MILLIMAN REPORT

Pricing considerations, opportunities, and product design under the VM-20 framework

for term life insurance and universal life insurance with secondary guarantees (ULSG)

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Caveats and limitations

This analysis is intended to be valid as of the date it has been prepared. Its future validity depends on the further development of market trends, regulations, and standards of practice.

The case studies that are developed in this report, including but not limited to product design, asset/liability assumptions, and methodology, are meant to be illustrative. It is certain that different companies will have different product designs and assumptions and may also apply different methodologies when calculating pricing measures. Accordingly, we caution the reader not to interpret the case study results as holding true for all products and in all situations.

Background

In the early 2000's the National Association of Insurance Commissioners (NAIC) began discussions regarding possible principle-based reserving (PBR) approaches for life insurance that would, for business issued at some point and going forward, replace the previous NAIC Model Regulation #830 (Regulation XXX or XXX reserves) and Actuarial Guideline 38 (AG38) calculations. Reserves under Regulation XXX and AG38 are widely considered significantly redundant for term life insurance (term) and universal life insurance with secondary guarantee (ULSG) products. Regulation XXX and AG38 employ conservative mortality assumptions, discount rates, net premiums, and policyholder behavior. The new reserve framework outlined in Chapter 20 of the Valuation Manual (VM-20) focuses largely on term and ULSG products, aiming to "right-size" the reserves by employing a principle-based approach. This new approach allows for the reflection of company experience in mortality and surrender rates and discount rates that are based on the company's actual investments and strategies. This new framework is the required reserving approach for all U.S. life insurance products issued starting in the year 2020.

The minimum reserve under VM-20 is effectively the maximum of three calculated values:

1. The net premium reserve (NPR)
2. The deterministic reserve (DR)
3. The stochastic reserve (SR)

The NPR is a formulaic reserve using prescribed assumptions for mortality, lapse, and discount rates, and sets the reserve floor. One significant distinction between this NPR and the XXX reserve calculations is the reflection of less conservative lapse assumptions in the calculation. The DR and SR are both principle-based calculations that allow for assumptions based on company experience for mortality and lapse, and discount rates to be based on either projected asset yields of the assets backing the reserve for the DR, or a discount rate reflecting the projected Treasury rates in the scenario path for the SR. Not all products will require all three components to be calculated. It is possible for certain lines of business or groups of policies to pass exclusions tests for the DR and SR components, which would allow the company to ignore those components when determining the minimum reserve requirement. ULSG products with material guarantees will generally not be expected to pass the stochastic exclusion test and will therefore require both the DR and SR to be calculated. Term products will generally be expected to pass the stochastic exclusion test but are explicitly restricted from using the deterministic exclusion test, and therefore must calculate a DR.

The new framework outlined in VM-20 will likely lead to some fundamental changes in the products available in the market. Some of these changes are clear, while others are yet to be explored or even contemplated. This paper explores some of the possibilities.

Challenges and opportunities

Under VM-20, there is now a direct link between policyholder behavior and realized mortality with minimum reserve levels. Additionally, assumptions used in the reserve calculation are updated as experience emerges. Poor emerging experience will have an additional cost, as higher-than-expected reserves will be required for the product. Beyond the direct impact that poor experience has on the economic return, the higher-than-anticipated reserves will further depress realized internal rates of return (IRRs) relative to original pricing targets. This second-order impact makes the assumptions used in pricing even more critical. Product repricing and product changes must now be more heavily scrutinized when setting assumptions.

However, this use of company experience also creates opportunities. Product designs that encourage certain behaviors can now have a positive impact on reserves and product economics. This creates an opportunity to consider new designs that achieve various policyholder objectives and/or achieve a more optimized result for the carrier.

In order to study this relationship, we analyzed product features for both ULSG and term products that add value for the client, but also potentially encourage behaviors beneficial to the carrier that could result in lower required reserves and improved profitability.

Implications for universal life with secondary guarantees

CASE STUDY DETAILS

The pricing analysis and associated charts and results in the following section are based on:

- Male, best nontobacco underwriting class, issue age 50
- A lifetime no lapse guarantee (unless otherwise specified)
- For charts and results pertaining to shadow account designs, the product is assumed to have a single shadow account

Net premium reserve

Background

The NPR for a ULSG product that is attributed to the secondary guarantee at any point in time is primarily a function of the funding ratio of that secondary guarantee and the calculated net single premium (NSP) at the valuation date. The NSP is defined as the PV of all expected future death benefits. The funding ratio for the secondary guarantee is defined as the ratio of the actual secondary guarantee (ASG) to the fully funded secondary guarantee (FFSG). The NPR is then determined by this formula:

$$NPR = Min\left[\frac{ASG_t}{FFSG_t}, 1\right] \times NSP_t - E_t$$

Where E_t is the expense allowance

The ASG and FFSG are separately defined for the two basic guarantee designs, shadow account designs and specified premium designs, as follows:

- Shadow account design
  - ASG: The current shadow account value
  - FFSG: The shadow account value that would be required for the guarantee to be considered fully paid up through the end of the guaranteed coverage period
- Specified premium design
  - ASG: The value of all premiums paid to date accumulated with any interest guaranteed in the contract
  - FFSG: The amount of premiums required to have been paid to date such that no future premiums are required to keep the contract in force through the end of the guarantee coverage period

Implications

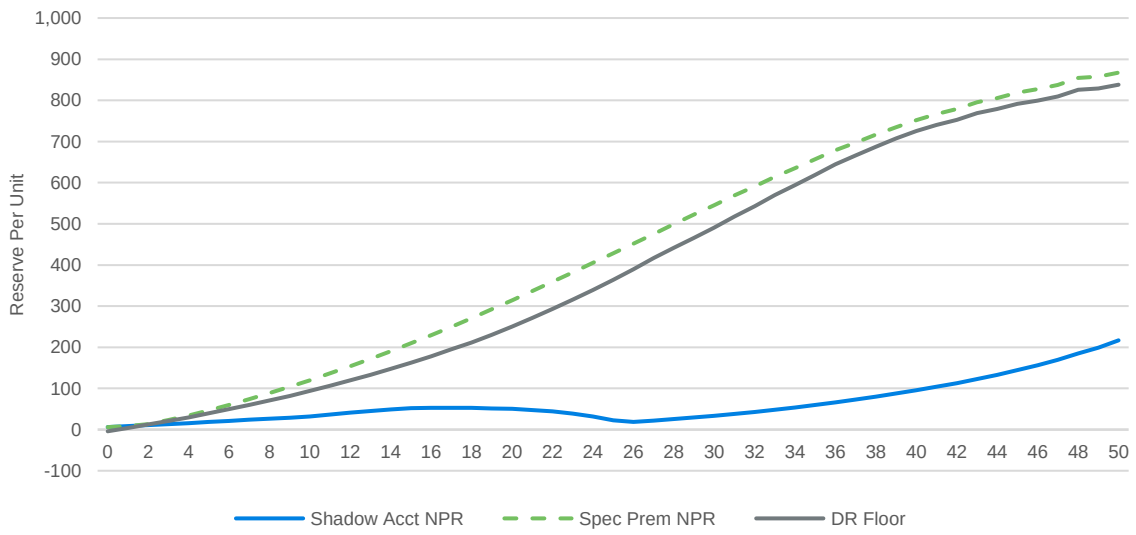
Considering this formulation of the NPR, it follows that designs that produce low funding ratios will produce a lower NPR. The definition of the ASG for specified premium designs requires that the accumulation of all past premiums is reflected. Therefore, the ASG will grow and the funding ratio will approach 100% as long as the policy pays the required premium. The definition of the ASG for shadow account designs, however, is a function of the shadow account balance, which is the accumulation of past premiums less all shadow account charges. Therefore, for any given premium level, the shadow account will be less than the accumulation of the paid premiums. This means that for an otherwise identical product in terms of premium, death benefit, and guarantee coverage, the shadow account design will have lower funding ratio than a specified premium design, both having the same NSP.

