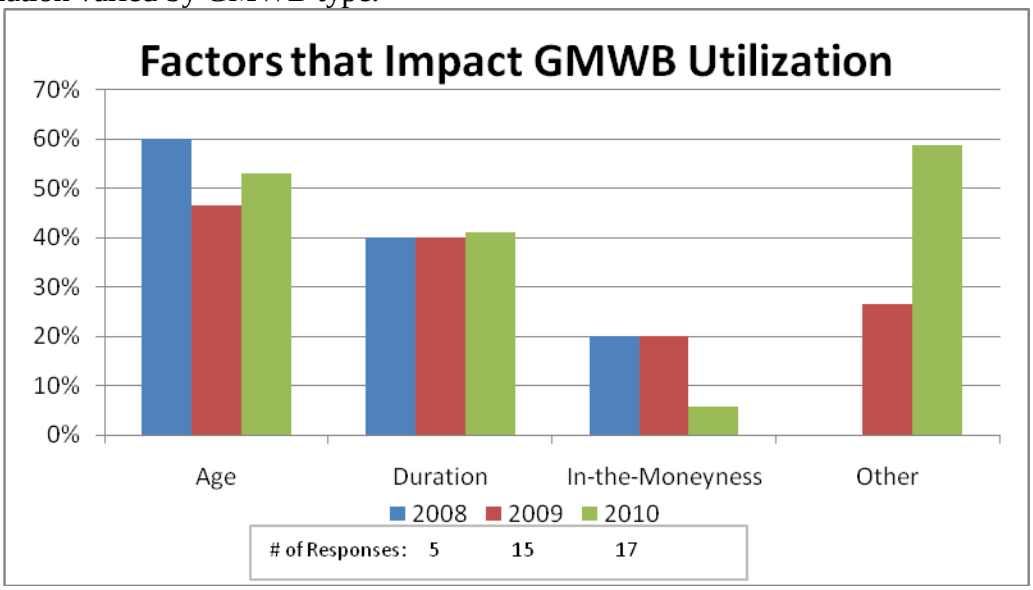
Income and Withdrawal Utilization

Insurers were also asked to describe their Income and Withdrawal utilization assumptions. For the first time, 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. There was a large increase in the number of insurers including factors other than age, duration, or in-the-moneyness as a parameter of the GMIB Utilization function, although it was unclear from their responses what these other parameters may be. Insurers were able to list more than one factor so the percentages will not sum to 100%.



Regarding the GMWB Utilization function, age and duration continue to be commonly used parameters, and did not significantly change in frequency from previous years. However, the popularity of using an ITM-ness parameter dropped considerably. Of the insurers responding "Other", three indicated that GMWB Utilization is impacted by

whether or not the policy was previously taking withdrawals, and two responded that the utilization varied by GMWB type.



Lapses by Distribution and Market

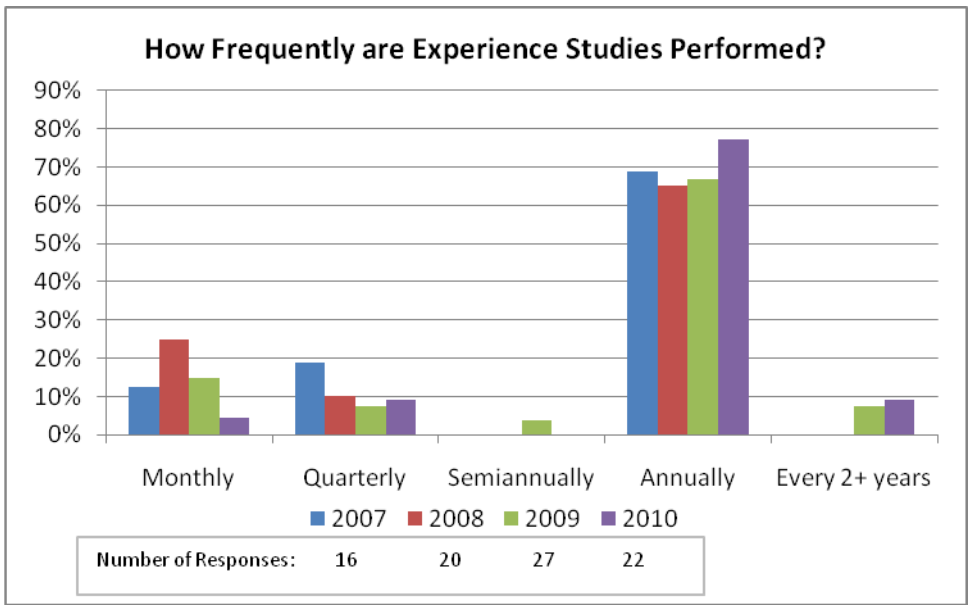
Insurers were asked if their lapses varied by distribution channel. Only 14% (3 out of 21) indicated a difference.

