

Combo Product Assumption Setting and Modeling Implications – Deep Dive

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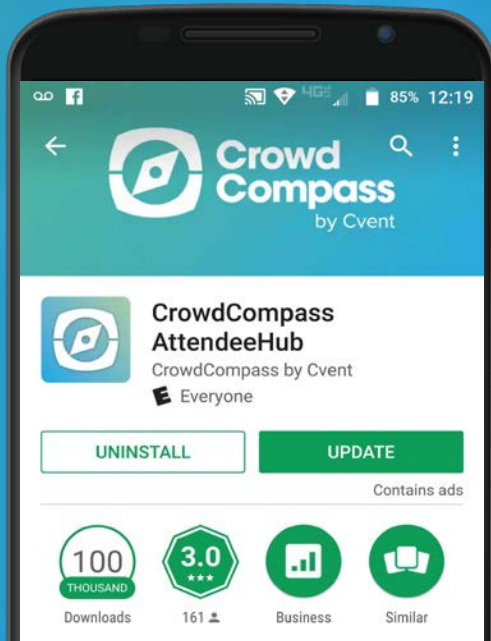
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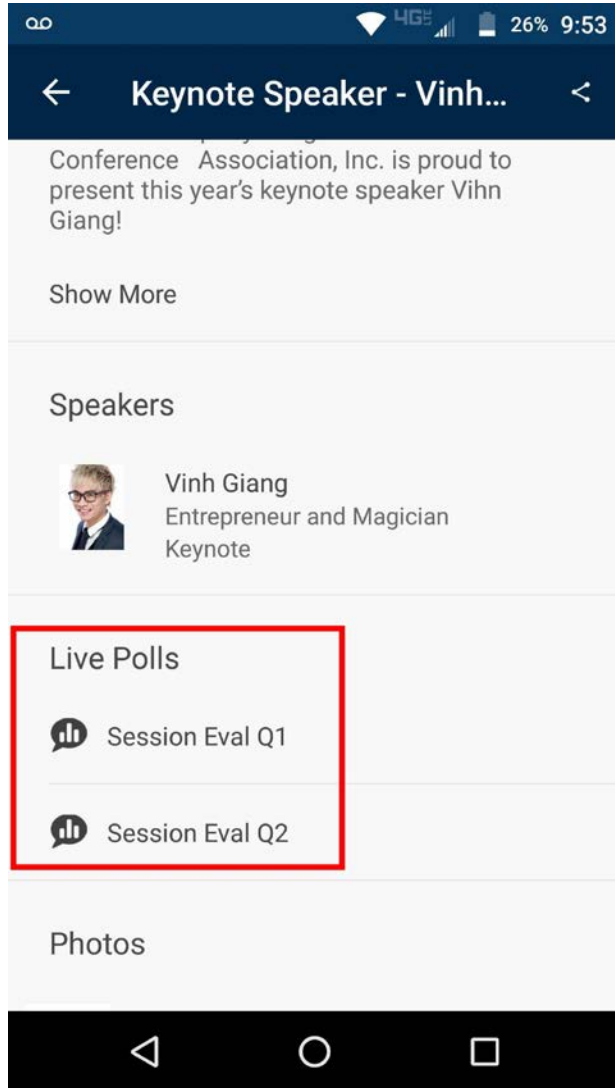
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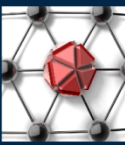
Combo Product Assumption Setting and Modeling Implications – Deep Dive

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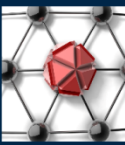
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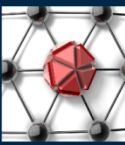
- Incidence Rates
 - By risk class
 - LTC classifications tend to be single/married, perhaps preferred/standard
 - Life classifications tend to be preferred/standard, non-smoker/smoker
 - Correlations?
 - Benefit richness factors
 - Combo experience vs. stand-alone LTC
 - Reduced incidence rates for combos, likely related to desire of policyholders to preserve other plan benefits and in some cases because clients are less focused on the LTC coverage



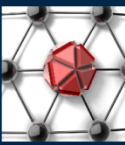
- Claim termination rates
 - Rates vary between unlimited lifetime benefits and other
 - By situs of care
 - Transition probabilities
 - New business vs. inforce projections
 - Combo vs. standalone LTCi
 - Shorter claims are less likely to be reported on combos, implying the average length of stay is higher for combos



