

Valuation for Waiver of Premium Benefit in Long Duration A&H Insurance Products: *A review of regulatory requirements and demonstrations of actuarial modeling approaches*

子曰：“道之以政，齊之以刑，民免而無恥；道之以德，齊之以禮，有恥且格。”

“If the people be led by laws, and uniformity sought to be given them by punishments, they will try to avoid the punishment, but have no sense of shame. If they be led by virtue, and uniformity sought to be given them by the rules of propriety, they will have the sense of shame, and moreover will become good.”

-- Confucius (551–479 BC)

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Abstract

Reserving for waiver of premium benefits in long duration accident and health insurance products has traditionally been an overlooked, if not neglected, issue in life insurance valuation due to gray areas of the law, immateriality of the affected business, and lack of actuarial resources. The existing regulations require appropriate set-up of active life reserves and disabled life reserves for both waiver of premium benefits and base contract benefits with careful considerations for how assumptions are developed and how cash flows are projected. The underlying actuarial modeling approaches may vary in two dimensions where the in-force could be total lives or healthy lives only and the benefit amounts could be incurred claims or claim payments. The aggregate reserves are mathematically identical for all the approaches to the extent that assumptions are consistent. However, the reserve balances will differentiate when experiences deviate from assumptions and the corresponding financial impacts could be significant and tangible as reflected by experience gains or losses. These conclusions strongly suggest that the choice of actuarial modeling should be a business decision with appropriate management accountabilities.

Key Words: Valuation; Waiver of Premium; Long-Term Care; Individual Disability Income; Total Lives; Healthy Lives; Incurred Claims; Claim Payments

Introduction

Long duration accident & health (A&H) products typically include a waiver of premium (WOP) benefit as an embedded feature. For example, while providing monthly indemnity to cover a portion of the loss of income, individual disability income (IDI) products usually waive the additional premium payments if the insured's total disability lasts beyond 90 consecutive days and even retrospectively refund the premiums

paid within those first 90 days of disability. Therefore, effectively the insurance company, instead of the policyholder, will pay to keep the policy in-force indefinitely until recovery. Similarly, while reimbursing a policyholder's expenses incurred to care providers due to the insured's loss of activity of daily living (ADL) or cognitive impairments, Long-Term Care Insurance (LTCI) products also waive the additional premiums following the date of the insured's eligibility for benefits after the waiting period, and retrospectively refund the premium to the date of benefit eligibility. Since such A&H products, IDI and LTCI included, are generally expensive and claims can continue for an extended time period, WOP coverage is a significant part of the total benefit and must be reserved appropriately. In addition, since the very existence of WOP coverage effectively keeps the policy active while the insured is on claim, the valuation issue for WOP is also associated with the question whether the company should release or continue to hold active life reserves (ALR) for the policy after setting up the disabled life reserve (DLR) when a claim is incurred.

Regulations specifically addressing the valuation of A&H products' WOP benefit are very limited. The language from the available regulatory and accounting/actuarial oversight bodies are all similar, and the explicit interpretation and guidance on those requirements lack details. In addition, the literature specifies requirements on a contingency of the underlying morbidity assumption and modeling techniques but does not have clear definitions on the assumptions and models. As a result, although the regulation requirements clearly exist, they are perceived by the industry as incomplete. Actual practices vary from company to company, and oversights can occur, particularly when the affected business volume is immaterial.

This paper will clarify the valuation issues for the WOP benefit in A&H products. We will start with a review for the available regulatory requirements, followed by a deep-dive on the actuarial modeling approaches and corresponding financial impacts. Finally, we will offer some observations and opinions on the implications of the various approaches to a company's financial performance. A numerical example is used to help demonstrate the concepts. Please note that the reserves cited here specifically refer to the tabular formulaic ALR and DLR. All other types of reserves -- such as deficient reserves based on asset adequacy testing and reserves based on actuarial judgements (e.g. claim reserves for incurred but not reported or IBNR) -- are out of scope for this discussion.

Regulatory Background

Limited literature is provided in this section to clarify the key points of the requirements. Our reviews are based on U.S. statutory valuation, however, the requirements can be extended to U.S. GAAP and tax too.

SSAP and State Laws

Valuation for A&H products are in scope for the National Association of Insurance Commissioners (NAIC)'s Statements of Statutory Accounting Principles (SSAP) #54 "*Individual and Group Accident and Health Contracts*" and Appendix A-010 "*Minimum Reserve Standards for Individual and Group Health Insurance Contracts*." Actuaries may more frequently refer to NAIC "Health Insurance Reserve Model Regulation" instead of the authentic Statutory Accounting Principles (SAP) articles. Specific languages regarding WOP include:

“Waiver of premium reserves involve several special considerations. First, the disability valuation tables promulgated by the NAIC are based on exposures that include contracts on premium waiver as in-force contracts. Hence, contract reserves based on these tables are NOT reserves on “active lives” but rather reserves on contracts “in force”. This is true for the 1964 CDT and for both the “1985 CIDA and CIDB tables.

Accordingly, tabular reserves using any of these tables should value reserves on the following basis:

Claim reserves should include reserves for premiums expected to be waived, valuing as a minimum the valuation net premium being waived.

Premium reserves should include contracts on premium waiver as in-force contracts, valuing as a minimum the unearned modal valuation net premium being waived.

Contract reserves should include recognition of the waiver of premium benefit in addition to other contract benefits provided for, valuing as a minimum the valuation net premium to be waived.

If an insurer is, instead, valuing reserves on what is truly an active life table, or if a specific valuation table is not being used but the insurer’s gross premiums are calculated on a basis that includes in the projected exposure only those contracts for which premiums are being paid, then it may not be necessary to provide specifically for waiver of premium reserves. Any insurer using such a true “active life” basis should carefully consider, however, whether or not additional liability should be recognized on account of premiums waived during periods of disability or during claim continuation.”

– NAIC Model Regulation Service, April 2004: “Health Insurance Reserves Model Regulation,” Appendix C. Reserves for Waiver of Premium

For states where NAIC model laws have been adopted, their statutes and/or regulations include provisions with the same or similar requirements. For example, in the state of New Jersey, N.J.A.C. 11:4-6.18 states:

“(a) Where an insurer calculates tabular reserves using the 1964 CDT, 85CIDA, 85CIDB or any other table based on exposures that include contracts on premium waiver as in-force contracts rather than a table based on “active lives,” reserves shall be valued on the following basis:

1. Claim reserves shall include reserves for premiums expected to be waived, valuing as a minimum the valuation net premium being waived.

2. Premium reserves shall include contracts on premium waiver as in-force contracts, valuing as a minimum the unearned modal valuation net premium being waived.

3. Contract reserves shall include recognition of the waiver of premium benefit in addition to other contract benefits provided for, valuing as a minimum the valuation net premium to be waived.

(b) If an insurer is valuing reserves on a true “active life” table, or if a specific valuation table is not being used, but the insurer’s gross premiums are calculated on a basis that includes in the projected exposure only those contracts for which premiums are being paid, it may not be necessary to provide specifically for waiver of premium reserves. Any insurer using such a true “active life” basis shall consider whether or not additional liability should be recognized on account of premiums waived during periods of disability or during claim continuation.”

- *New Jersey Administrative Code: Title 11. Department of Banking and Insurance Division of Insurance, Chapter 4. Actuarial Services, Subchapter 6. Minimum Reserve Standards for Individual and Group Health Insurance Contracts, §11:4-6.18 Reserves for Waiver of Premium*

Actuarial Public Policy Practice Notes

The American Academy of Actuaries (AAA) has released a few practice notes and discussed the valuation issues related to the WOP benefit in A&H products. These describe actuarial practice, but are not legal requirements, and actual practices may vary.

In its March 2006 practice note, “*Statutory Reserve for Individual Disability Income Insurance*”, the AAA’s Health Practice Council intended to clarify the reserve for WOP benefit for both ALR and DLR:

“Q. How are active life reserves calculated for the waiver-of-premium provision?”