Insurers were also asked if their lapses varied by market. Only 19% (4 out of 21) indicated their lapses vary by market. One insurer described that its differences relate to Employer vs. Individual markets, and another described it as a difference between tax-qualified versus non-qualified sales, with the tax-qualified sales having a higher lapse rate.

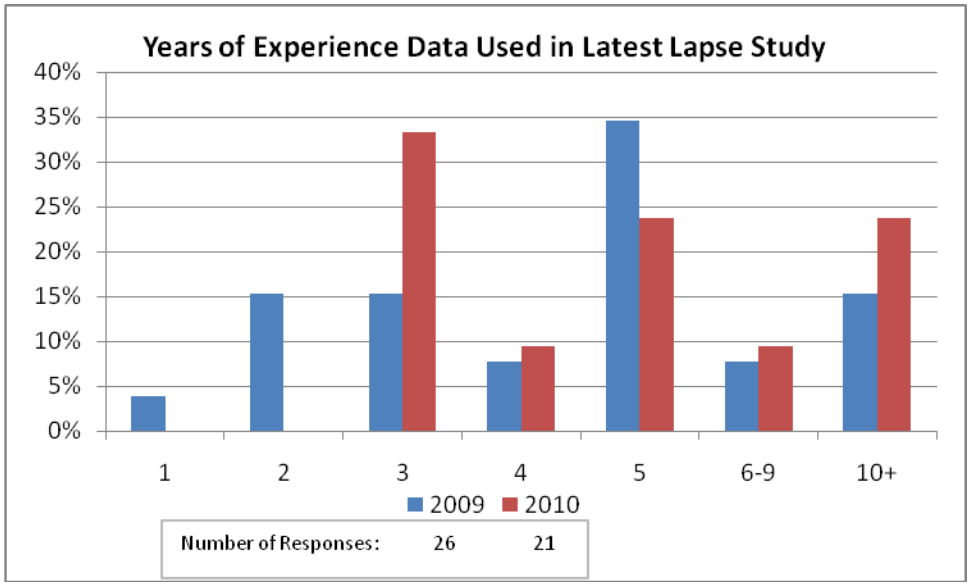
Source of Assumptions

Insurers were asked to provide the source they used for their lapse assumptions, as well as the frequency of lapse studies performed in the company. This question was likely interpreted, in many cases, as a request for the source of the base case assumptions, rather than the source of assumptions for policyholder behavior "in the tail." 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." Whatever our interpretation for the part of the probability distribution being considered, the survey responses show that "company experience studies" continue to be the most popular source of assumptions, and most companies that perform experience studies perform them annually. Note that over the past years very few companies indicated that they used industry experience. It is our hope that with the publication of the forms that assumptions take, we will 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.

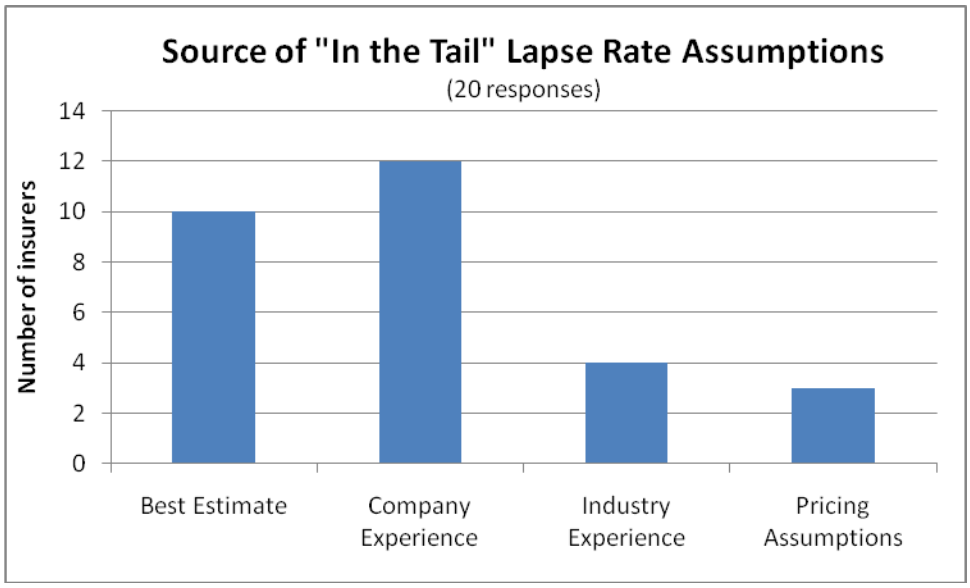


Insurers were asked how many years of experience data were used in their latest lapse study. From 2009 to 2010, it appears that insurers incorporated a larger minimum block of exposure.



