Article from:

Product Matters!

October 2010 – Issue 78

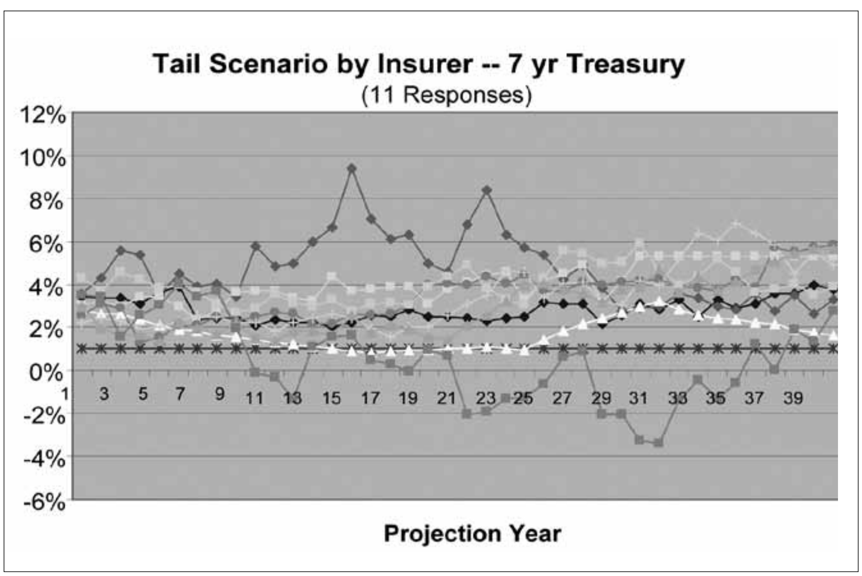
2009 Policyholder Behavior in the Tail Study Results for **Universal Life Products with Secondary Guarantees**

By Jim Reiskytl

Jim Reiskytl, FSA, MAAA, is a retired actuary from Northwestern Mutual Life Insurance company and regular SOA volunteer. He can be contacted at jimreiskytl@wi.rr.com

The Society of Actuaries' Policyholder Behavior in the Tail (PBITT) working group conducts surveys to gain insight into companies' assumptions as to policyholder behavior under extreme conditions. Specifically, extreme conditions are defined to be the scenarios in the 90 CTE calculations if stochastically modeled, or the assumptions for events that occur outside two standard deviations of expected experience. Since current RBC and principle-based reserves in some cases place increasing reliance on actuarial judgment, we hope that these surveys will help guide those efforts and provide useful background information. The goal is to examine and ultimately, through annual studies, provide a resource to actuaries for guidance on how to set policyholder assumptions in extreme scenarios and information for the reviewing actuary and/or regulators. It is important to note that all individual company responses to our surveys are kept confidential.

Stephen Hodges, a member of the Working Group, and Brian Grinnell recently completed an analysis and summary report of the 2009 survey data on the range of assumptions actuaries use in pricing, reserving, and risk management of Universal Life (UL) secondary guarantees. Twenty-three companies responded to our survey, although not every company answered every question.



Selected highlights of the 2009 UL secondary guarantee study include:

1. Investment return is the assumption that most respondents considered to be a critical risk; 15 respondents indicated that they felt this assumption was critical for analyzing experience in the tail. Slightly less than half of respondents considered the mortality and/or lapse assumptions to be critical. Respondents were allowed to select more than one.
2. Fewer than 50 percent of respondents use stochastic modeling to set or analyze capital levels for UL with secondary guarantees.
3. Respondents using stochastic modeling to set their capital levels reported using more scenarios than in the previous survey's results; the most common response was 1000 scenarios compared to 200 scenarios in 2008.
4. Interest assumptions used vary widely among respondents for the one-year, seven-year, and 30-year periods. For example, the graph below shows the seven-year results.
5. As shown, assumptions vary widely amongst insurers. In general, rates remain low in the near future durations and rise after duration 20. Additionally, the yield curve tends to flatten over time, with the differences between one-year and 30-year treasuries narrowing.
6. In the tail scenarios, lapse rates also vary widely amongst insurers. In general they decrease with increasing issue age or policy duration. Lapse rates also decrease as the account value approaches zero.
7. Half of respondents model future mortality improvement. Improvements typically vary by gender and are only applied until attained age 85-90.

Hopefully this sample of the highlights will encourage you to read the full report found at www.soa.org/research/risk-management/research-2009-behavior.aspx. The actual survey questions are also included in the report.

We welcome any questions or suggestions for improvements. Please e-mail them to Steve Siegel, SOA Research Actuary, at ssiegel@soa.org or Jim Reiskytl, PBITT Working Group Chair, at jimreiskytl@wi.rr.com.