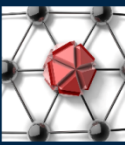
- Disabled life mortality
 - Conservation of mortality: disconnects can occur if aggregate mortality is low (super-preferred life, or annuity e.g.) and LTC incidence rates are high
 - Active life mortality
 - Implied recovery rates
- Mortality of recovered lives



- Lapses
 - Riders (level charges) generally lapse supported: implications for mortality
 - Variations exist based on level of LTC benefits provided
 - Different level of lapses exist depending on base plan chassis, especially when the product is not primarily an LTC sale
 - Impact and risks relative to ROP provisions



- Expenses
 - Incremental costs of underwriting an LTCi rider may be low or for certain riders zero
 - Claims adjudication costs will be incurred, but in theory for ADB riders the level of expense warranted is lower than for standalone LTCi
 - Will third party vendors adapt to this view?



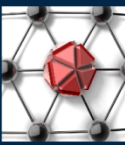
- Net investment income
 - Duration of assets
 - Low lapses expected
 - ROP features have been diluted on much new business across the industry
 - Duration shortened by LTC claims



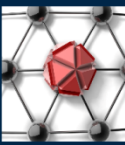
- Variations in morbidity assumptions by combo type
 - ADB only on life
 - Base plan underwriting of value
 - May or may not be additional underwriting for rider
 - Anti-selection felt to be minimal generally
 - Combo adjustment factors fully in play
 - Hybrid life with ADB and EOB
 - May be simplified underwriting, but much of this business is single premium sales with low anti-selection
 - Haven't seen meaningful differences in combo experience from ADB only plans



- Variations in morbidity assumptions by combo type
 - Chronic illness life
 - Base plan underwriting of value
 - Usually no additional underwriting for rider, especially if discounted death benefit approach is used
 - Anti-selection felt to be minimal generally
 - Combo adjustment factors in play, but since there can be no restriction on use of proceeds, disability model loadings are needed
 - Annuity combos featuring tax qualified LTC benefits that are a multiple of AV
 - Simplified or no underwriting
 - Haven't used life combo adjustment factors generally, given the fact that the only way to get gains out of the contract is via LTC benefit payouts, thus creating tax incentives to go on claim and collect AV



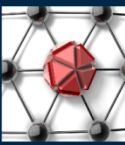
- Variations in morbidity assumptions by combo type
 - Annuity doublers and other variations featuring non-tax qualified LTC benefits
 - No underwriting
 - Typically use disability model
 - Benefits, depending on design, may be modest, and are rarely a key marketing feature for the plan
 - Some combo adjustment factors appear to be warranted, as tax benefits don't exist, coupled with low benefits



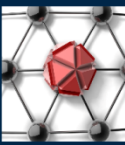
- Mortality
 - Largely driven by expectations of base plan and underwriting used
 - Single premium business has low anti-selection



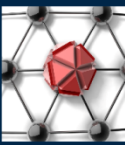
- 2017 Milliman study on Combo experience
 - Mortality
 - Lapses
 - LTC incidence rates



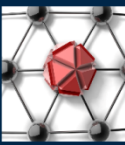
- Capital requirements
 - NAIC values not defined definitively, especially for ADB riders
 - LTCi riders factors logically fit with LTCi requirements
 - How to deal with plans with no rider premiums but rider COI charges against AV (most would treat charge as premium)



- Reserve requirements
 - Integrated calculation or independent
 - By product type
 - How will hybrid plans be impacted by PBR?
 - If underlying life product is ULSG, it will be subject to PBR
 - PBR for LTC?