Furthermore, within shadow account designs, mechanics that result in lower ongoing shadow account balances will result in a lower funding ratio, and therefore a lower NPR. Consider a product design with level charges in the shadow account that are slightly less than the minimum required guarantee premium. The shadow account balance would remain small for the life of the contract, resulting in a low funding ratio. Under the XXX framework, to minimize reserves, carriers were compelled to develop products with minimum required premiums for shadow account products following a parallel pattern to the reserve mortality table. This led to shadow account charge structures

being largely focused on COI-based charges in a traditional increasing pattern. This is no longer the case under the VM-20 framework, so shadow account charges can shift more to level charges (e.g., per unit loads) that may encourage certain policy behaviors without a reserve penalty.

Figure 1 illustrates the NPR and DR per unit for a specified premium product and a shadow account product structured primarily with level charges that are identical in terms of no lapse guaranteed premium, death benefits, and guarantee coverage period.

FIGURE 1: NPR PER UNIT COMPARISON



As seen in Figure 1, the NPR for a shadow account product remains far below both the NPR for a specified premium design as well as the DR floor. The NPR becomes the prevailing reserve for this policy using a specified premium design. As shown in Table 1, this can have a material impact on the statutory IRR of the product:

TABLE 1: GUARANTEE DESIGN PRICING

GUARANTEE DESIGN	IRR
Shadow Account	12.1%
Specified Premium	7.7%

For an otherwise identical product in terms of premium, death benefit, and guarantee coverage, the IRR is more than 4% lower using a specified premium design rather than a shadow account design.

Using a shadow account with level charges, the NPR is effectively removed as a limiting factor in the product pricing. As a result, the focus can be shifted to product designs that are optimized in the context of the DR and SR calculations and truly designed with company and policyholder needs in mind.

While there have been discussions surrounding this arguably inequitable treatment of the two product design types in VM-20, there is no clear solution at the time of this research. The focus on this issue does not appear to be a high priority within the industry. As it stands, the current formulation of the NPR in VM-20 could eliminate specified premium designs from the market in favor of shadow account designs that will shift from COI-based charges to level (e.g., per unit) charges. Note that there is still likely to be a place in the market for COI-based designs including for annually increasing premium, short-term coverage, and limited pay situations.

Deterministic and stochastic reserves

Background

The deterministic reserve and stochastic reserve are both based on cash-flow projections using prescribed economic scenarios. The underlying assumptions used in the projections are generally based on company experience with margins. Where company experience lacks credibility, industry experience must either supplement (through credibility weighting) or dictate the assumption. For mortality, the assumption ultimately grades to a prescribed industry assumption. Each assumption must also contain margins to reflect uncertainty, which adds an additional layer of conservatism to that assumption.

For the DR, the projected cash flows are discounted at the projected net asset earned rate (NAER) on the portfolio underlying the block under a single prescribed economic scenario. The portfolio is constructed of existing assets at the beginning of the projection. At future points in time, the portfolio will change according to the modeled reinvestment and disinvestment strategy. For the SR, discounting is along the path of the one-year Treasury rate in effect at the beginning of the projection year multiplied by 105%. The investment portfolio and strategy also drives the accumulation of assets that is important for the SR calculation.

The SR is the CTE 70 of the greatest present value of accumulated deficiencies (GPVAD) using a set of stochastic scenarios that are generated using a prescribed scenario generator. For each stochastically generated scenario, the negative projected value of general account and separate account assets for each projection year is discounted to the valuation date. The maximum of those amounts is the reserve for that scenario (the scenario reserve). The scenario reserves are then ranked lowest to highest. The CTE 70 of these scenario reserves is the calculated SR for that valuation period.

While generally ULSG products will not pass the deterministic or stochastic exclusion tests, the underlying fundamentals, driven largely by assumptions, for both the DR and SR are the same. Therefore, the DR and SR reserves are expected to be affected similarly by varying product designs and assumption sets. As such, for simplicity, this analysis is performed with a focus on the DR only with the expectation that the relative outcomes will be similar for the SR.

PRODUCT DESIGN CASE STUDY: CASH VALUE ACCUMULATION

In the following case study, product designs with three cash value levels (low, medium, and high) under three lapse scenarios (low, medium, and high) are analyzed. The baseline results are the lowest cash value product with the lowest lapse assumption. The following charts illustrate the difference in future cash values and cumulative lapse rates:

FIGURE 2: PATTERN OF CASH VALUE PER UNIT, DEVIATION FROM BASELINE DESIGN

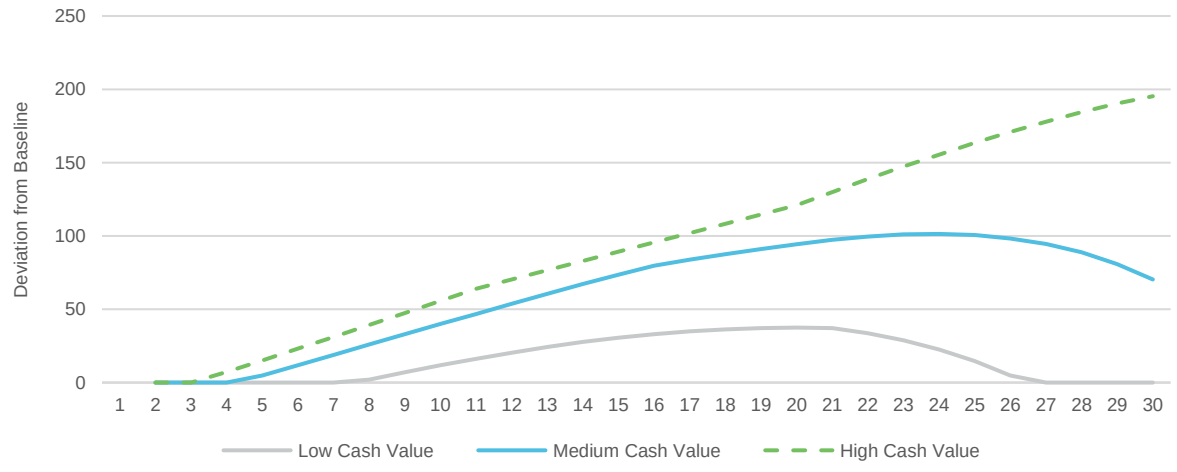


TABLE 2: CASH VALUE COMPARISON

20 YEAR* CASH VALUE AS % OF BASELINE	
Medium Cash Value	262%
High Cash Value	350%

*Cash values for all product versions decumulate later in the projection.