Pricing and Hedging Considerations **for Guaranteed Withdrawal Benefit Included In a Fixed Indexed Annuity**

By Daniel R. Patterson

In the last several years the Fixed Indexed Annuity (FIA) product has continued to innovate in its design and offering. One of the latest and successful benefit additions (measured by products sold) has been the Guaranteed Withdrawal Benefit (GWB) rider.

It is not the intent of this article to illustrate a full pricing exercise of the GWB rider in a FIA chassis, but to highlight several key items the pricing actuary should consider when including a GWB rider as a part of their company's product offering.

Guaranteed Withdrawal Benefit

For discussion in this article, the author considers a fairly plain vanilla GWB rider:

1. A bonus equal to 10 percent of premium applied to a Guaranteed Withdrawal Account (GWA),
2. A "rollup rate" equal to 6.20 percent compounded with a cap on the GWA equal to two times premium,
3. One-year waiting period,
4. Single Life Withdrawal Rates based on attained age at income election equal to the following:

   a. attained age [0 – 60]: 0 percent
   b. attained age [61 – 65]: 5.0 percent
   c. attained age [66 – 70]: 5.5 percent
   d. attained age [71 – 75]: 6.0 percent
   e. attained age [76 – 80]: 6.5 percent
   f. attained age [81 +]: 7.0 percent,

5. Annual Rider Charge = 0.5 percent deducted from the account value 1/12 per month, and
6. At election of the GWB, it is assumed the rollup ceases and the GWA remains constant subject to "excess withdrawals" that would require a proportional reduction to eliminate any dollar-for-dollar pricing problems (the article assumes all withdrawals will equal the guaranteed amount).

Modeling Considerations

1. Utilization of the withdrawal benefit

An obvious first consideration when pricing the GWB rider is the assumed election of the GWB. While the rider is relatively new in the FIA product space and experience is limited to a few years, the author feels a reasonable election assumption for pricing (Issue Age 68) could be the following:

Income election assumption: Issue Age 68

Policy Year	Attained age	Benefit utilization
2 (first year available)	69	12%
3	70	10%
4	71	20%
5	72	15%
6	73	10%
7	74	8%
8	75	6%
9	76	15%
10	77	10%
11	78	8%
12	79	6%
13	80	6%
14	81	100%

I base my assumptions on the following key reasons:

a. **Experience:** Actual observed utilization rates have exceeded 10 percent in the first year the benefit is available.
b. **Marketing:** GWB riders have become a key benefit in the selling broker's sales story. The author feels this is a nontrivial benefit that the consumer will not forget.
c. **Pattern of attained age withdrawal rates:** Most designs have increases in payment rate (from 4 percent to 5 percent) as the contract holder reaches a new attained age grouping. These increases (25 percent going from 4- to 5-percent) in the guaranteed benefit will likely create discrete jumps in the election rates of the benefit as a contract owner ages into a new payment rate.
d. **100 percent election:** I assume 100 percent of the in-force not having elected income will elect after the rollup ceases, and there being no more increases in payment. This obviously is somewhat conservative, but the author feels it is a reasonable assumption.

CONTINUED ON **PAGE 30**

Daniel R. Patterson, principal of Creative Actuarial Concepts, an actuarial consulting firm has over 12 years experience pricing, modeling and hedging fixed indexed annuities. He can be reached at daniel.patterson@creative-actuarialconcepts.com

e. **Sensitivity testing:** Lastly, due to the relatively recent introduction of these benefits, the pricing actuary should include a thorough sensitivity testing of the assumption.

2. Dynamic liability modeling

An important second consideration when pricing the GWB rider relates to the dynamic nature of the assumptions and resulting projected financials depending on the policy year that the withdrawal benefit is elected. It would not be surprising to see actuarial pricing models that price the GWB benefit as some form of highly utilized free withdrawal benefit. There are obvious shortcomings to this approach.

The pricing actuary would benefit by having:

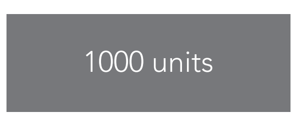
a. a pricing model that models withdrawal benefit elections as "new and unique" modeling cells,

b. policy behavior assumptions that vary depending on the policy year of benefit election, and

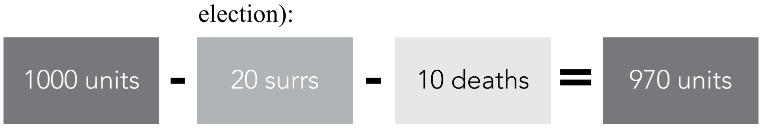
c. a pricing and modeling platform that dynamically adjusts the "hedging amounts" depending on the stochastic index path and the resulting "GWB reserve floor" that the stochastic path creates.