- AAA Working Group
 - Review of reserving practices on combo products
 - Experiences of working group members are being documented
 - AAA survey of companies writing such plans
- Survey findings
- Practice Note will be ultimate work product



Thank you

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Combo Product Assumption Setting and Modeling Implications – Deep Dive

Practical Assumption Setting Considerations

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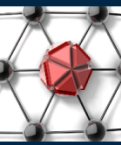




- To Create Consistency
- To Recognize Modeling Approximations and Simplifications
- To Prepare For Known Sensitivities or Questions
- To Reflect Lack of Credibility / Estimation Error
- To Include Appropriate Provisions for Adverse Deviation (PADs) and Margins for the Intended Use



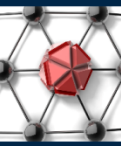
- Prescribed Assumptions
- Best Estimate
- Prudent Estimate
- Moderate Adverse Deviation
- Provisions for Adverse Deviation (PAD or PfAD)
- Margin



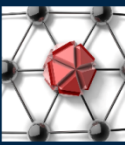
- Pricing
- Valuation
 - GAAP
 - Statutory
 - Tax
- Risk and Sensitivity Analysis
- In-Force Management
- Regulatory Reporting



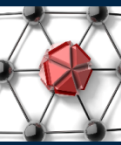
- Lapse
- Mortality
- Partial Surrenders & Loans
- Claim Incidence
- Claim Termination
- Utilization/Salvage
- Situs and Transition



- Less Lapses means More Exposure to Future Claims
- What about Return of Premium Benefits?
- Less Lapses Increases Total Costs, But May Distort Among Benefits



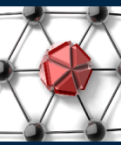
- Objective of PAD is to Increase the Cost
 - Increase Mortality as a PAD (Life Insurance) To Increase DB costs
 - Decrease Mortality as a PAD (LTC Insurance) To Increase Exposure to Incidence and thus LTC Claims costs
 - What Do I Do For a Combo Product where I face both costs?
- Valuation Challenges – Prescribed Tables
- Also, Which Mortality Do We PAD?
- PADing Mortality May Distort Among Benefits
- Mortality Improvement... more to come



- More Incidence means more Claim Cost
- Except It Doesn't Always
- Higher Incidence Distorts Mortality in Complex Ways



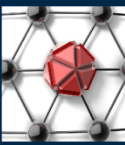
- Either or both could include future Improvement
- Possible source of PAD is to omit or reduce
- Mortality and Incidence Improvement have complex interaction
- Disabled Mortality Improvement should also be considered



- Less Disabled Mortality Means Longer Claims, More Claim Costs
- But Not Quite That Simple
- Disabled Mortality Improvement



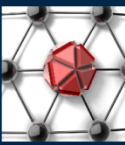
- Less Recovery Means Longer Claims, More Claim Costs
- Except...
 - Interacts with Mortality
 - Possible Administrative Issues



- Can You Go Wrong By Assuming People Will Use More Benefits?
- Assuming Full Utilization Distorts LTC and Death Costs
- Very Interactive With Incidence PAD
- Utilization Assumption likely varies by Policy Size and Inflation Option



- What About Sensitivity Runs?
- What About Stochastic Scenarios?



- No Magic Bullet
- Prudent Practices
 - Test Various Options
 - Review Thoroughly to Avoid Unintended Offsetting PADs or anti-PADs
 - Understand Your Sensitivities and Correlations
 - Cohort Analysis Tools
 - Peer Review Is Crucial
 - External Review May Be Warranted
 - Never Believe It's Done