A. Active life reserves for waiver-of-premium are normally calculated using the same valuation methodology and assumptions as the base contract, but reflecting the terms of the waiver agreement and the monthly premium. The actuary may choose to bear in mind that waiver payments are often made for the length of the premium paying period, which may not coincide with the base contract benefit payment period.

Some companies apply overall adjustment factors to the base active life reserve. The actuary usually determines those factors by modeling a comparison between the base claim costs and the waiver-of-premium claim costs. This would usually recognize actual premium levels, the waiver elimination period, and any significant retroactive provision.

Q. How are claim reserves calculated for the waiver-of-premium provision?”

A. Additional claim reserves for the waiver-of-premium benefit are normally calculated separately. Claim reserves for the waiver of premium benefit are normally calculated using the same valuation methodology and assumptions as the base contract, but reflecting the terms of the waiver agreement and the monthly premium. Waiver payments are often made for the length of the premium paying period, which may not coincide with the base contract benefit payment period. Some actuaries apply a level factor to the base claim reserves to estimate the overall waiver claim reserve without taking the exact waived premium for each claim into account.”

And the AAA’s Health Practice Financial Reporting Committee specifically addressed whether ALR should be held for policies in open claim status and how WOP should be accounted for in ALR in its September 2010 practice note “*Practices for Preparing Health Contract Reserves*”:

“18. Are contract reserves held for policies in open claim status?”

Contract reserves typically are held for policies in open claim status. The claim costs underlying the contract reserve calculations typically are developed using all in-force policies as the exposure basis as opposed to only using non-benefit eligible (i.e., active) policies. When claim costs are developed using all in-force policies without regard to claim status, contract reserves must be held for all in-force policies to capture all expected future benefit payments for a block of business. Policies on claim normally continue in force, often due to the waiver-of-premium provision.

Note that the 1964 CDT, 1985 CIDA, and 1985 CIDB disability valuation tables were developed using all in-force policies as the exposure basis.

Theoretically, contract reserves may not need to be held for policies in open claim status if the claim costs underlying the contract reserves were developed using active policies as the exposure basis—instead of all in-force policies. Before releasing contract reserves for policies in open claim status in this scenario, the actuary should consider carefully whether the contract reserves should be maintained to the extent that they are accounting for costs related to future changes in claim status, such as a recovery followed later by another claim incidence.

Note that Appendix A-010 paragraph 34.c states that the contract reserve is in addition to claim reserves and premium reserves. It could be argued that this statement means that each policy that requires a contract reserve must have a contract reserve regardless of benefit eligibility status. Holding contract reserves on all in-force policies, whether theoretically necessary or not, allows the insurer to satisfy this NAIC requirement without ambiguity.

19. How are waiver-of-premium provisions accounted for in contract reserves?

Contract reserves for waiver-of-premium normally are calculated using the same valuation methodology and assumptions as used for the contract reserves for the base benefits. The key difference between the waiver-of-premium contract reserve calculation and the base contract reserve calculation is that the monthly premium is substituted for the base benefit amount. Insurers typically use the gross monthly premium in the waiver-of-premium calculation. As an alternative, some companies apply overall adjustment factors to the base contract reserve for which the factors are developed by modeling a comparison between the base claim costs and the waiver-of-premium claim costs.

Waiver-of-premium adjustments typically must be accounted for when contract reserves are calculated with underlying claim costs that were developed using all in-force policies as the exposure basis. In this scenario, contract reserves must be held for all in-force policies, which typically mean that net premiums are assumed to be collected for benefit-eligible policies on waiver-of-premium. This overstatement in the net premiums understates the contract reserves. The waiver-of-premium adjustments described above are meant to offset this overstatement in net premiums.

Again from a theoretical viewpoint, if the claim costs underlying the contract reserves were developed based on non-benefit eligible (i.e., active) policies only, then contract reserves only need to be held on active policies. In this scenario, there is not an overstatement in assumed net premiums, and waiver-of-premium adjustments typically are not required.

Exhibit 2 (Reserves for Waiver of Premium (supplementary explanatory material)) of Appendix A-010 discusses waiver-of-premium SAP reserve considerations for individual disability income policies.”

Other Actuarial Standards

In responding to a NAIC request and the general need from the industry, Society of Actuaries (SOA)'s Long-Term Care Insurance Valuation Methods Task Force was charged to develop valuation recommendations for LTCI products and published its final report in 1995. The report discussed the WOP issues, including:

“The approach used to compute active life reserves generally determines which of two techniques should be employed to properly value waiver of premium benefits.

If the active life reserves computation assumes future premiums are received from all in-force policies regardless of benefit status, then a correcting adjustment is necessary. This is commonly accomplished by explicitly recognizing future waived premium as an additional benefit amount. The adjusted benefit amount is applied to active life reserve and claim reserve factors.

If the active life reserves computation omits premiums to be waived from the present value of future premiums, then no additional adjustments may be required.

When properly constructed, either approach can be expected to produce equivalent aggregate reserves...”

- *Society of Actuaries Long-Term Care Insurance Valuation Methods Task Force, 1995: “Long-Term Care Insurance Valuation Methods,” Transactions of Society of Actuaries, Vol. 47, Page 667.*

In summary, the regulatory requirements and industry guidelines appear clear and firm about the need to reserve for the WOP provision., There is plenty of flexibility, however, on how to carry that out. The specific methods used in practice rely on how the morbidity assumptions and projection models are constructed for the base policy, including whether the future premiums should be based on total lives or healthy lives only in consistence with the exposure of the morbidity assumption. At the absence of a disciplined model, it is also acceptable to use high-level factors, as long as they are internally coherent, particularly to keep in mind that the reserving for DLR and ALR are not independent and must be consistent.

In the following sections, we will discuss the options for actuarial modeling, and demonstrate the equivalence among the different choices.

Actuarial Modeling

Before we dive into the details for the WOP benefit, it is essential to go over the basics of actuarial modeling. We will also share four theoretical actuarial modeling approaches and further demonstrate using a numerical example.

Actuarial Modeling and A&H Products ¹

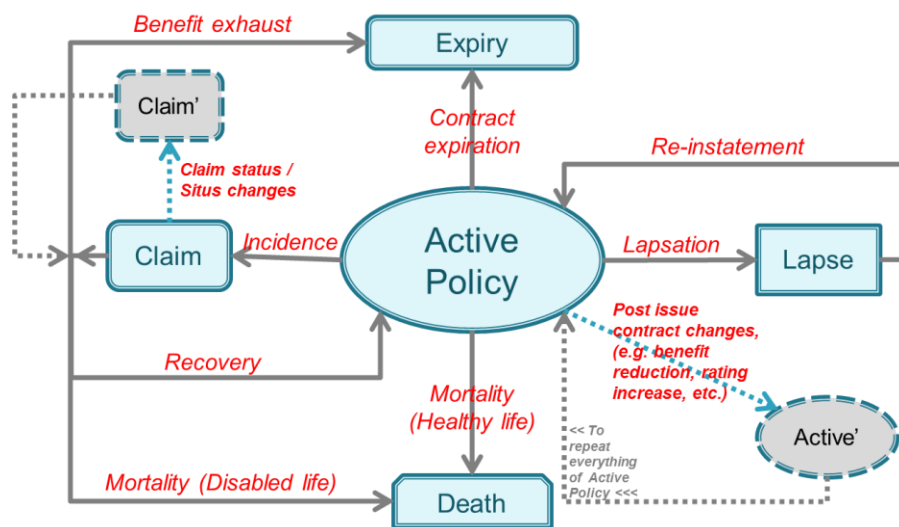
By issuing an insurance contract, the insurance company engages in a long-term commitment to the policyholder. The company receives upfront premiums and in return, promises to pay benefits to the beneficiary when claims are incurred in the future. The company must also comply with all accounting rules including holding adequate reserves and maintaining an appropriate level of capital in order to stay in business, and manage costs in order to ensure long-term financial strength and ultimately optimize the values for the owners (e.g. the shareholders for stock companies and policyholders for mutual companies).