I illustrate bullets a) and b), considering the above GWB benefit for an issue age 68 with an expectation that 12 percent of the issued policies in force at the end of the first elect income for life. I will address bullet c) in its own section later in the article.

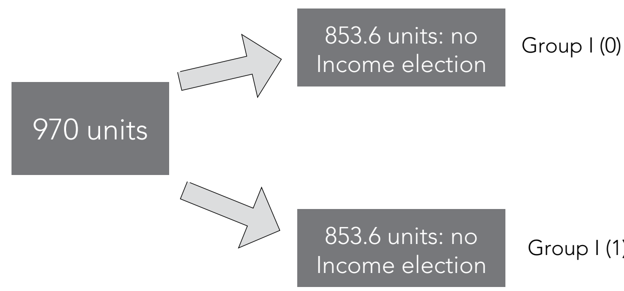
We begin by assuming we issue 1000 units sold with inclusion of the GWB rider:



Based on policy behavior assumptions in the first year, we may expect the following in-force experience at the end of the first policy year (immediately prior to GWB election):



Assuming use of a robust pricing model, the 970 units in force at the end of the first year should "segregate" into two separate and unique modeling groups:



At this point, your model should have two distinct groups; Group I(0), those not electing income, and Group I(1), those electing income at the end of the first year. As the pricing model the author utilizes projects into the future, it continues creating new groups as additional units elect income in each of the subsequent policy years.

Questions naturally arise as to the pricing assumptions (policy behavior) of each group. It is likely that actual behavior experience for Group I(0) will evolve significantly different than the experience evolves for Group I(1). To illustrate my point, let us consider a view of expected lapses and patterns of death along with example assumptions to model the expected policy behavior. While there are clearly additional assumptions (free partial withdrawals, etc.) that require reexamination, in the interest of brevity I limit myself to lapses and death, assuming the logical development applies to assumptions not mentioned.

a) Expected Lapses

To make my point, consider an FIA chassis having a 10-year surrender charge. Let us move forward in time to the end of policy year 10. A typical vanilla FIA chassis would have the normal "shock" lapse assumption occuring in policy year 11 when the contract's surrender charge becomes zero.

Consider a comparison of Group I(0) (those at the end of the 10th year that have yet to elect income) and Group I(1) (those electing income at the end of the first policy year). In policy year 11, we should expect Group I(0) to have a much different lapse assumption than Group I(1). Annuity brokers offering a new product to individuals having a policy where the surrender charge becomes zero contribute significantly to the "shock" lapse at the end of an annuity's surrender period. Group I(1), having elected income for nine years, will likely not lapse their contract realizing the value of the remaining guaranteed payments. In addition, suitability rules will likely be in place that will make it almost impossible for a selling broker to exchange the in-force contract for a newly issued one.

One representation of the lapse assumption dependent on policy year of income election may be the following:

Policy Year	Group I (0)	Group 1 (0)
1	3.00%	
2	5.00%	2.00%
3	5.00%	2.00%
4	5.00%	2.00%
5	5.00%	2.00%
6	5.00%	2.00%
7	5.00%	2.00%
8	5.00%	2.00%
9	6.00%	2.00%
10	7.00%	0.00%
11	40.00%	0.00%
12	20.00%	0.00%
13	10.00%	0.00%
14	7.00%	0.00%
15	7.00%	0.00%

The above table highlights three points of interest:

i. **Lapse rates while the surrender charge is positive:** Traditional annuity lapse assumptions assume some positive lapse rate while a contract's surrender charge is positive. Inclusion of a GWB should result in a different assumption set for Group I(1). Individuals in Group I(1) made an important election. Because of this election, the author feels this group will be less likely to exit their contract. It is feasible that there will still be reasons that Group I(1) will, for reasons only they understand want to exit the contract. Prudent pricing would imply a lowering of the assumption when comparing to the group not yet electing income.

ii. **Shock lapse rates when surrender charge becomes zero**: The author feels given suitabilty issues and the economics of the AV compared to the GWB that there should be no shock lapse for Group I(1) at time surrender charge equals zero.

iii. **Ultimate lapse rates equal to zero:** Lastly one may want to consider grading lapse rates that ultimately equal zero after a period of time. Certainly when the account value is exhausted there is no incentive for a person to surrender their contract. While the values assumed are flat at 2 percent for eight years, various assumptions would seem reasonable including assumptions that vary the lapse rate as a function of the PV of annuity payments to the account value (account value less than PV annuity payments implies "out of moneyness").

The above logic applied to Group I(1) should be developed for all Group I(j) where j is the end of the policy year of income election.

b) Pattern of deaths

In addition to the obvious lapse rate behavior, a more subtle, but as important, assumption concerns the dynamics of future mortality and election of the income benefit.