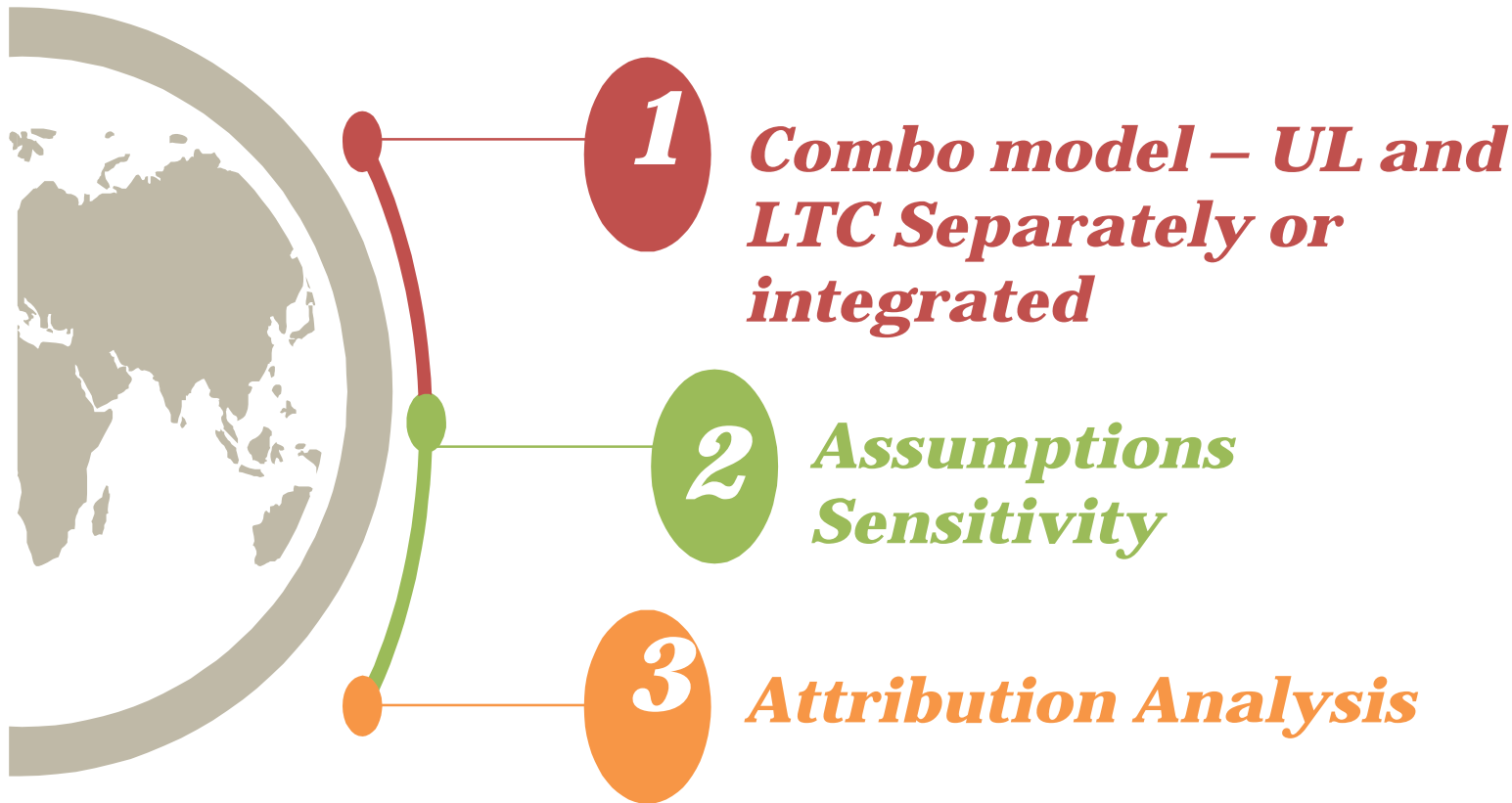
Combo Products & Actuarial Modeling

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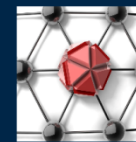
Actuarial Modeling