¹ More details on actuarial modeling overview is available at the author’s presentation at the 2016 Actuarial Society of Greater New York (ASNY) Spring Meeting titled “Actuarial Modeling of LTC Insurance Products: The current and future states from a typical carrier’s point of view.” See the web link: https://www.goasny.org/assets/docs/2016ASNYSpringMeeting/asny-spring2016_ltcmodelling_from%20xianmei.pdf

Besides the premiums and claims transactions as contractually defined between policyholders and the insurance company, policyholders may also lapse the policy. Depending on the renewability feature of the contract, the insurance company may or may not cancel the policy unilaterally, and may or may not raise premiums after the policies are issued. Take a guaranteed renewable LTCI policy as an example. The complete ongoing activities following the policy issue can be illustrated by **Figure 1**. Correspondingly, actuarial modeling is a chronicled quantification of the activities based on estimates of the frequency and severity of each event. A disciplined model should be sophisticated enough to register all the multi-state path-dependent transitions. Specifically, the model should:

- Read all relevant census data regarding the policy (in the case of ALR) or claim (in the case of DLR);
- Project future stages per the defined contract terms (e.g. coverage period, benefit period, elimination period.), assumed policyholder / claimant behaviors (e.g. controlled activities such as lapse, utilization, etc., and uncontrolled activities such as death or mortality, disability incidence or morbidity etc.) as well as applicable economic factors (such as inflation, increase in cost of care, etc.). Note that behaviors in later stages may or may not be independent from earlier stages; and
- Quantify all measurements based on the inherent relationships of the variables and applicable accounting rules.

Figure 1: Illustration of the Evolution of A Long-Term Care Insurance Policy



Based on all the internal results processed by the calculation engine, the model should populate all aspects of the measurements for the contract/claim and the entity's financial positions. Such outputs typically include data and information regarding inforce or inventory (e.g. premium inforce, policy/claim counts, lapse/death decrements.), cash flows (e.g. premiums received, claim payments.), balance sheets and income statements (e.g. reserves, deferred acquisition cost, risk based capital, required capital, revenues, expenses, benefits, earnings.), profit measures (e.g. premium margin, loss ratio, internal rate of return, return on equity, risk adjusted return on capital.) and other metrics deemed essential (e.g. liability duration).

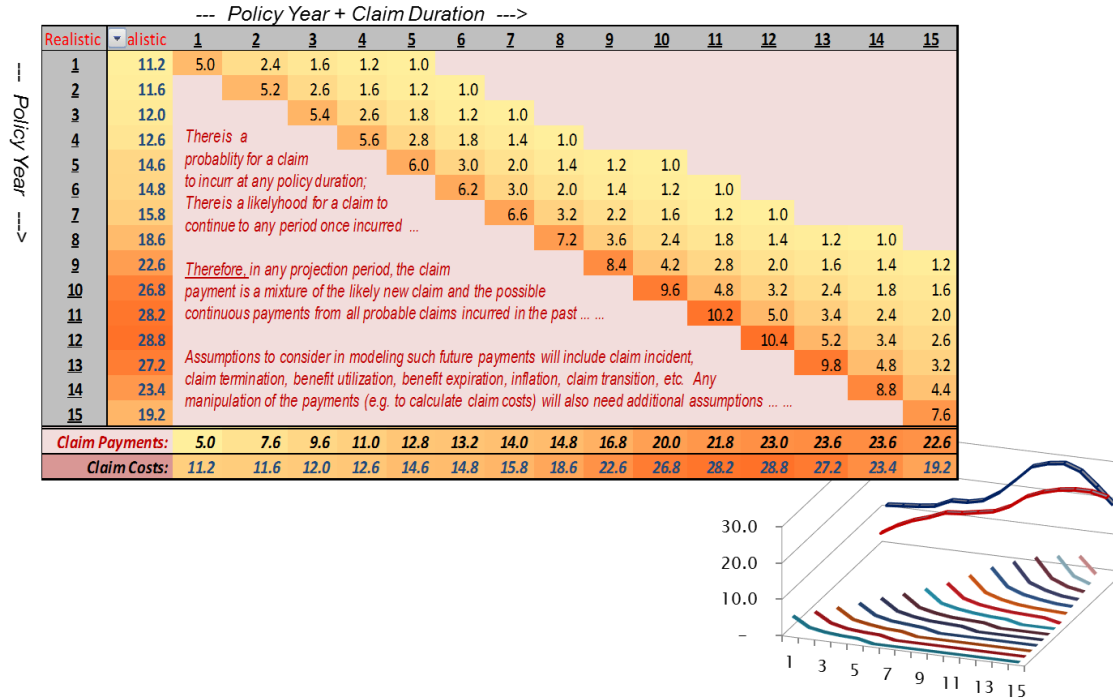
A disciplined actuarial model for the valuation of WOP benefit will do the same things by first projecting future financial transactions and then applying accounting rules. As mentioned in prior sections, however, there are multiple approaches for the modeling process, primarily driven by the underlying morbidity assumptions.

Modeling for WOP

As mentioned before, the modeling choice should be internally consistent with how the morbidity assumptions are developed. Depending upon whether the assumptions are based on exposures including policies on claim or not, the actuarial model should project the future income and cash flows on total lives or only on healthy lives correspondingly referred to as the **Total Lives Model** and the **Healthy Lives Model**.

Another aspect of model choice that creates a theoretical debate is the relationship between ALR and DLR. The underlying issue is whether the projected future benefits at each policy duration are incurred claims or claim payments considering claims involve a series of periodical payments. The incurred claim approach makes the benefit at each policy duration equal to the present value of all claim payments for the claim assumed to be incurred at that particular policy duration. The claim payment approach makes the benefit at a policy duration equal to the sum of projected claim payments to be made at the policy duration for all claims assumed to have been incurred in the current and all prior policy durations. The two approaches can be referred as **Incurred Claim Model** and **Claim Payment Model** respectively. Corresponding to the two methods, the structure of the morbidity assumptions will have different requirements. An overall claim cost will suffice for the “Incurred Claim Model”, while the “Claim Payment Model” requires a set of more disciplined first principle assumptions involving disability incidence and claim termination at the minimum. As background, the relationship of claim costs (i.e. incurred claims) and claim payments is illustrated in *Figure 2*.

Figure 2: Illustration of the Relationship between Claim Cost (or Incurred Claim) and Claim Payment



If the benefit in ALR is based on incurred claims, then DLR should be set up once a claim is incurred to cover the continuous claim payments. If ALR is based on claim payments instead, then DLR is not needed since the benefits have been reserved in ALR to reflect how they will be paid. Note that from a regulation point of view, the latter is not a permitted practice in reserves. For valuation purposes, the projected benefits must be on an incurred basis. Even with claim payment cash flows being projected under certain first principle assumptions, the valuation model must convert the series of payments into claim costs at each policy duration in order to calculate ALR reserves. Some may argue that this was not clarified in any literature, but our position is that the existing regulations leave no gray area. For example, NAIC Accounting Practices and Procedures Manual states that “*liabilities require recognition as they are incurred*” (Preamble, Par. # 34) and even more straightforwardly, “*the contract reserve is in addition to claim reserves and premium reserves*” (A-010, Par. 34(c)). It takes good faith and a careful thought process to interpret accounting rules when regulations are sparse and subtle. In this discussion, we keep the **Claim Payment Model** as an option purely for theoretical / mathematical demonstration.

The modeling approach used for the WOP benefit in A&H products is defined by three questions:

1. Must the WOP benefit be explicitly reserved, or has the base policy reserve already included it?
2. Is DLR truly needed, base policy or WOP?
3. Should ALR reserves continue being held when a policy goes to claim?

The answers to these questions are determined by these two issues:

1. How are the morbidity assumptions developed? That is, what’s the exposure of the assumptions, and are the policies in open claim status included or excluded?

2. *How are the future benefits to be used? That is, are the projected benefits overall claim cost (i.e. incurred claim) or claim payments?*

The first issue determines if the model should project future financial states (i.e. premiums and benefits) based on total lives inforce (i.e. to include the disabled lives) or healthy lives only. This further defines if an explicit reserve for WOP is needed separately from the base benefit and if ALR must continue to be held for policies on claims. The second issue determines, again theoretically speaking, if DLR is needed at all, or in other words, if ALR has already covered the continuing loss of the claims.