FIGURE 3: CUMULATIVE LAPSE COMPARISON (1000 STARTING UNITS)

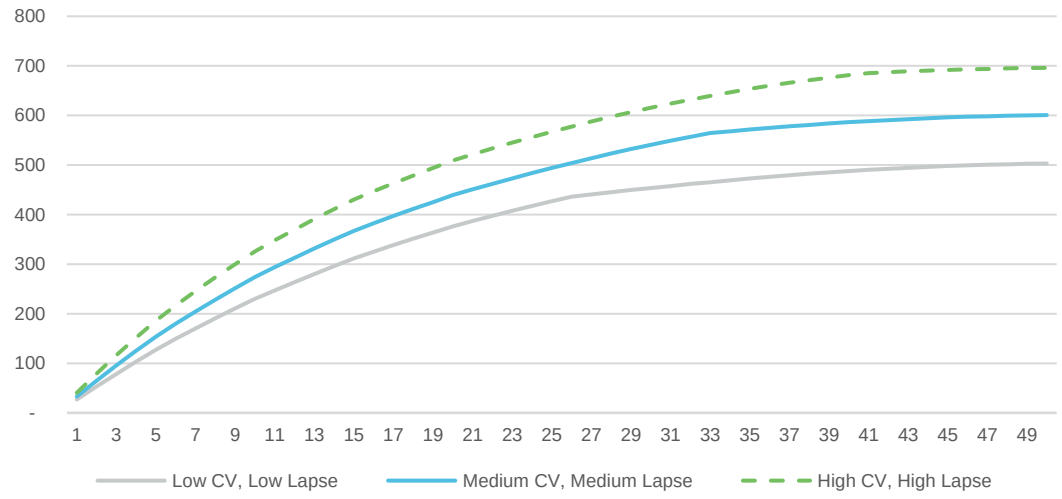


TABLE 3: LAPSE ASSUMPTION COMPARISON

CUMULATIVE LAPSE AS % OF BASELINE LOW CV LOW LAPSE	
20 Years	
Medium Cash Value, Medium Lapse	117%
High Cash Value, High Lapse	135%
50 Years*	
Medium Cash Value, Medium Lapse	119%
High Cash Value, High Lapse	138%

*As units decrease later in the projection, higher lapse rates are applied to fewer units in the high lapse scenarios. Therefore, cumulative lapse rates diverge at a decreasing rate.

PRIOR STATE: AG38

Under the AG38 framework, company experience has no impact on the level of minimum reserves. This removes incentive or, in some instances, creates a disincentive to design products that encourage behaviors that might be economically beneficial to the carrier. These economic benefits could, and likely would due to competitive pressures, then be passed on to policyholders in the form of better and/or more affordable benefits.

Excluded from the AG38 calculation is the economic impact of changing behavior when better cash value accumulation is introduced to a product. Higher cash value may generally be expected to result in higher lapse rates, which reduces the cost of the death benefit guarantee. First, having access to an attractive cash value will encourage surrender. Additionally, experience has shown lapse rates fall significantly as a premium paying policy becomes in-

the-money, which occurs when the account value is less than zero but the shadow account value remains funded. The longer the account value remains positive, the longer the period prior to falling in-the-money, and therefore the higher the expected lapse rate. These higher lapse rates reduce the economic cost of the death benefit guarantee. Under the AG38 framework, while the benefit of lower lapses would flow through pricing cash flows, there is minimal impact to the reserve and capital strain. The product simply offers a higher surrender benefit and therefore must charge a higher price. In a highly competitive market, this has driven cash values toward zero for most secondary guarantee designs and has led to the low lapse experience and assumptions typical of ULSG products.

The following charts show the impact on AG38 reserves per unit of the two higher lapse assumptions, as well as the subsequent impact on pricing:

FIGURE 4: LARGE ASSUMPTION IMPLICATION — AG38 RESERVE

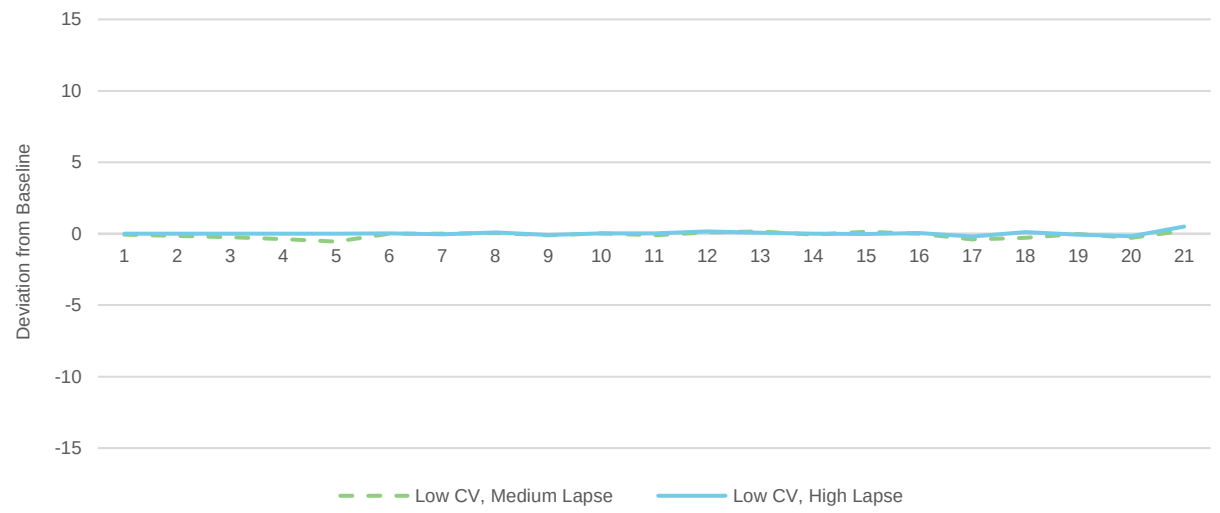


TABLE 4: LAPSE ASSUMPTION IMPLICATIONS — AG38 PRICING RESULTS

STATUTORY IRR WITH AG38 RESERVES

CASH VALUE	BASELINE LAPSE	HIGH LAPSE	HIGHEST LAPSE
Baseline	10.8%	11.5%	12.5%

As shown above, the lapse scenario has no material impact on reserves. While the statutory IRR is higher under the higher lapse scenarios, the impact is relatively minor relative to the change in the underlying assumption. The general high level of AG38 reserves overshadows much of the economic impact on the actual cost of the guarantee.