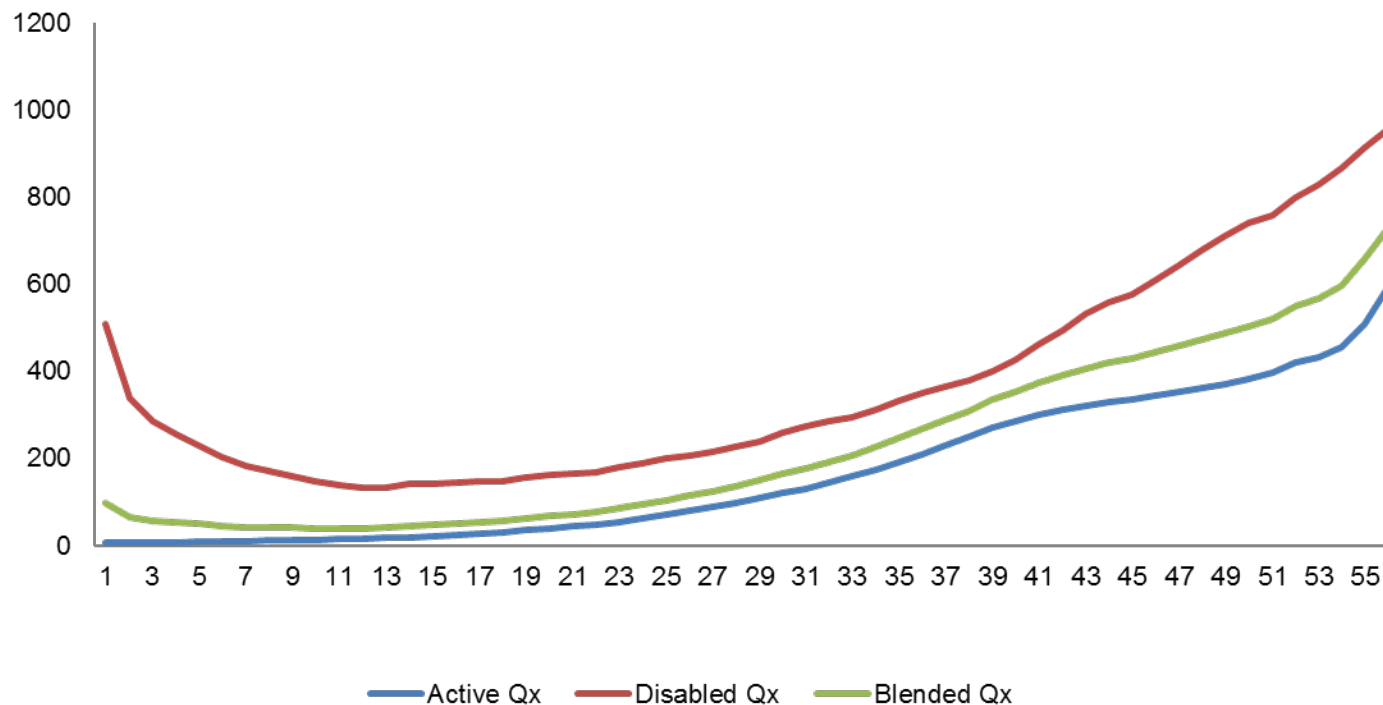


- ***How different are the results if combo products are modelled on an integrated vs standalone basis?***
- ***Can good sensitivity scenarios account for the difference in products?***
- ***Additional considerations on interdependencies of product features when testing sensitivities***

Mortality Tables of LTC Products

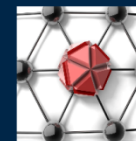


- Mortality between Active lives, disabled lives and the equivalent combined



The total mortality is weighted by the number of policies. The disabled lives population is usually much smaller than the active lives.

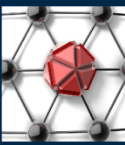
Gross Value Reserve Impact



Base Scenario				
	Integrated	UL	LTC	UL+LTC
PV Premium	3,382	1,351	2,013	3,363
PV LTC benefits	(3,072)	-	(5,425)	(5,425)
PV Death Benefits	(6,944)	(3,837)	-	(3,837)
PV Surrender	(1,457)	(4,061)	-	(4,061)
PV Other Outgos	(992)	(152)	(1,040)	(1,192)
GPV Reserves	9,298	6,822	4,757	11,579
Margin/Base GPV				
Integrated/Sum	80.3%			

- For the same assumptions, reserves of an integrated combo model are about 80% of the sum of 2-standalone UL and LTC models.
- Integrated model shows lower LTC benefits than the standalone LTC due to lapse assumptions for the LTC feature is less than the integrated model.
- Standalone LTC does not include death benefit payment while on claims, so the integrated model shows higher death benefits.
- The UL account value draws down faster to pay for LTC benefits, so the integrated model shows less surrender benefits than standalone UL.
- Overall, integrated model reflects the inter-dependency of the product features better.

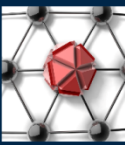
Financial impact of Sensitivity Test



	Base Scenario				Base + 10% Incidence Up			
	Integrated	UL	LTC	UL+LTC	Integrated	UL	LTC	UL+LTC
PV Premium	3,382	1,351	2,013	3,363	3,374	1,351	2,002	3,353
PV LTC benefits	(3,072)	-	(5,425)	(5,425)	(3,367)	-	(5,870)	(5,870)
PV Death Benefits	(6,944)	(3,837)	-	(3,837)	(7,104)	(3,837)	-	(3,837)
PV Surrender	(1,457)	(4,061)	-	(4,061)	(1,454)	(4,061)	-	(4,061)
PV Other Outgos	(992)	(152)	(1,040)	(1,192)	(1,008)	(152)	(1,060)	(1,212)
GPV Reserves	9,298	6,822	4,757	11,579	9,785	6,822	5,246	12,067
PV LTC benefits					9.6%	-	8.2%	8.2%
PV Death Benefits					2.3%	-	-	0.0%
Margin/Base GPV					5.2%	-	10.3%	4.2%
Integrated/Sum	80.3%				81.1%			