As a result, models can be classified into four types as shown in **Table 1**. As a clarification, without converting the claim payments into claim costs, Modeling Approach 2 and Modeling Approach 4 are not permitted methods to set up reserves in actual financial reporting under the current accounting and regulatory environment as mentioned before.

Table 1: Theoretical Options for Actuarial Modeling Approaches

		Measurement of Benefit Used in the Model	
		Claim Cost Model	Claim Payment Model
In-force Exposure in Assumption and Projection	Healthy Lives Model	<p><u>Modeling Approach 1:</u></p> <ul style="list-style-type: none"> Reserves for base policy having already included WOP benefit, so explicit WOP reserve not needed Both ALR and DLR needed ALR not needed for policies on claim, however, other factors should be considered, e.g. ALR should reflect claim recovery 	<p><u>Modeling Approach 2:</u></p> <ul style="list-style-type: none"> Reserves for base benefit policy having already included WOP benefit, so explicit WOP reserve not needed Only ALR needed ALR not needed for policies on claim, however, other factors should be considered, e.g. ALR should reflect claim recovery
	Total Lives Model	<p><u>Modeling Approach 3:</u></p> <ul style="list-style-type: none"> Explicit reserves needed for both base policy and WOP benefit Both ALR and DLR needed ALR still needed for policies on claim 	<p><u>Modeling Approach 4:</u></p> <ul style="list-style-type: none"> Explicit reserves needed for both base policy and WOP benefit Only ALR needed ALR still needed for policies on claim

Demonstration²

Since the models are based on the same regulatory rules addressing the same actuarial issues, the models should be equivalent, despite different technical details, to the extent of consistent assumptions. This applies to the four modeling approaches previously discussed. In this section, we will present a numerical example using an Excel spreadsheet to demonstrate that the aggregate reserves under the four methods are

² The numerical exhibits used in this demonstration are made self-explainable to the best possibilities permitted by the format of this article. The original Excel spreadsheet underlying the exhibits is available from the contact author upon request.

identical mathematically. To the point where experience in the real world differs from the assumptions used in the models, however, the different approaches will produce different actual financial results in term of temporary experience gain or loss.

Sample Contract Terms, Assumptions and Projection of Key Variables

For demonstration purposes, please see **Figure 3** and **Figure 4**. All policy or claim durations are expressed in years, and interest and all other assumptions besides morbidity have been ignored.

Figure 3: Contract Terms, Assumptions and Projected Benefits and Calculated Net Premiums Used in the Sample

Introduction		Reserve Development (ALR and DLR)												
To demonstrate ALR & DLR based on various actuarial approaches focusing on the reconciliation between the incurred vs. paid claims and total lives vs. healthy lives model. (All other liability assumptions and interest are ignored for demonstration purpose)														
ADL Benefit: \$ 1,100														
Gross Premium: \$ 500														
Benefit and premium projection	ADL Benefit: \$ 1,100													
	Policy	IncidentRate	Policy Duration + Claim Duration										Incurred	
	Duration		1	2	3	4	5	6	7	8	9	10		
	1	2.5%	27.50	27.50	27.50	27.50	27.50							137.50
	2	3.1%		34.38	34.38	34.38	34.38	34.38						171.88
	3	3.9%			42.97	42.97	42.97	42.97	42.97					214.84
	4	4.9%				53.71	53.71	53.71	53.71	53.71				268.55
	5	6.1%					67.14	67.14	67.14	67.14	67.14			335.69
	6	7.6%						83.92	83.92	83.92	83.92	83.92		419.62
	7	9.5%							104.90	104.90	104.90	104.90	104.90	419.62
	8	11.9%								131.13	131.13	131.13	131.13	393.39
	9	14.9%									163.91	163.91	163.91	327.83
	10	18.6%										204.89	204.89	204.89
	Sum	83.1%	27.50	61.88	104.84	158.55	225.69	282.12	352.65	440.81	551.01	688.76	868.76	2,893.81
	NLP:		289.38	289.38	289.38	289.38	289.38	289.38	289.38	289.38	289.38	289.38	289.38	
WOP Benefit \$ 393 -> Net Premium														
Policy	IncidentRate	Policy Duration + Claim Duration										Incurred		
Duration		1	2	3	4	5	6	7	8	9	10			
1	2.5%	9.82	9.82	9.82	9.82	9.82							49.09	
2	3.1%		12.27	12.27	12.27	12.27	12.27						61.36	
3	3.9%			15.34	15.34	15.34	15.34	15.34					76.70	
4	4.9%				19.17	19.17	19.17	19.17	19.17				95.87	
5	6.1%					23.97	23.97	23.97	23.97	23.97			119.84	
6	7.6%						29.96	29.96	29.96	29.96	29.96		149.80	
7	9.5%							37.45	37.45	37.45	37.45	37.45	149.80	
8	11.9%								46.81	46.81	46.81	46.81	140.44	
9	14.9%									58.51	58.51	58.51	117.03	
10	18.6%										73.14	73.14	73.14	
Sum WOP	83.1%	9.82	22.09	37.43	56.60	80.57	100.71	125.89	157.36	196.70	245.88	303.31	1,033.05	
NLP:		103.31	103.31	103.31	103.31	103.31	103.31	103.31	103.31	103.31	103.31	103.31		
NLP_expected:	392.69 ->	*Goal Seek* solves this premium so that the sum of the "Net Prem" below equals the sum of ADL benefits above. The "Net Prem" in each column below is the premium to be solved minus the calculated WOP benefit at each policy/claim year in the "Sum WOP" row above, assuming the premium to be solved is the WOP benefit exposure.												
NTG Ratio:	79%													
Net Prem:		382.87	370.60	355.26	336.08	312.12	291.97	266.80	235.32	195.98	146.81	73.14	2,893.81	

Figure 4 Projected Future DLRs Based on Projected Claim Payments

DLR based on claim development triangle:

ADL Benefit:										
Policy Duration	Policy Duration + Claim Duration									
	1	2	3	4	5	6	7	8	9	10
1	110.00	82.50	55.00	27.50	-					
2		137.50	103.13	68.75	34.38	-				
3			171.88	128.91	85.94	42.97	-			
4				214.84	161.13	107.42	53.71	-		
5					268.55	201.42	134.28	67.14	-	
6						335.69	251.77	167.85	83.92	-
7							314.71	209.81	104.90	-
8								262.26	131.13	-
9									163.91	-
10										-
Sum	110.00	220.00	330.00	440.00	550.00	687.50	754.47	707.05	483.87	-

Reserve at end of period is the sum of future payments, e.g. \$171.88 = \$42.97+\$42.97+\$42.97+\$42.97 from Figure 3

WOP Benefit:										
Policy Duration	Policy Duration + Claim Duration									
	1	2	3	4	5	6	7	8	9	10
1	39.27	29.45	19.63	9.82	-					
2		49.09	36.81	24.54	12.27	-				
3			61.36	46.02	30.68	15.34	-			
4				76.70	57.52	38.35	19.17	-		
5					95.87	71.90	47.94	23.97	-	
6						119.84	89.88	59.92	29.96	-
7							112.35	74.90	37.45	-
8								93.62	46.81	-
9									58.51	-
10										-
Sum	39.27	78.54	117.81	157.07	196.34	245.43	269.34	252.41	172.74	-

This example assumes a plain vanilla LTCI policy offering a base morbidity benefit (\$1,100/year for demonstration purpose), referred to as the “ADL Benefit”, with a WOP provision embedded in the contract, at a price of \$500 gross premium per year. We simplified morbidity assumptions as the given single cell claim incident rates (column *IncidentRate*) and claims, once incurred, are assumed to last five years and then fully recover. Correspondingly, the future benefit payments are projected at each policy and claim year. Note that for WOP, the “benefit payments” are the waived premiums at each policy year, although in reality, the WOP benefit does not involve a cash transaction. With the projected payments, the equivalent incurred claims or claims costs are backed out for each policy year (see Column *Incurred*, which is the sum of the payments on its left for each row).