Generally annuity pricing models assume some improved mortality when compared against population mortality. To model an additional mortality component we may want to consider the following modeling method:

i. The "population" buying annuities does not really change with the introduction of the GWB benefit (I realize this statement may be debatable itself, but to illustrate let's assume it to be true), therefore the aggregate mortality assumption of an issue age 68 cohort does not change.

CONTINUED ON PAGE 32

ii. Policyholders who elect the income benefit will have an assumed lower mortality than the remaining group. Group I(1) mortality (age 69) = ***mortality ratio*** x aggregrate mortality (age 69), leaving Group I(0) mortality to "solve for" aggregate mortality.
iii. The favorable ***mortality ratio*** wears off after a number of years so that Group I(1) "n" years from election will have no noticable mortality difference than GroupI(0) "n" years from now.

Depending on one's view, this assumption can significantly impact profitability. At a minimum, sensitivity around the "allocation" of mortality to the election groups should be considered to understand the financial implications of the "healthy" lives electing the GWB while the remaining lives elect to surrender or death results in payment of the account value at death.

Hedging Considerations

The last item this article considers (but by no means exhausts GWB pricing issues) is hedging. In a traditional plain vanilla annual reset FIA, a hedge strategy is typically defined as an "at the money" option with some hedge ratio (less than one) multiplied by account value in force. Inclusion of the GWB benefit with reasonably high utilization introduces additional complexity to the underlying hedge. To illustrate this complexity, let's consider our issue age 68 cohort assuming the following amounts in force at the end of policy year three.

In force end of policy year three with positive index gains = 4.158 percent in each policy year

Income election year	Premium issued	Index credits since issue	Account Value	GWA	AV reserve	GWA reserve(1)
Not elected	10,000,000	13%	11,300,000	13,175,474	10,470,523	9,889,322
2	1,500,000	13%	1,490,058	1,752,300	1,380,680	1,235,494
3	1,000,000	13%	1,130,000	1,240,628	981,198	875,645

(1) the GWA reserve equals the present value of expected life contingent guaranteed payments using the SPDA valuation rate while the account value is positive and the SPIA valuation rate after the account value is zero plus the present value of expected death benefits (return of positive account value) at the SPDA valuation rate less the present value of GWB charges discounted at the SPDA rate.

Consider a company that is running their typical vanilla FIA hedge where the "at the money" hedge with notional equal to AV multiplied by the Hedge Ratio immunizes increases in STAT profit caused by positive index increases. Under the above scenario, the "normal" FIA hedging will provide satisfactory results.

Now let's consider an alternative scenario. Assume now the same policy experience but consider a reasonable scenario where in each of the three policy years the index provided 0 percent return.

In force end of policy year three with positive index gains = 0.0 percent in each policy year

Income election year	Premium issued	Index credits since issue	Account Value	GWA	AV reserve	GWA reserve(1)
Not elected	10,000,000	0%	10,000,000	13,175,474	9,265,949	9,586,305
2	1,500,000	0%	1,307,247	1,752,300	1,211,288	1,188,701
3	1,000,000	0%	1,130,000	1,240,628	863,369	843,027

Under this reasonable scenario at the end of year three, the GWA reserve is the greater reserve. At this point hedging under the traditional methods will result in less than satisfactory hedge results. The reason being that inclusion of a GWB creates a "path dependent" floor requiring path dependent hedging resulting in significantly different hedge positions.

The GWB "floor" reserve is akin to the minimum SNFL cash value required on a contract. Most FIA designs make use of the "87.5 percent @ SNFL rate less the FIA haircut" resulting in the SNFL floor being "in the money" (index returns 0 percent for 10 years or more) in a small number of random scenarios. From my experience, most pricing actuaries ignore the SNFL floor, as pricing scenarios where the SNFL floor impacts profitability rarely occur. The same should not be said of the GWB floor.

The likelihood of the GWB floor being "in the money" is much higher and therefore requires attention when pricing a product. Pricing an FIA contract under a single path assuming an "at the money" hedge with notional equal to AV times the Hedge Ratio will result in unintended financial surprises under reasonable index crediting deviations.

A pricing and modeling platform that identifies and models this path dependent hedge process is important. In addition, as contracts issued reach policy anniversary it is important to have a hedge "tracking" tool that identifies the next appropriate hedge for an in-force block.

Conclusion

The above article attempts to illustrate several key pricing issues related to including GWB benefits in FIA contracts. The pricing actuary needs to be comfortable that the modeling platform captures the new dynamics introduced with the GWB. In particular, modeling capabilities that allow robust policy behavior dependent on the election year are critical. Lastly, the author highlights the GWA reserve floor that requires full attention from the pricing and in force hedging actuaries. ◻