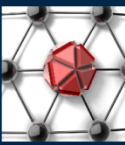
- The shock on incidence rate does not impact the standalone UL model. In reality, higher incidence rate would result in more death benefit payouts for disabled lives.
- For projected LTC benefits and death benefits, the integrated model is more sensitive to a 10% incidence rate shock than the standalone models (5.2% vs 4.2%), although the total amounts from the standalone models are still higher.
- Again, the integrated model reflects the inter-dependency of the product features more appropriately.

Financial impact of Sensitivity Test

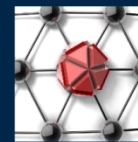


	Base Scenario				Base + 10% Active Life Mortality Up			
	Integrated	UL	LTC	UL+LTC	Integrated	UL	LTC	UL+LTC
PV Premium	3,382	1,351	2,013	3,363	3,373	1,349	1,999	3,348
PV LTC benefits	(3,072)	-	(5,425)	(5,425)	(3,061)	-	(5,321)	(5,321)
PV Death Benefits	(6,944)	(3,837)	-	(3,837)	(7,412)	(4,201)		(4,201)
PV Surrender	(1,457)	(4,061)	-	(4,061)	(1,453)	(4,049)	-	(4,049)
PV Other Outgos	(992)	(152)	(1,040)	(1,192)	(989)	(152)	(1,030)	(1,181)
GPV Reserves	9,298	6,822	4,757	11,579	9,767	7,185	4,652	11,836
PV LTC benefits					-0.4%	-	-1.9%	-1.9%
PV Death Benefits					6.7%	9.5%	0.0%	9.5%
Margin/Base GPV					5.0%	5.3%	-2.2%	2.2%
Integrated/Sum	80.3%				82.5%			

- For projected LTC benefits and death benefits, the integrated model is more sensitive to a +10% mortality rate shock to the active-life population than the standalone models.
- The reserve increase for the integrated model is 5.0%, more sensitive to the standalone models, which the increase is 2.2%.
- The impact on the UL reserve is higher for the standalone model. The UL mortality is combined with the active lives and the disabled lives, and cannot apply the shock to the active lives alone.



- Standalone does not reflect well the interdependency of the combo products. Can overstate the reserves, and understate the sensitivities.
- With sensitivity scenarios, to achieve the same level of changes as the integrated model, higher shocks can be applied.
- How granular should the assumptions be in the first principle model?



- How many ways to validate best estimate assumptions?
- What new insights with new data as time passes?
- What extra mileage can get out of new actuarial systems?
- How many dedicated resources to play in “Sand Box”?

Attribution Analysis - 1



Gain & Loss by Assumption					
		Total Lives		Active Lives	Disabled Lives
		Reserve Change	Policy Count Change	Reserve Change	
Act Death	Reserve Change - Actual	(188)	(4,968)	(104)	0
	Reserve Change - Expected	(269)	(6,272)	(149)	0
	A/E % Ratio:	70%	79%	70%	0%
	Gain(+)/Loss(-):	(81)	(1,304)	(45)	
Lapse	Reserve Change - Actual	(166)	(3,405)	(166)	0
	Reserve Change - Expected	(241)	(3,024)	(241)	0
	A/E % Ratio:	69%	113%	69%	0%
	Gain(+)/Loss(-):	(74)	381	(74)	0
Incurral	Reserve Change - Actual	71	7,788	(450)	522
	Reserve Change - Expected	46	8,889	(535)	581
	A/E % Ratio:	96%	88%	84%	90%
	Gain(+)/Loss(-):	(25)	1,102	(84)	59

For lapse, reserves changes and policy count changes in the opposite direction.
Why?