Since WOP benefit is embedded in the contract, the model should solve for a net premium for the whole contract although reserves (and the net premiums) for ADL benefit and WOP benefit can be calculated separately. Under the net premium valuation method, the waived premium, therefore the WOP benefit, is exactly the net premium of the whole contract. In practice, companies may choose to use gross premium as the WOP benefit in their model. It is permitted from a regulation compliance perspective as long as it is a conscious choice producing adequate reserves. Solving for this net premium is done using Excel’s Goal Seek function as described in the note near the bottom of **Figure 3**. The premiums in the *Net Prem* row referred in the note are those expected to be collected from healthy lives, including recoveries. ALR should be the total of future benefits minus the total of future net premiums.

With all future claim payments being projected under the given incidence and termination rates, the future DLR at each policy/claim year can be calculated when it is needed. DLR will be the total of projected future unpaid claims as noted in **Figure 4**.

Reserves under Different Modeling Approaches

With the projected benefits and premiums discussed in the prior subsections as the foundation, ALR and DLR reserves can be laid out side-by-side under the four modeling approaches.

In **Figure 5**, the upper left quadrant labeled *Healthy Lives Model* and *Incurred Basis* shows the results for Modeling Approach 1. The projected benefits are incurred claims, and premiums are those to be collected from the healthy lives only. Since the reserving of ALR is based on incurred claims, while the actual benefit payment transactions (once a claim is incurred) are only for the due amounts, DLR reserve must be calculated for those undue payments on the projected incurred claims. On the other hand, the upper right quadrant, labeled *Incurred Basis*, shows the results for Modeling Approach 2, in which benefits are the projected claim payments (instead of incurred claims). In this case, DLR should not be held since the benefits used in ALR are consistent with transactions. The difference of the ALRs in Modeling Approaches 1 and 2 is exactly the DLR in Modeling Approach 1, as shown in column *DeltaALR*. For these two models, explicit WOP reserves should not be calculated because the expected premiums are projected on healthy lives only and have already been deducted for the waived amounts. Projected healthy lives should include those assumed to have recovered from projected claims.

Figure 5: Reserve Development under the Different Modeling Approaches

Reserve Development										
Healthy Lives Model:										
Policy Duration	Incurred Basis:			Check DLR				Cash Basis:		
	Ben.	Prem	ALR	DLR	ClaimTriangle	DeltaALR	Ben.	Prem	ALR	
0			0							0
1	137.50	382.87	245.37	110.00	110.00	110.00	27.50	382.87	355.37	
2	171.88	370.60	444.09	220.00	220.00	220.00	61.88	370.60	664.09	
3	214.84	355.26	584.51	330.00	330.00	330.00	104.84	355.26	914.51	
4	268.55	336.08	652.04	440.00	440.00	440.00	158.55	336.08	1,092.04	
5	335.69	312.12	628.46	550.00	550.00	550.00	225.69	312.12	1,178.46	
6	419.62	291.97	500.82	687.50	687.50	687.50	282.12	291.97	1,188.32	
7	419.62	266.80	348.00	754.47	754.47	754.47	352.65	266.80	1,102.47	
8	393.39	235.32	189.93	707.05	707.05	707.05	440.81	235.32	896.98	
9	327.83	195.98	58.09	483.87	483.87	483.87	551.01	195.98	541.96	
10	204.89	146.81	0.00	-	-	(10.00)	688.76	146.81	0.00	
Sum	2,893.81	2,893.81					2,893.81	2,893.81		

Total Lives Model: Base										
Policy Duration	Incurred Basis:			Check DLR				Cash Basis:		
	Ben.	Prem	ALR	DLR	ClaimTriangle	DeltaALR	Ben.	Prem	ALR	
0			0							0
1	137.50	289.38	151.88	110.00	110.00	110.00	27.50	289.38	261.88	
2	171.88	289.38	269.39	220.00	220.00	220.00	61.88	289.38	489.39	
3	214.84	289.38	343.92	330.00	330.00	330.00	104.84	289.38	673.92	
4	268.55	289.38	364.75	440.00	440.00	440.00	158.55	289.38	804.75	
5	335.69	289.38	318.44	550.00	550.00	550.00	225.69	289.38	868.44	
6	419.62	289.38	188.20	687.50	687.50	687.50	282.12	289.38	875.70	
7	419.62	289.38	57.96	754.47	754.47	754.47	352.65	289.38	812.44	
8	393.39	289.38	(46.04)	707.05	707.05	707.05	440.81	289.38	661.01	
9	327.83	289.38	(84.49)	483.87	483.87	483.87	551.01	289.38	399.38	
10	204.89	289.38	-	-	-	-	688.76	289.38	-	
Sum	2,893.81	2,893.81					2,893.81	2,893.81		

Figure 3: Upper Box, Col. "Incurred"	Figure 3: Upper Box, Row "NLP"	Figure 4: Upper Box, Row "Sum"	ALR on right minus ALR on left	Figure 3: Upper Box, Row "Sum"	Figure 3: Upper Box, Row "NLP"
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The lower left quadrant of **Figure 5** shows the reserves for ADL Benefits (the base contract) under Modeling Approach 3, where benefits are incurred claims, and premiums are those from total lives. Similar to Modeling Approach 1, DLR is necessary for this approach. The lower right quadrant shows the results for Modeling Approach 4, where the future benefits are the projected claim payments instead of incurred claims. Similar to Modeling Approach 2, DLR should not be calculated for this approach. Like the previous two models, the difference of the ALRs between Modeling Approaches 3 and 4 is the DLR as required in Modeling Approach 3.

Unlike the two healthy lives models, Modeling Approaches 3 and 4 assume that premiums continue to be collected from policyholders even when the policies are on claim. The reserves for ADL Benefit, therefore, do not include WOP, therefore the WOP reserve must be explicitly set up as an additional balance amount. **Figure 6** show the explicit WOP reserves under the two approaches. Modeling Approach 3 requires DLRs, which are exactly the difference of the ALRs between Modeling Approaches 3 and 4.

Figure 6: Explicit WOP Reserve Development under the Different Modeling Approaches

Total Lives Model: WOP											
Policy	Incurred Basis:				Check DLR				Cash Basis:		
Duration	Ben.	Prem	ALR	DLR	ClaimTriangle	DeltaALR		Ben.	Prem	ALR	
0			0								0
1	49.09	103.31	54.22	39.27	39.27	39.27		9.82	103.31	93.49	
2	61.36	103.31	96.17	78.54	78.54	78.54		22.09	103.31	174.70	
3	76.70	103.31	122.78	117.81	117.81	117.81		37.43	103.31	240.58	
4	95.87	103.31	130.21	157.07	157.07	157.07		56.60	103.31	287.29	
5	119.84	103.31	113.68	196.34	196.34	196.34		80.57	103.31	310.02	
6	149.80	103.31	67.19	245.43	245.43	245.43		100.71	103.31	312.61	
7	149.80	103.31	20.69	269.34	269.34	269.34		125.89	103.31	290.03	
8	140.44	103.31	(16.44)	252.41	252.41	252.41		157.36	103.31	235.97	
9	117.03	103.31	(30.16)	172.74	172.74	172.74		196.70	103.31	142.57	
10	73.14	103.31	0.00	-	-	(0.00)		245.88	103.31	-	
Sum	1,033.05	1,033.05						1,033.05	1,033.05		

Figure 3:
Lower Box,
Column
"Incurred"

Figure 3:
Lower Box,
Row "NLP"

Figure 4:
Lower Box,
Row "Sum"

ALR on
right minus
ALR on left

Figure 3:
Lower Box,
Row
"Sum WOP"

Figure 3:
Lower Box,
Row "NLP"

As in Figure 5, ALR is the sum of future benefits minus sum of future premiums, and DLR is as those described in Figure 4.

In addition to the reconciliation that the sum of ALRs and DLRs under the two *Incurred Basis* models match the ALRs under the corresponding two *Cash Basis* models, another way to validate the approaches is to combine the reserves of ADL Benefit and the explicit WOP benefit. As shown in **Figures 5 and 6**, the sum of ADL Benefit reserves and WOP explicit reserves in Modeling Approaches 3 and 4, under the label *Total Lives Model*, equal those ADL Benefit reserves in the two corresponding models under the label *Healthy Lives Model*. With these, the equivalence of the four models are demonstrated.