This reality of the AG38 framework resulted in a binary universal life product market:

1. Accumulation focused products
2. Death-benefit-guarantee-focused products

Accumulation-focused products

For an accumulation-focused product, the secondary guarantee represents an additional cost that is largely driven by high reserves resulting from the AG38 framework, and the cost of extended term insurance (ETI). The ETI is a result of shadow account products designed to minimize reserves under the AG38 framework. ETI is created when the policyholder ceases premium payments and the shadow account is funded beyond the actual account, which is generally the case. The policy remains in force after the account value is withdrawn or depleted until the shadow account is depleted. This cost is a function of underlying shadow account mechanisms, designed to minimize reserves, that allow material shadow account balances to accumulate over the base account value.

The additional costs of the excess reserves and the resulting ETI reduce the accumulation potential of the product.

Guarantee-focused products

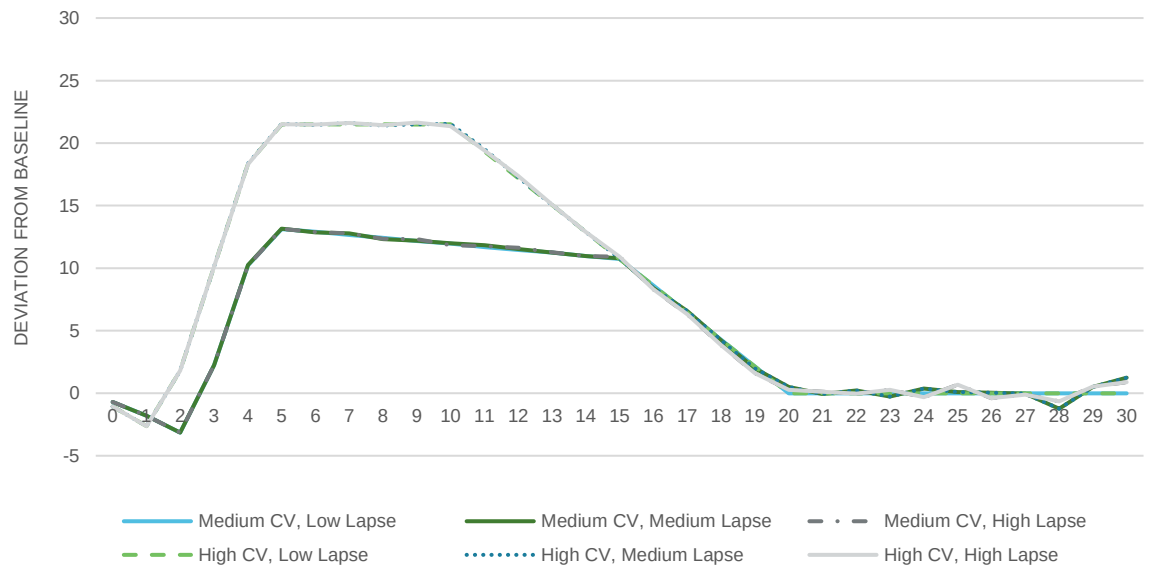
For a guarantee-focused product, the higher surrender value that would result from strong accumulation merely creates an additional cost that is driven by higher reserves and the additional surrender benefit. These costs would increase the required guarantee premium.

While adding a guarantee to an accumulation product will necessarily come with an economic cost, under the AG38 framework, the additional reserves required are far beyond the economic cost. Additionally, it stands to reason that the economic cost of a guarantee would be reduced on a product with higher cash value potential that encourages higher lapse, which is not reflected under AG38.

AG38: Adding cash value accumulation to a guarantee-focused product

Figure 5 illustrates the difference in the AG38 reserve per unit for two alternate ULSG products with medium and high cash value potential product over the baseline cash value product under a low lapse, medium lapse, and high lapse scenario. The outcome varies only slightly among the lapse scenarios, so the three lines for each cash value level appear to be stacked.

FIGURE 5: CASH VALUE IMPLICATIONS — AG38 RESERVE



As shown, adding accumulation potential to a product with a material secondary guarantee has a significant impact on the reserves. The impact is not affected by the specific lapse scenario. Therefore, the pricing impact is well beyond the economic impact of the change. Adding accumulation potential can significantly lower the IRR as shown in Table 5:

TABLE 5: CASH VALUE IMPLICATIONS — AG38 PRICING RESULTS

STATUTORY IRR WITH AG38 RESERVES			
CASH VALUE	**BASELINE LAPSE**	**HIGH LAPSE**	**HIGHEST LAPSE**
Baseline	10.8%	11.5%	12.5%
Medium Cash Value	9.0%	9.3%	9.7%
High Cash Value	8.0%	8.1%	8.2%

To achieve target profitability, this design would require a significant increase in the guaranteed premiums that is likely to exceed the economic value of the added surrender benefits. Adding a stronger death benefit guarantee to an accumulation-focused product would have similar inefficiencies.

As a result, a product that attempts to offer attractive accumulation and a material guarantee will not be able to do so and achieve target profitability. To achieve target profitability, such a product would have neither attractive accumulation nor a low guaranteed premium.

CURRENT STATE: VM-20

In contrast with AG38, company experience does have a direct impact on reserves under the VM-20 framework. The following charts show the impact on the DR per unit under the two higher lapse scenarios with the baseline low cash value, as well as the subsequent impact on pricing.