Two new questions regarding "in the tail" lapse rate assumptions were 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. A majority of respondents

indicated that company experience was one of the sources for tail lapse assumptions, while half incorporated best estimates, and only 20% relied in part or in full on industry experience.

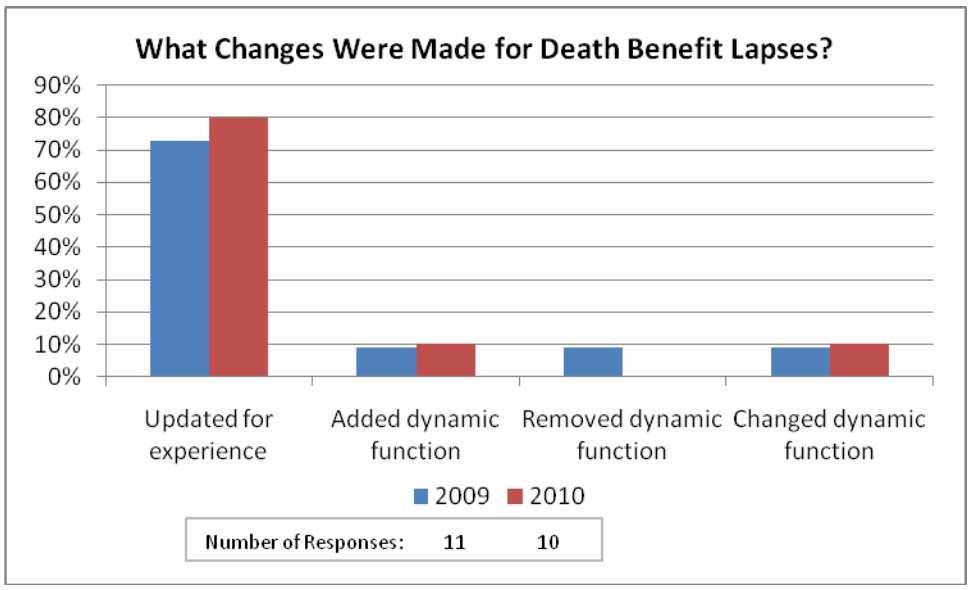


As a follow-up question, insurers were asked, if they were using company experience as a source for "in the tail" lapse rate assumptions, what years were used. Eight of the 12 insurers who included company experience responded, six of them indicating calendar years of experience that were used. All six included the most recent exposure, with the start of the exposure period varying from 1989-2009.