An additional technical comment is that the WOP reserves can also be derived mathematically once the benefit and net premium for ADL Benefit are known. Looking at **Figure 3**, the ADL Benefit net premium vs. benefit ratio is $\$289.38 / \$1100.00 = 26.31\%$, so the ratio of the total net premium (i.e. ADL Benefit plus WOP) to the ADL Benefit must be:

$$0.2631 + 0.2631^2 + 0.2631^3 + 0.2631^4 + \dots = \frac{0.2631}{1 - 0.2631} = 35.70\%$$

The WOP reserve, therefore, must be 35.70 percent of the stand-alone base benefit reserve (WOP is excluded for both benefit and premium), which can be checked by those reserve numbers in the two total lives models (Modeling Approaches 3 and 4). Effectively, what the projection models do illustrate this mathematical relationship. In this example, the iterating loops performed by the Goal Seek function mentioned earlier, exactly converge to this 35.70% factor. The solved total policy net premium is \$392.69, which is equal to 35.70 percent of the ADL Benefit of \$1,100.00.

Financial Impact from Reserves under Different Modeling Approaches

Reserves in different valuation models will be mathematically identical if calculated correctly using consistent assumptions. The financial performance measures, balance sheets or income statements, therefore, should be immune to the choice of actuarial models if actual experience is the same as assumptions. For example, profit must emerge as premium load (the excess of gross premium over net premium) since by design, reserves will smooth out the claim volatility. This ideal situation -- the perfect match between experiences and valuation assumptions -- however, would never happen in the real world. Once experience deviates from assumptions, or assumptions no longer match experience, the different actuarial reserve models will produce different -- sometimes dramatically different -- financial results reflected by liability volatility on the balance sheet and experience gain or loss on the income statement, although they are all temporary in nature. Using a hypothetical example, we think it is worth the effort to demonstrate such impact.

Following numerical example for the four modeling approaches earlier, we extend the demonstration to the downstream financial impacts with a simplified scenario below:

1. It is a single LTCI policy as previously described
2. No claim has been incurred until the end of policy year five
3. The incurred claim lasted five years to policy year 10, by which time the policy has also expired;
4. The actual cash flows include gross premiums collected in the amount of \$500.00 per year for the first five years, and benefits paid at \$1,100.00 per year for the remaining five years, for all four models.

Figure 7 depicts elements of an income statement for the four models, followed by the actual and expected reserve balances on the right. Each variable in the income statement is shown with a comparison of the actual vs. reserved (those expected in valuation) amounts, therefore, sources of earning (SOE). Notice the different methods for setting up reserves cause the periodic variance of net income although the actual cash flow transactions are the same.

Figure 7: Financial Impact of the Actuarial Modeling Approaches

Model 1: Healthy Lives; Incurred Claims

Duration	(+ Premium Collected)			(-) Benefit			(-) Change of Reserve			(=) Net Income			Reserve				
	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	Total	Reserved	ALR
0																	
1	500.00	382.87	117.13	-	(137.50)	137.50	(245.37)	(245.37)	-	254.63	-	254.63	245.37	355.37	245.37		
2	500.00	370.60	129.40	-	(171.88)	171.88	(198.72)	(198.72)	-	301.28	-	301.28	444.09	664.09	664.09		
3	500.00	355.26	144.74	-	(214.84)	214.84	(140.41)	(140.41)	-	359.59	-	359.59	584.51	914.51	914.51		
4	500.00	336.08	163.92	-	(268.55)	268.55	(67.53)	(67.53)	-	432.47	-	432.47	652.04	1,092.04	1,092.04		
5	500.00	312.12	187.88	-	(335.69)	335.69	(4,847.96)	23.58	(4,871.54)	(4,347.96)	-	(4,347.96)	5,500.00	1,178.46	628.46		
6	-	291.97	(291.97)	(1,100.00)	(419.62)	(680.38)	1,100.00	127.64	972.36	-	-	-	4,400.00	1,188.32	500.82		
7	-	266.80	(266.80)	(1,100.00)	(419.62)	(680.38)	1,100.00	152.82	947.18	-	-	-	3,300.00	1,102.47	348.00		
8	-	235.32	(235.32)	(1,100.00)	(393.39)	(706.61)	1,100.00	158.07	941.93	-	-	-	2,200.00	896.98	189.93		
9	-	195.98	(195.98)	(1,100.00)	(327.83)	(772.17)	1,100.00	131.84	968.16	-	-	-	1,100.00	541.96	58.09		
10	-	146.81	(146.81)	(1,100.00)	(204.89)	(895.11)	1,100.00	58.08	1,041.92	-	-	-	-	0.00	0.00		
Sum	2,500.00	2,893.81	(393.81)	(5,500.00)	(2,893.81)	(2,606.19)	-	(0.00)	0.00	(3,000.00)	-	(3,000.00)					

Model 2: Healthy Lives; Cash Claims

Duration	(+ Premium Collected)			(-) Benefit			(-) Change of Reserve			(=) Net Income			Reserve				
	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	Total	Reserved	ALR
0																	
1	500.00	382.87	117.13	-	(27.50)	27.50	(355.37)	(355.37)	-	144.63	-	144.63	355.37	355.37	355.37		
2	500.00	370.60	129.40	-	(61.88)	61.88	(308.72)	(308.72)	-	191.28	-	191.28	664.09	664.09	664.09		
3	500.00	355.26	144.74	-	(104.84)	104.84	(250.41)	(250.41)	-	249.59	-	249.59	914.51	914.51	914.51		
4	500.00	336.08	163.92	-	(158.55)	158.55	(177.53)	(177.53)	-	322.47	-	322.47	1,092.04	1,092.04	1,092.04		
5	500.00	312.12	187.88	-	(225.69)	225.69	1,092.04	(86.42)	1,178.46	1,592.04	(0.00)	1,592.04	-	1,178.46	1,178.46		
6	-	291.97	(291.97)	(1,100.00)	(282.12)	(817.88)	-	(9.86)	9.86	(1,100.00)	0.00	(1,100.00)	-	1,188.32	1,188.32		
7	-	266.80	(266.80)	(1,100.00)	(352.65)	(747.35)	-	85.85	(85.85)	(1,100.00)	0.00	(1,100.00)	-	1,102.47	1,102.47		
8	-	235.32	(235.32)	(1,100.00)	(440.81)	(659.19)	-	205.48	(205.48)	(1,100.00)	-	(1,100.00)	-	896.98	896.98		
9	-	195.98	(195.98)	(1,100.00)	(551.01)	(548.99)	-	355.03	(355.03)	(1,100.00)	-	(1,100.00)	-	541.96	541.96		
10	-	146.81	(146.81)	(1,100.00)	(688.76)	(411.24)	-	541.95	(541.95)	(1,100.00)	-	(1,100.00)	-	0.00	0.00		
Sum	2,500.00	2,893.81	(393.81)	(5,500.00)	(2,893.81)	(2,606.19)	-	(0.00)	0.00	(3,000.00)	0.00	(3,000.00)					