FIGURE 6: LAPSE ASSUMPTIONS IMPLICATIONS — VM-20 DR

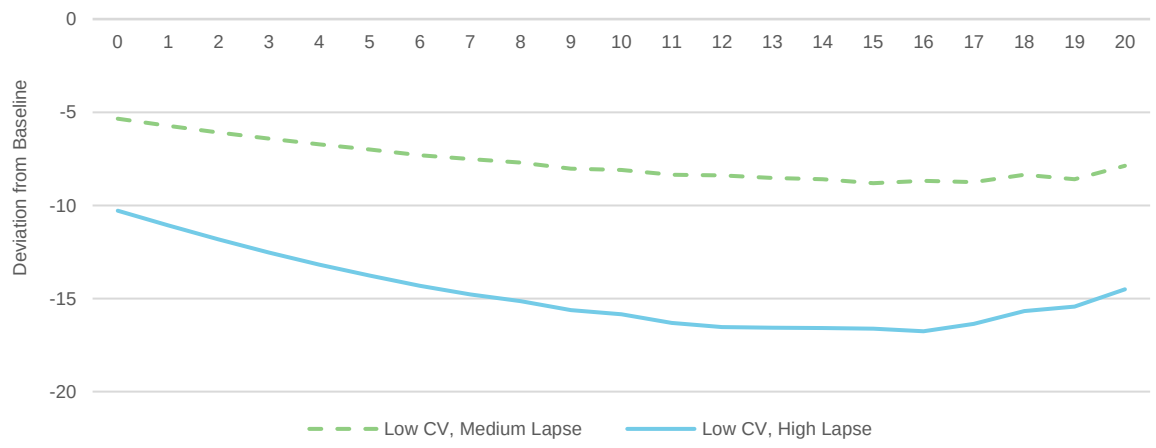


TABLE 6: LAPSE ASSUMPTIONS IMPLICATIONS — VM-20 PRICING RESULTS

STATUTORY IRR WITH VM-20 RESERVES			
CASH VALUE	**LOW LAPSE**	**MEDIUM LAPSE**	**HIGH LAPSE**
Low Cash Value	11.1%	18.5%	27.2%

As shown above, the lapse assumption has a significant impact on reserves. Unlike the AG38 results, the impact to the statutory IRR can be significant, as the lapse scenario impacts not only the true cost of the benefit but also the level of required reserves. This also demonstrates the importance of assumptions under the VM-20 framework. This second-order impact can result in realized profitability significantly different from pricing when emerging experience differs from the pricing assumption.

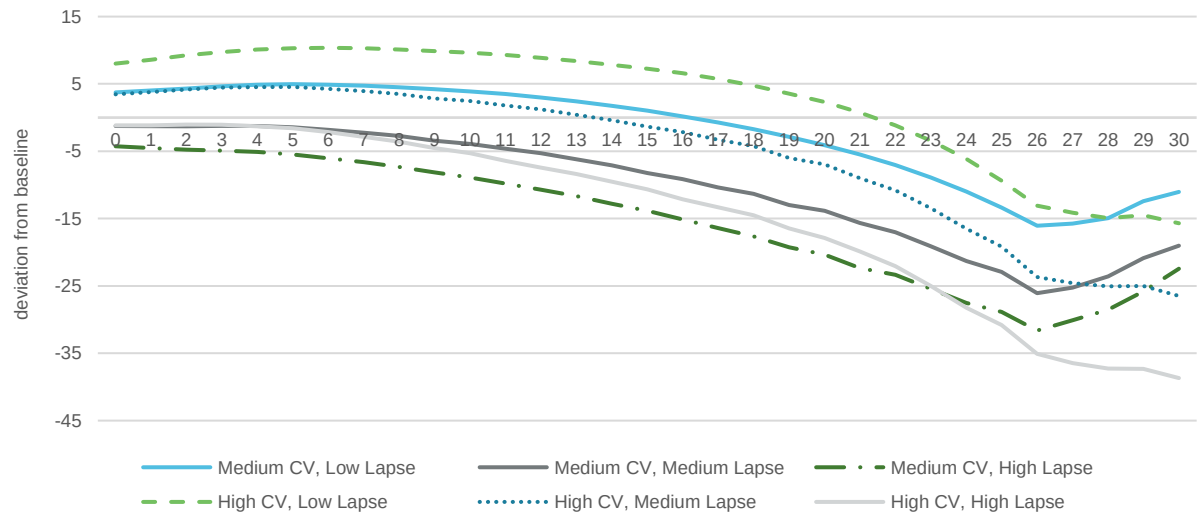
This illustrates how the effect of lapse rates on the DR and SR can create incentive to design products that encourage certain behaviors. For an otherwise identical guarantee, the reserves attributable to the guarantee for a product that encourages higher lapses by offering better accumulation potential should be lower than a product that minimizes cash value accumulation. The DR and SR should be lower for a product if the marginal increase in surrender benefits is less than the marginal decrease in guaranteed death benefits. Additionally, a product designed with level charges in the shadow account to minimize the NPR could also minimize or effectively eliminate the cost of the shadow extended term insurance, where coverage continues for a material period after the policy account value goes to zero. This lower reserve and benefit cost can help to offset the cost of offering better cash value accumulation.

There could now be an opportunity to design a product that offers both attractive cash value accumulation and an attractive guarantee premium for the secondary guarantee.

VM-20: Adding cash value accumulation to a guarantee-focused product

Figure 7 illustrates the difference in the DR per unit for the two high cash value products over the baseline cash value product under a baseline lapse, high lapse, and highest lapse scenario:

FIGURE 7: LAPSE ASSUMPTION IMPLICATIONS — VM-20 DR



As shown here, adding accumulation potential with no adjustment to lapses does significantly increase reserves. However, the lapse assumption has a significant impact. The medium cash value product has lower reserves for the entire projection under both of the higher lapse scenarios. Even the high cash value product has lower reserves for the entire projection under the high lapse scenario and for much of the projection under the medium lapse scenario.

Note that even in the low lapse scenarios, the medium and high cash value product's reserves still eventually fall below the baseline cash value product. This occurs because we assumed a dynamic lapse effect that reduces lapse rates even further when the account value falls below zero. The medium and high cash value products will take longer for the account value to deplete. Therefore, while the baseline product has lower cash values early on, it also more quickly reaches that downward lapse adjustment. This will cause the DR to rise more quickly than the higher cash value products and eventually surpass those products' DR. This effect reverses for the medium cash value product as the account value eventually depletes and the dynamic lapse adjustment applies. The per unit reserves for all product variations eventually converge.