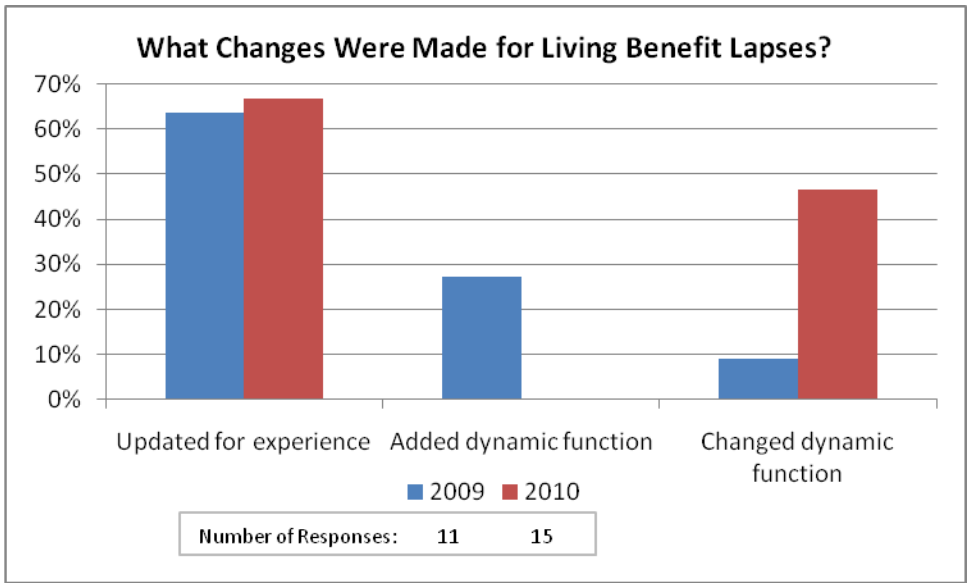
Changes in Assumptions

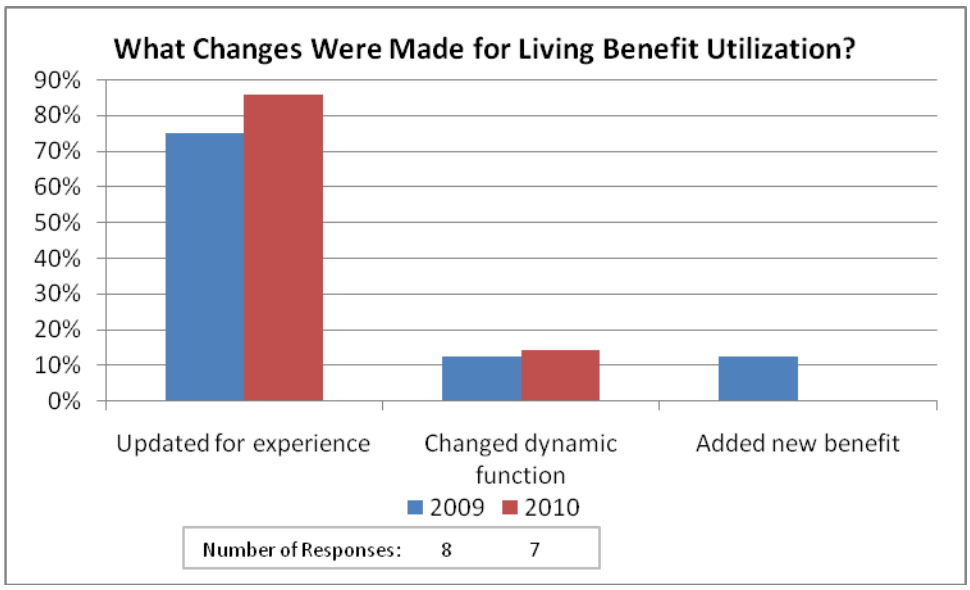
Insurers were asked if any of the assumptions previously discussed in the survey were changed from the previous year's analysis. The percentage of respondents indicating that some assumptions were changed increased from 55% (16 out of 29) in 2009 to 82% (18 out of 22) in 2010.

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 responses.



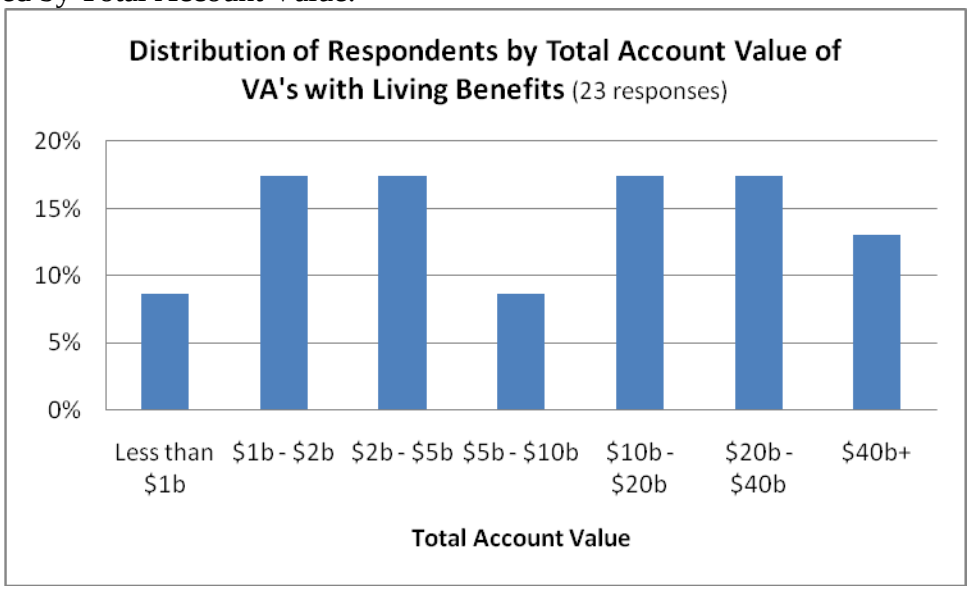
Insurers were far more likely to make changes to their dynamic functions for living benefit lapses in 2010 than they were in 2009, perhaps in reaction to experience in the recent tumultuous economic environment.