Model 3: Total Lives; Incurred Claims

Duration	(+ Premium Collected)			(-) Benefit			(-) Change of Reserve			(=) Net Income			Reserve				
	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	Total	Reserved	ALR
0																	
1	500.00	392.69	107.31	-	(186.59)	186.59	(206.10)	(206.10)	-	293.90	-	293.90	206.10	355.37	206.10		
2	500.00	392.69	107.31	-	(233.23)	233.23	(159.45)	(159.45)	-	340.55	-	340.55	365.55	664.09	365.55		
3	500.00	392.69	107.31	-	(291.54)	291.54	(101.15)	(101.15)	-	398.85	-	398.85	466.70	914.51	466.70		
4	500.00	392.69	107.31	-	(364.43)	364.43	(28.26)	(28.26)	-	471.74	(0.00)	471.74	494.96	1,092.04	494.96		
5	500.00	392.69	107.31	-	(455.53)	455.53	(7,937.15)	62.85	(8,000.00)	(7,437.15)	(0.00)	(7,437.15)	8,432.11	1,178.46	432.11		
6	-	392.69	(392.69)	(1,100.00)	(569.41)	(530.59)	1,776.73	176.73	1,600.00	676.73	-	676.73	6,655.39	1,188.32	255.39		
7	-	392.69	(392.69)	(1,100.00)	(569.41)	(530.59)	1,776.73	176.73	1,600.00	676.73	-	676.73	4,878.66	1,102.47	78.66		
8	-	392.69	(392.69)	(1,100.00)	(533.83)	(566.17)	1,741.14	141.14	1,600.00	641.14	-	641.14	3,137.52	896.98	(62.48)		
9	-	392.69	(392.69)	(1,100.00)	(444.86)	(655.14)	1,652.17	52.17	1,600.00	552.17	-	552.17	1,485.35	541.95	(114.65)		
10	-	392.69	(392.69)	(1,100.00)	(278.03)	(821.97)	1,485.35	(114.65)	1,600.00	385.35	-	385.35	0.00	0.00	0.00		
Sum	2,500.00	3,926.86	(1,426.86)	(5,500.00)	(3,926.86)	(1,573.14)	-	(0.00)	-	(3,000.00)	(0.00)	(3,000.00)					

Model 4: Total Lives; Cash Claims

Duration	(+ Premium Collected)			(-) Benefit			(-) Change of Reserve			(=) Net Income			Reserve				
	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	SOE	Actual	Reserved	Total	Reserved	ALR
0																	
1	500.00	392.69	107.31	-	(37.32)	37.32	(355.37)	(355.37)	-	144.63	-	144.63	355.37	355.37	355.37		
2	500.00	392.69	107.31	-	(83.96)	83.96	(308.72)	(308.72)	-	191.28	-	191.28	664.09	664.09	664.09		
3	500.00	392.69	107.31	-	(142.27)	142.27	(250.41)	(250.41)	-	249.59	-	249.59	914.51	914.51	914.51		
4	500.00	392.69	107.31	-	(215.16)	215.16	(177.53)	(177.53)	-	322.47	-	322.47	1,092.04	1,092.04	1,092.04		
5	500.00	392.69	107.31	-	(306.26)	306.26	(86.42)	(86.42)	-	413.58	-	413.58	1,178.46	1,178.46	1,178.46		
6	-	392.69	(392.69)	(1,100.00)	(382.83)	(717.17)	(9.86)	(9.86)	-	(1,109.86)	(0.00)	(1,109.86)	1,188.32	1,188.32	1,188.32		
7	-	392.69	(392.69)	(1,100.00)	(478.54)	(621.46)	85.85	85.85	-	(1,014.15)	(0.00)	(1,014.15)	1,102.47	1,102.47	1,102.47		
8	-	392.69	(392.69)	(1,100.00)	(598.17)	(501.83)	205.48	205.48	-	(894.52)	-	(894.52)	896.98	896.98	896.98		
9	-	392.69	(392.69)	(1,100.00)	(747.71)	(352.29)	355.03	355.03	-	(744.97)	-	(744.97)	541.95	541.95	541.95		
10	-	392.69	(392.69)	(1,100.00)	(934.64)	(165.36)	541.95	541.95	-	(558.05)	-	(558.05)	-	-	-		
Sum	2,500.00	3,926.86	(1,426.86)	(5,500.00)	(3,926.86)	(1,573.14)	-	-	-	(3,000.00)	(0.00)	(3,000.00)					

Under Modeling Approach 1 (*Model 1* in the exhibits), the DLR was set up and ALR was released when the claim was actually incurred. The actual DLR must be calculated with the actual ADL Benefit amount of \$1,100.00 per year, which caused the big jump of actual reserves at duration 5. The setup of the actual DLR triggers a large loss at duration 5, while the periodical release of the DLR offsets the ongoing benefit payments. Other elements of the earning include the impact of net premium to premium load before claim and the loss of gross premium revenue after claim, as well as the impact of the assumed benefit curve in reserve assumptions.

Under Modeling Approach 2 (*Model 2* in the exhibits), DLR reserve was not needed at all while ALR was released at claim incurral, therefore, the actual reserve balance became zero at the end of year five. There appears to be a gain at year five due to the reserve release, although a claim has been incurred. At the same time, there was no reserve available to cover the ongoing claim payments, therefore, it shows continuous net losses in the amount of the claim payments after year five.

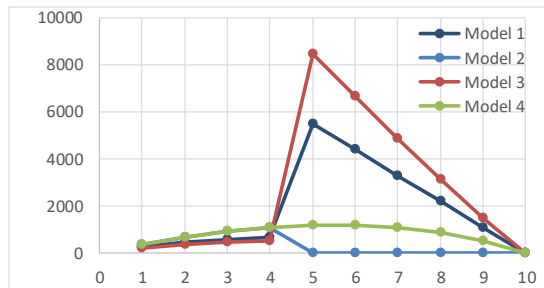
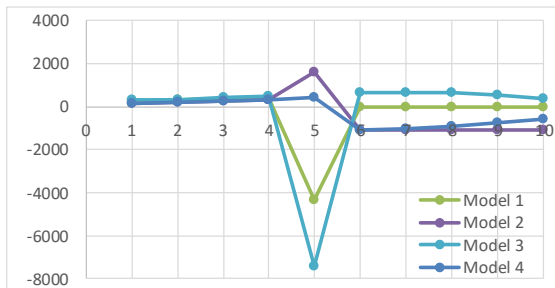
Modeling Approach 3 (*Model 3* in the exhibits) produces more complex results. Under the total lives logic, ALR cannot be released upon claim. At the same time, the incurred claim approach used in ALR development requires the setup of DLR when a claim is incurred. In addition, WOP reserve is explicitly required due to the total lives exposure. As a result, an even larger DLR was set up at end of year five based on the total policy benefits (the \$1,100.00/year ADL Benefit plus the \$500.00/year WOP benefit). Correspondingly, year five recorded the largest loss among the four methods, but it was followed by gradual gains due to the periodical release of the reserves in excess of the claim payments.

Modeling Approach 4 (*Model 4* in the exhibits) produces the most confusing results among the four models. Under the total lives exposure, ALR is not released upon claim. At the same time, since ALR is developed based on estimated benefit payments at each policy year instead of incurred claims, DLR is not needed at all. Correspondingly, the actual reserve balances, regardless of actual claim experiences, were exactly the same as those expected by the valuation model. Premiums collected and benefits paid, however, were still different between actual and expected. The income statement then showed early gains before the claim was incurred, and losses thereafter.

Figure 8 shows a condensed comparison of the impact different actuarial models can cause to the actual financial status, purely for impression, indicated by the differences of the plotted curves at the bottom. All the data are directly taken from **Figure 7**. The root cause of the variance is the deviation of experience from assumptions, not the model itself. The impact caused by the modeling approach is temporary, as proven by the grand total earnings over the life time of the product, which is the same \$3,000 loss under all the four models. However, the model does have an amplification effect on periodic variations. Recognizing that the experience will never emerge the same as assumptions and assumptions will never be able to predict the future realities perfectly for any company in any time, the existence of experience gain or loss is a business norm. And for this reason, the choice of actuarial models matters, even if they are all mathematically equivalent.