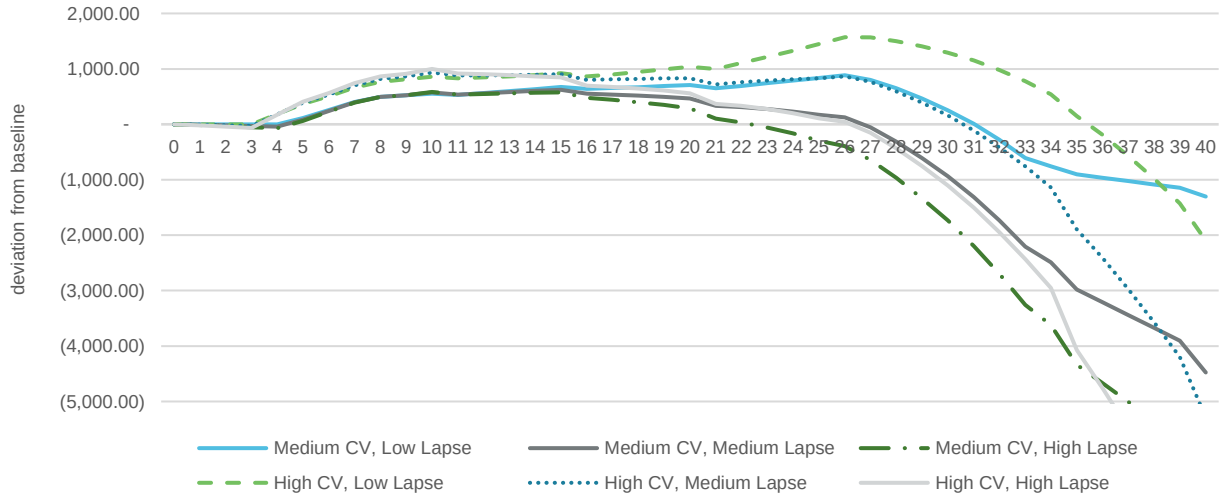
TABLE 7: CASH VALUE IMPLICATIONS — VM-20 PRICING RESULTS

STATUTORY IRR WITH VM-20 RESERVES			
CASH VALUE	**LOW LAPSE**	**MEDIUM LAPSE**	**HIGH LAPSE**
Low Cash Value	11.1%	18.5%	27.2%
Medium Cash Value	8.4%	11.7%	15.3%
High Cash Value	6.7%	8.1%	10.9%

The higher lapse rates associated with higher cash values can reduce both the economic cost of the guaranteed death benefit and the reserves such that the IRR remains similar to the low cash value product. However, as expected, the results of the high cash value products without any increase in lapse rates would be materially worse. Under this set of assumptions, the medium and high cash value products can be viable alternatives under the assumption that the added cash values will drive more surrenders.

The economics driving the DRs and the pricing results can be observed in the net cash outflows (Policy Holder Benefits + Expenses – Premiums) of the different product scenarios. Figure 8 illustrates the deviation in cash outflows from the baseline product under the different lapse scenarios:

FIGURE 8: NET CASH OUTLOW DEMONSTRATION (LESS BASELINE)



As expected, the net cash outflows early in the projection for the higher cash value products under any lapse assumption are greater than the baseline product. However, with fewer persisting policies in the projections under the higher lapse scenarios, benefits paid are significantly lower later in the projection and the net cash outflows are lower than the baseline product. As seen earlier, this is reflected in the DR calculation resulting in lower reserves.

This again highlights the importance of the underlying behavioral assumptions, regardless of the product design. Experience that deviates from expectations will not only carry an economic impact but also impact the level of minimum reserves. We see here the leveling effect of this secondary impact.

This new dynamic resulting from the implementation of VM-20 could lead to fundamental changes in the UL marketplace. With any pricing exercise using VM-20 reserves, under any given set of assumptions, there is now an optimization exercise to be performed. Lower cash value is no longer necessarily better for a product with a material guarantee.

Furthermore, outside the realm of optimization, while the best cash value accumulation products may not have an attractive guarantee, and the cheapest guarantee products may not have the best cash value accumulation, there may now be an opportunity to go to market with a third product category. One that offers attractive enough cash value accumulation and a reasonably priced guarantee for those that desire some level of guarantee and accumulation potential.

PRODUCT DESIGN CASE STUDY: LIMITED GUARANTEE PERIODS

Currently, the ULSG market is driven by guarantees to age 90 or older, with a strong focus on lifetime guarantees and guarantees to age 100. Current ULSG product designs, which were largely driven by the desire to minimize AG38 reserves, result in a suboptimal tradeoff between the decrease in guarantee premiums and the shorter guarantee period length. Premiums are driven by both shadow account mechanics and the underlying economics (i.e., earned rates, mortality, lapse, etc.). The disconnect between these two factors makes it difficult to set premiums that achieve consistent profitability and minimize the guaranteed premiums across all ages and guarantee period lengths. Given higher guarantee premiums on ULSG products, and with limited opportunity to build cash value over shorter periods, term insurance is generally the preferred option when lifetime coverage is not needed.

However, using a level charge shadow account design under the VM-20 framework, the premium reduction resulting from a shorter guarantee period should reflect the change in the underlying economics. Using a level charge shadow account structure removes the shadow account mechanics as a limiting factor. Similarly, the minimum reserve levels will also reflect these economics. This fundamentally aligns the pricing of a limited guarantee length ULSG product with a term product.

The table below illustrates the premium reduction at a given level of profitability for less-than-lifetime guarantee periods for our representative pricing cell, male issue age 50, best nontobacco class. For the purposes of this demonstration, we have assumed that all policies will lapse at the “guaranteed to” age.

TABLE 8: LESS-THAN-LIFETIME GUARANTEE PREMIUM COMPARISON

	PREMIUM CHANGE		
SCENARIO	% OF LIFETIME GUARANTEE	% OF PREVIOUS GUARANTEE	% OF NEXT GUARANTEE
Lifetime Guarantee (Age 121)	100%		102%
Guarantee to Age 100 (50 Years)	98%	98%	107%
Guarantee to Age 95 (45 Years)	92%	94%	118%
Guarantee to Age 90 (40 Years)	78%	85%	127%
Guarantee to Age 85 (35 Years)	62%	79%	136%
Guarantee to Age 80 (30 Years)	45%	73%	138%
Guarantee to Age 75 (25 Years)	33%	72%	133%
Guarantee to Age 70 (20 Years)	25%	75%	

As shown here, there is little benefit of reducing the lifetime guarantee option to an age 100 or age 95 guarantee, with only a 2% and 8% reduction in premium, respectively. However, as the guarantee period continues to shorten, significant reductions in guarantee premiums occur. A guarantee to age 80 requires less than half the premium of a lifetime guarantee. A guarantee to age 70 requires slightly more than half the premium required for a guarantee to age 80.

It is notable that the largest decrease in premium on a percentage basis comes from moving from a 35-year guarantee to 30-year and 25-year guarantees. This is just outside the insurance period range that a 50-year-old might expect to find in the typical retail term insurance market.

Additionally, while the coverage of the limited guarantee period ULSG products under this framework would be aligned with term insurance, the premiums developed in the guarantee to age 70 analysis above are materially higher than term insurance premiums that we observe for an otherwise identical 20-year term pricing cell. This is a result of the underlying assumptions used. The assumptions used in the above analysis for the shorter guarantee periods were the same as the assumptions for a product with a lifetime guarantee. Using these assumptions leads to higher premiums than what would be seen using assumptions driven by the experience of typical term insurance products (in particular, ULSG lapse rates are lower than typically seen on term products). The question becomes: Is that appropriate? Are policyholders of a 20-year guarantee ULSG product more likely to behave as 20-year term policyholders or guarantee to age 100 ULSG policyholders? This is a key question for companies to consider when exploring the design and marketing of a limited term ULSG.