Respondents Profile

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



APPENDIX – COMPLETE SURVEY QUESTIONS

Policyholder Behavior in the Tail
Fifth Annual Variable Annuity Guaranteed Benefits Survey

Default Question Block

The Society of Actuaries' Risk Management Task Force is trying to develop better estimates of policyholder behavior in the tail (PBITT). Our mission is to examine and ultimately give guidance to actuaries on how to set policyholder assumptions in extreme scenarios. We are most interested in the assumptions for the scenarios in the 90 CTE calculations if stochastically modeled, or the assumptions for events that occur above two standard deviations of expected experience.

This brief questionnaire, the fifth of its kind, is designed to confidentially gather the range of assumptions actuaries use in pricing, reserving, and risk management of secondary guarantees on Variable Annuity products, such as death benefits, income benefits, withdrawal benefits and accumulation benefits. The definitions of these benefits are as follows:

- Guaranteed Minimum Death Benefit (GMDB)
  guarantees 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
- Guaranteed Minimum Accumulation Benefit (GMAB)
  guarantees a minimum account value at a specified time

If data are not available, please report your best estimate assumptions for behavior in the tail. Please respond even if you are unable to answer all questions. Partial responses are both acceptable and helpful. Kindly disregard any questions that are not relevant to your business.

Assumption based capital adequacy (or RBC) requirements for these benefits were introduced as of 12/31/05, and we hope all companies in this market are comfortable enough with this exercise to participate in this fifth survey. Obviously, a greater number of survey participants will enhance the value and usefulness of the survey results. As an added incentive for participants, the results will be provided to them in advance of their availability on the SOA website.

We greatly appreciate your time and efforts in helping us to attain our goal. It is our hope that the results of this survey will enhance the actuary's ability to set assumptions for these products in extreme scenarios and also enable better peer review.

We respect the proprietary nature of each company's models, and we can assure you the results will be reported anonymously and that your specific results will be held under the strictest confidence.

Please submit responses to the survey by **July 20, 2010.**

If there is any additional information that you would like to add, please feel free to email it to: bscott@soa.org.

Question 1: BACKGROUND Variable Annuity Guaranteed Benefits Information

List the approximate size of your company's current total VA book by line (understanding there may be some contracts with more than one guaranteed benefit). Please enter amounts in millions. For example, 20,000,000 should be entered as 20.

NOTE: Totals are not necessarily the sum for individual benefits

	Yr began writing	Premiums	Account Value	Guaranteed Value
GMDB				
GMIB				
GMWB				
GMAB				
Total				

Question 2: TAIL SCENARIO for Variable Annuity Guaranteed Benefits

Before examining policyholder behavior in the tail, the "tail scenario" needs to be defined. Information on your particular tail scenario will provide a frame of reference for each set of results.

2a. Do you currently use stochastic modeling to set capital levels? (e.g. for the RBC C-3 phase 2 calculation)

- ○ Yes
- ○ No

2b. If so, how many scenarios do you typically model?

2c. How many years in the future do you typically project?

2d. If you are performing stochastic modeling for required capital/RBC calculation purposes, please list the scenario with the first negative result of your modified 90 CTE calculation (that is, the least negative result of all scenarios with a negative present value in these calculations). If you are not currently using stochastic modeling, please list the tail scenario. Please provide your scenario in the format of annual non-cumulative returns. The interest rate should be based on the 5-year Treasury Rate.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Equity										
Bond										
Int Rates										

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Equity										
Bond										
Int Rates										

	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Equity										
Bond										
Int Rates										

	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Equity										
Bond										
Int Rates										

Question 3: DYNAMIC ASSUMPTIONS for Variable Annuity Guaranteed Benefits

3a. Does your dynamic lapse function vary by benefit combination or do you have separate dynamic formulas for each individual guaranteed benefit?

- ○ Formula for each individual benefit
- ○ Vary by combination of benefits. Please describe the basis of the combinations of benefits used.

Please answer the remaining Dynamic Assumption questions (3b - 3i), if possible. If the set up of your combinations do not fit the format of the following questions, please provide the additional information requested to Barbara Scott at bscott@soa.org.

3b. Considering death benefits alone, does your lapse assumption vary dynamically?