Figure 8: Summary of Financial Statements Impacts

Summary and Comparison: Actual Results									
Duration	Income Statement: Earning				Balance Sheet: Reserve				
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	
0									
1	254.63	144.63	293.90	144.63	245.37	355.37	206.10	355.37	
2	301.28	191.28	340.55	191.28	444.09	664.09	365.55	664.09	
3	359.59	249.59	398.85	249.59	584.51	914.51	466.70	914.51	
4	432.47	322.47	471.74	322.47	652.04	1,092.04	494.96	1,092.04	
5	(4,347.96)	1,592.04	(7,437.15)	413.58	5,500.00	-	8,432.11	1,178.46	
6	-	(1,100.00)	676.73	(1,109.86)	4,400.00	-	6,655.39	1,188.32	
7	-	(1,100.00)	676.73	(1,014.15)	3,300.00	-	4,878.66	1,102.47	
8	-	(1,100.00)	641.14	(894.52)	2,200.00	-	3,137.52	896.98	
9	-	(1,100.00)	552.17	(744.97)	1,100.00	-	1,485.35	541.95	
10	-	(1,100.00)	385.35	(558.05)	-	-	0.00	-	
Sum	(3,000.00)	(3,000.00)	(3,000.00)	(3,000.00)					



Implications

The legitimacy and validity of the models, no matter how different they appear to be, are mathematically and actuarially explainable. It is quite obvious once the technical jargon is stripped away as demonstrated in prior sections. However, the real-world business results are not just mathematical calculations and go beyond actuarial explanations. Periodic experience gains and losses (G/L) are inevitable. And even for the temporary differences, the consequences will be real and tangible and can reach far and deep in terms of impacts to earning guidance, analyst reactions and even executive compensations. Therefore, even if all models are equivalent, the choice of actuarial modeling approach in the real world should be a business decision, going beyond just mathematical implementation or accounting compliance. Business strategy, in addition to legal compliance, should determine which approach to choose, and consistency must be maintained in all financial reporting periods. During this process, the influence of an actuary should not be underestimated in constructing experience studies and setting up assumptions, determining accounting policies, and ultimately holding the right people accountable for key decisions. Choosing an actuarial model and recognizing the influence of actuaries are not just actuarial issues but rather a business choice.

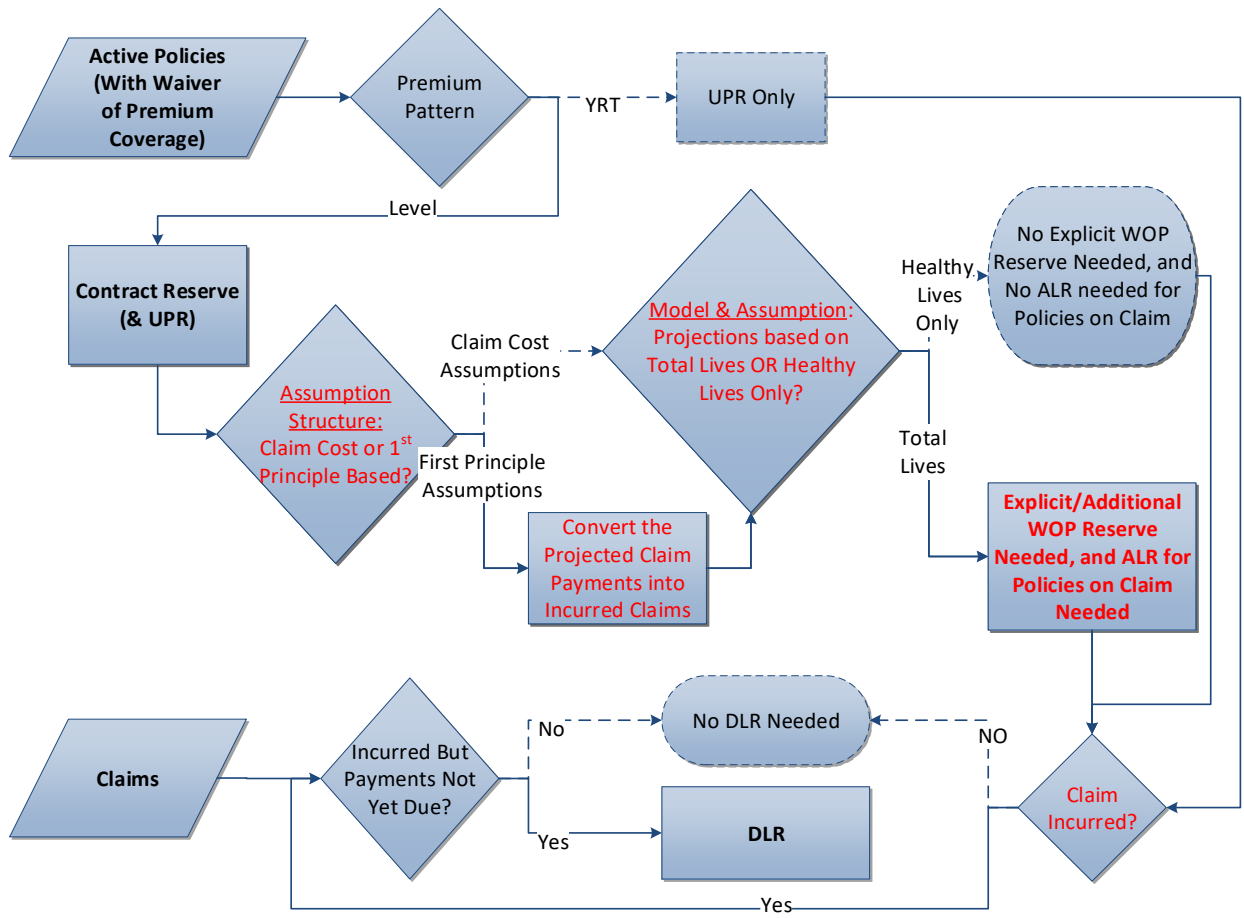
On the technical side, there are gray areas in implementing specific methodologies. A company may use certain customized approaches as appropriate or necessary with considerations for materiality and resources, however, ignorance or negligence should not be blamed for the lack of regulatory requirements or actuarial technologies. The difference is a company's faithful and mindful interpretation. According to the most recent Milliman survey on LTCI valuation (2016 Milliman Research Report: *Long-term Care Insurance Valuation: An Industry Survey of Assumptions and Methodologies*), the treatment of WOP in ALR calculation varies from the approach of "to increase benefit payments in the calculation to reflect

the cost associated with the waiver (waiver of premium is included in both premium and claims),” which reflects the opinion of 82 percent of the surveyed companies, to certain healthy lives modeling of “assuming that only active policyholders (versus both active and disabled policyholders) pay premiums (waiver of premium is excluded from both premium and claims).” On the DLR side, the survey discovered that 20 percent of respondents do not reflect waiver of premium in DLR. It’s hard to judge any individual company’s practice without knowing its assumptions and actuarial modeling details, but we could not agree more on the final comment in the survey: “It is important to carefully consider the treatment of waiver of premium in the ALR and DLR calculations.”

As a practice guidance, we recommend designing a flow chart to assist with the decision process of setting up ALR and DLR reserves for the A&H products with WOP benefits (see **Figure 9**):

- Start with active policies. The first decision is whether to hold the contract reserves or ALR. It is determined by premium pattern. If the product is priced with yearly renewable term (YRT) type of premium structure, then only unearned premium reserve (UPR) is needed. Otherwise, additional contract reserves are required to recognize the prefunding of claims in premiums.
- Once it’s determined to hold the additional contract reserves, the company must determine the assumption structure as the second decision-making point. The morbidity assumption can be overall claim cost factors, or certain more disciplined first principle assumptions including claim incidence and termination rates. If the latter, the model must convert the projected future claim payments into incurred claims at each policy duration as in interim step of ALR calculation.
- The third decision is about the in-force exposure used in assumption development and valuation premium projections. The assumption and valuation model must be constructed consistently. If only healthy lives are included, then no explicit or additional WOP reserve is needed, and ALR is not needed for policies on claims. For total lives, however, an explicit additional WOP reserve must be set up on top of the base policy reserve, and ALR cannot be released even when the policies are on claim.
- Since the benefits used in ALR are ultimately incurred claims, DLR will be required if the actual claims involve continuous losses.
- Then finally for claims that have already been incurred as of the valuation date, the decision is about the nature of the claim on whether it involves continuous losses in term of payments not yet due. DLR is required to cover those future benefit payments. Note that policies may also have various optional benefits and riders, e.g. death benefit, nonforfeiture benefit in form of return of premiums, etc. For those benefits, claims are supposed to be paid off once incurred therefore do not require the setup of DLR.

Figure 9: Flow Chat for Determining the Valuation Processes of A&H Products



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