Assuming that the ULSG charges are structured to incentivize similar behavior to term beyond the guarantee to age (for simplicity, we are comparing only the period covering the guarantee to age), it stands to reason that the term assumptions should be more appropriate for the ULSG product. Naturally, this leads to the question of what assumption set is most appropriate for the interim guarantee to ages—for instance, to age 85. If the assumptions for guarantee to age 70 should align with term assumptions, and if the ULSG assumptions are based on guarantee to age 100, it stands to reason that assumptions for guarantee to age 85 should be somewhere in between.

By using the level charge ULSG shadow account structure discussed previously in this analysis, the NPR is less likely to drive the minimum reserve for ULSG than for term insurance. Using an identical assumption set, the DR will be the same for the term and ULSG products. Thus, with the reserve for the ULSG product lower than the equivalent term insurance product and the underlying economics otherwise equal, the guarantee premiums for a shorter guarantee ULSG product targeting a given level of profitability should be equal to or lower than those of an equivalent term product. This suggests that ULSG products with shorter guarantees could offer superior value and flexibility over term insurance.

To illustrate this, a 20-year ULSG product was priced using assumptions associated with a competitive lifetime guarantee ULSG product similar to one seen in the market today at a premium level associated with a competitive 20-year term product similar to that seen in the market today. The major assumptions were then changed one at a time to align with the assumptions associated with the term product.

TABLE 9: ULSG TO TERM PRICING WATERFALL

20-YEAR ULSG WITH TERM ASSUMPTIONS	
ASSUMPTION SET	**IRR**
All ULSG Assumptions	-1.3%
+Term Mortality	5.2%
+Term Commissions	8.7%
+Term Expenses	9.5%
+Term Lapses (All 20-Year Term Assumptions)	11.5%
Baseline Term Product Profitability	**10.5%**

The 20-year guarantee ULSG product priced at a premium level comparable to a 20-year term product using assumptions of a lifetime guarantee ULSG shows very poor profitability. However, after applying all the major assumptions associated with the term product, as a result of the lower NPR, the ULSG IRR exceeds that of the term product under the VM-20 framework.

This again highlights the importance of assumption setting and understanding the impact of product changes. While VM-20 presents an opportunity and flexibility to design products not limited by non-economic reserves, understanding the impact of product changes on behavior is key. To price a shorter guarantee product with premiums competitive against a term product, the assumption must first be made that the experience will mimic that of the equivalent term product. In making this assumption, the impact of how the product is marketed and sold should be taken into account.

The fundamental question here all boils down to a classic “chicken or the egg” dilemma. However, the answers could result in fundamental changes in the ULSG and term insurance markets.

Implications for term insurance

CASE STUDY DETAILS

The pricing analysis and associated graphs and results in the following section are based on:

- Male, issue ages 35 and 55
- Best underwriting class
- 20-year level term

Net premium reserve

The NPR calculation is a prescribed calculation with little room for flexibility in its application. With the NPR unlikely to drive product design changes for term, it was therefore not a focus of this research.

Deterministic and stochastic reserve

Background

The DR and SR are both based on cash-flow projections using prescribed economic scenarios. The underlying assumptions used in the projections are generally based on company experience with margins. Where company experience lacks credibility, industry experience must either supplement (through credibility weighting) or dictate the assumption. For mortality, the assumption ultimately grades to a prescribed industry assumption. Each assumption must also contain margins to reflect uncertainty, which adds a layer of conservatism to each assumption. The projections reflect an initial asset portfolio constructed of existing assets backing the projected liabilities. At future points in time, the portfolio will change according to the modeled reinvestment and disinvestment strategy.

The DR is defined as the present value of all benefits under the contract less all considerations, discounted at the net investment earned rate (NAER) of the projected assets under a single prescribed economic scenario. For term products, post-level term (PLT) period cash flows are only allowed to be incorporated into the DR adjusted for the credibility of the PLT experience. The VM-20 regulation specifically dictates that term contracts sold after 1/1/2017 do not have PLT credibility. Therefore, PLT cash flows are only incorporated during the LTP if they increase the DR (i.e., the present value of cash outflows exceeds the present value of cash outflows).

The SR is the CTE 70 of the greatest present value of accumulated deficiencies (GPVAD) across projections run using a set of stochastic scenarios that are generated using a prescribed scenario generator. For each stochastically generated scenario, the negative projected value of general account + separate account assets for each projection year is discounted to the valuation date at 105% of the Treasury rate at the valuation date. The maximum of those amounts is the reserve for that scenario (the scenario reserve). The scenario reserves are then ranked lowest to highest. The CTE 70 of these scenario reserves (approximately the average of the highest 30% of scenario reserves) is the SR for that valuation period.

Generally, term insurance products are expected to pass the stochastic exclusion test. Therefore, the SR was not included as part of our analysis of term products. However, term products are explicitly prohibited from relying on the deterministic exclusion test. All term products must calculate a DR, and any excess over the NPR will increase the minimum reserve requirement.

PRODUCT DESIGN CASE STUDY: POST-LEVEL TERM (PLT) PREMIUM PATTERNS

Currently, term products commonly offer premiums after the initial level term period that increase annually and track the valuation mortality curve. This is driven by the segmented reserve calculation under the XXX framework. For each new premium level, a new segment is created. For each segment, the reserve is calculated as a net premium reserve. If the gross premiums for segments in the post-level period are insufficient to cover the valuation mortality cost, additional reserves will need to be held during the level term period (LTP). Annual segments with premiums that are guaranteed to grow relative to the reserve mortality assumption serve to minimize reserves in the post-level period and ensure that there will be no additional reserves required during the LTP.

There are two common post-level premium patterns used to achieve this:

1. Post-level premiums are set to a multiple of the valuation mortality (YRT pattern)
2. Post-level premiums linearly grade to a multiple of the valuation mortality over a specific number of years (linear grading)

With no segmented reserves or the need to ensure annual segments under VM-20, it is worth further exploring other PLT premium patterns. In addition to the two common PLT premium patterns mentioned above, this case study focuses on a pattern of offering a new LTP at various premium levels after the initial LTP. Unlike the other two patterns, a new level period does not result in annual segments under the XXX framework.

Specifically, the following PLT premium patterns are analyzed:*

1. Immediate jump to YRT @ 200% of 2017 CSO
2. Five-year grade to 200% of 2017 CSO
3. New 10-year level term period
   - Scenario A: 200% of 2017 CSO at start of new LTP (i.e. same initial jump as pattern 1)
   - Scenario B: 160% of 2017 CSO at start of new LTP
   - Scenario C: 140% of 2017 CSO at start of new LTP
   - Scenario D: 100% of 2017 CSO at start of new LTP

*Note that the percentages of the 2017 CSO are approximate here. The premiums generally round to the nearest 10% of the percentage of 2017 listed.