- ○ Yes
- ○ No

3c. If so, please describe the dynamic lapse functions you are using for death benefits:

3d. Does your lapse assumption vary dynamically for living benefits?

- Yes
- No

3e. Please describe the dynamic lapse functions you are using for living benefits:

3f. For Income Benefits, does your utilization assumption vary dynamically?

- Yes
- No

3g. If so, please describe the dynamic utilization function that you are using:

3h. For Withdrawal Benefits, does your withdrawal assumption vary dynamically?

- Yes
- No

3i. If so, please describe the dynamic withdrawal function you are using:

Question 4: BASE LAPSE RATES for Variable Annuity Guaranteed Benefits

Please enter base (non-dynamic) lapse rates assumed:

	Death Benefits	Accumulation/Maturity Benefits	Income Benefits	Withdrawal Benefits	Combination of Benefits*
Year 1					
Year 2					
Year 3					
End of Surr Period					
SP+1					
SP+2					
SP+3					
SP+t (ultimate)					

*For Question 4, please describe the combination of benefits:

Question 5: LAPSE RATES IN THE TAIL for Variable Annuity Guaranteed Benefits

Please enter the lapse rates assumed in the tail scenario listed in Question 2:

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Death Benefits										
Accumulation/ Maturity Benefits										
Income Benefits										
Withdrawal Benefits										
Combination of Benefits*										

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Death Benefits										
Accumulation/ Maturity Benefits										

Income Benefits										
Withdrawal Benefits										
Combination of Benefits*										

	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Death Benefits										
Accumulation/ Maturity Benefits										
Income Benefits										
Withdrawal Benefits										
Combination of Benefits*										

	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Death Benefits										
Accumulation/ Maturity Benefits										
Income Benefits										
Withdrawal Benefits										
Combination of Benefits*										

*For Question 5, please describe the combination of benefits:

Question 6: GMIB ANNUITIZATION UTILIZATION RATES IN THE TAIL

For Income Benefits, please enter the utilization rate or range of rates assumed in the tail scenario in Question 2. If rates vary by age, duration, or any other factor, please specify:

- [ ] Age
- [ ] Duration

☐ Other *(please specify:)*

	Factor	Utilization
Factor 1		
Factor 2		
Factor 3		
Factor 4		
Factor 5		

NOTE: If this does not accommodate your assumptions, please e-mail a table or other information specifying the rates to bscott@soa.org.

Question 7: GMWB WITHDRAWAL RATES IN THE TAIL

For Withdrawal benefits, please enter the % using full withdrawal rates assumed in the tail scenario in Question 2. If rates vary by age, duration, or any other factor, please specify:

☐ Age

☐ Duration

☐ Other *(please specify:)*

	Factor	Utilization
Factor 1		
Factor 2		
Factor 3		
Factor 4		
Factor 5		

NOTE: If this does not accommodate your assumptions, please e-mail a table or other information specifying the rates to bscott@soa.org.

Question 8: LAPSE RATES BY DISTRIBUTION SYSTEM for VA Guaranteed Benefits

8a. Do your lapse assumptions differ by Distribution System?

- Yes
- No

8b. If so, please describe the Distribution Systems and differences in lapse assumptions.

Question 9: LAPSE RATES BY MARKET for VA Guaranteed Benefits

9a. Do your lapse assumptions differ by Market?

- Yes
- No

9b. If so, please describe the Markets and differences in lapse assumptions.

Question 10: SOURCES of Variable Annuity Lapse Rate Assumptions

10a. What is the source of your expected lapse rate assumptions (e.g. company study, best estimate)?

10b. If your company performs expected lapse experience studies, how often are they done?

10c. If applicable, how many calendar years of experience data were used in your latest study?

10d. What is the source of your "in the tail" lapse rate assumptions (e.g. company study, best estimate, or other)?

10e. If your "in the tail" assumptions are based on an actual company study, what years were used?

Question 11: CHANGES in ASSUMPTIONS from Previous Year

11a. Were any of the previously described assumptions changed from the Year-End 2008 capital calculation?

- Yes
- No

11b. If so, please describe the change.

Death Benefit Lapses

Living Benefit Lapses

Living Benefit Utilization

Question 12: COMMENTS

Please add any additional explanatory comments or clarifications:

Question 13:
Please provide us with a primary and secondary contact in case we need to follow-up with you on your submission.

	Name	Telephone	Email
Primary			
Secondary			

Please contact bscott@soa.orgÂ if you have any questions regarding this survey.