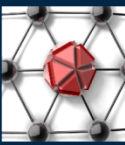
Attribution Analysis - 2



Gain & Loss by Assumption with Adjustments					
		Total Lives		Active Lives	Disabled Lives
		Reserve Change	Policy Count Change	Reserve Change	
Active Death * 88%	Reserve Change - Actual	(188)	(4,968)	0	0
	Reserve Change - Expected	(204)	(4,918)	0	0
	A/E % Ratio:	92%	101%	0%	0%
	Gain(+) / Loss(-) :	(16)	49	0	0
Lapse Multiple Adjustments	Reserve Change - Actual	(166)	(3,405)	(166)	0
	Reserve Change - Expected	(174)	(3,291)	(174)	0
	A/E % Ratio:	95%	103%	95%	0%
	Gain(+) / Loss(-) :	(8)	114	(8)	0
Incurral * 93%	Reserve Change - Actual	71	7,788	(450)	522
	Reserve Change - Expected	73	8,028	(465)	533
	A/E % Ratio:	98%	97%	97%	98%
	Gain(+) / Loss(-) :	(3)	241	(15)	11

With assumption adjustments, now the reserve change and policy count change are moving in the same directions and closer in magnitude.

Reserve Movement - 3

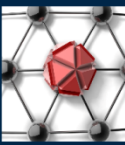


Gain/Loss by Assumption with Adjustment Comparison			
	Total Actual	Total w Adjustments	Difference
Adjusted reserves @ Period Start	9,412	9,412	0
-Assumptions Adjustments		(512)	(512)
- AL Death	(81)	(16)	65
- DI Death	(18)	(5)	13
- Lapse	(74)	(8)	66
- Incurral	(25)	(3)	22
- Recovery	1	(1)	(2)
- Exhaustion	9	8	(1)
- Residue	(11)	(15)	(4)
Model EOP Valuation Run	9,612	9,965	353
Total Change	(200)	(553)	(353)

With assumptions adjustments, the potential reserve increases could be more than double

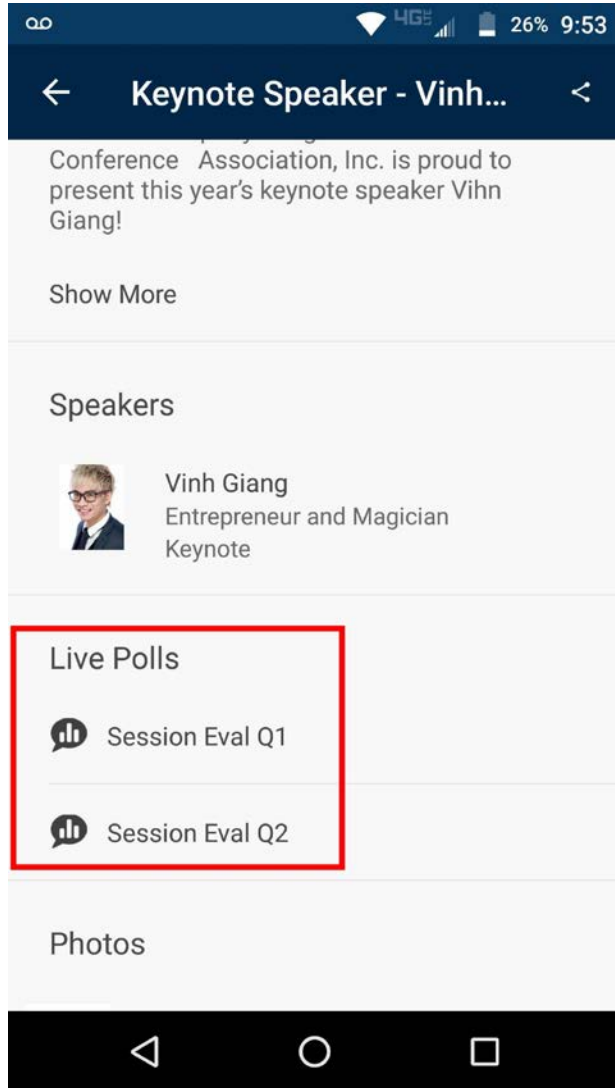
The A/E analysis by assumption may provide indication on which assumption to adjust in which direction.

Potentially provide more likely financial forecast for the future.



1. To gain more insight into your business, analysis via model is a powerful tool.
2. Assumption validation sends out early warnings in your financial forecasting. Results would be more indicative than unbiased sensitivity tests.

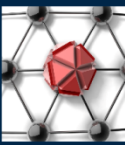
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Q & A

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