The following tables provide some background on the patterns subject of this analysis.

POST-LEVEL TERM PREMIUM PATTERN	YEARLY RENEWABLE TERM (YRT)	LINEAR GRADING TO YRT	NEW LEVEL TERM PERIOD
Advantages	XXX reserves: Creates annual segments after the LTP that follow mortality curve to minimize reserves during and after the LTP.	XXX reserves: Creates annual segments after the LTP that follow mortality curve to minimize reserves during and after the LTP. Smaller initial premium jump reduces shock lapse and anti-selection.	Attractive option for client who needs to extend coverage, but doesn't require permanent insurance.
Disadvantages	Not attractive for healthy individuals. Large premium jump results in large shock lapse and extreme anti-selection. Highly volatile outcomes.	Still ultimately ends up at YRT pattern, which is not attractive for healthy individuals. Anti-selection delayed, not eliminated.	Premium jump result in large shock lapse, and lower subsequent premium (compared to YRT cases) lowers profitability. XXX reserves: Lower premium jumps (compared to YRT cases) increase redundant reserves during LTP.

As this analysis focuses on the impact of the PLTP, the key assumptions driving pricing results generally surround two primary factors:

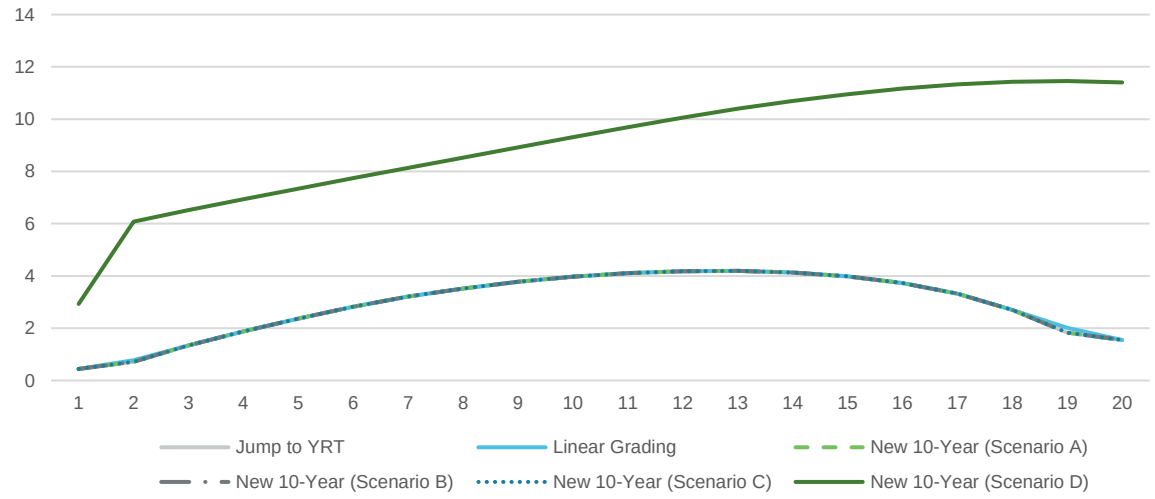
Key assumptions:

- Shock lapse
- PLT mortality and anti-selection effect

For this analysis, these assumptions were grounded in the pricing of a typical competitive 20-year term product. For illustrative purposes, adjustments were made to these assumptions to account for the newly tested premium patterns based on actuarial judgement. Any company should perform its own due diligence and use its own judgement when developing its assumptions.

The following charts illustrate the impact on the reserves during the LTP for the PLT premium patterns under both XXX and VM-20:

FIGURE 9: XXX RESERVES PER UNIT DEMONSTRATION — ISSUE AGE 35



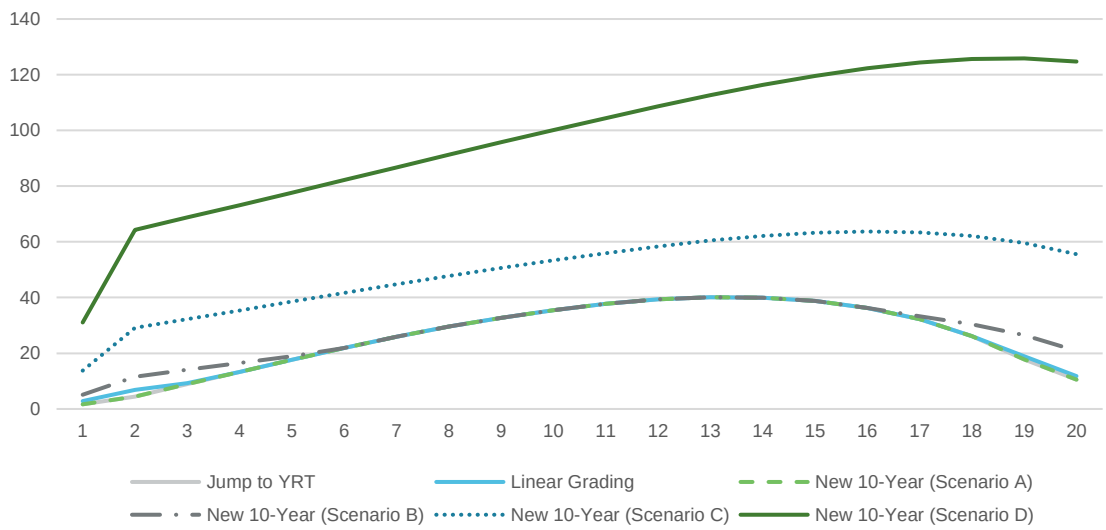
Note that five of the six premium patterns mostly overlap in the bottom section of the graph. The top line is only the new 10-year premium pattern scenario D.

As shown above, the PLT premium pattern has no effect on the XXX LTP reserve for three of the five alternate patterns. For the immediate jump to YRT pattern, annual segments with premiums sufficient to reserve mortality cost results in no additional reserve during the LTP. While difficult to see, the linear grading pattern does have a slight impact on reserves during the LTP (see the green line peeking out from behind the blue) because the early annual PLT segments are not sufficient to cover the reserve mortality. This impact would be larger if a longer grading period were chosen. However, this impact is minimal, as the premium pattern still has a close relationship to the reserve mortality, and the linear grading substantially minimizes reserves both during and after the LTP. In three of the four premium levels for the new 10-year LTP, there is no impact on LTP reserves. While the PLT segments are 10 years rather than annual, the premiums are still sufficient to cover the reserve mortality cost for the segment. However, as demonstrated in scenario D, which has the lowest premium level tested, at a certain premium level, the premium is not sufficient to cover the reserve mortality. This results in a significant impact on the reserve during the LTP.

While the immediate jump to YRT and linear grading patterns by definition follow the reserve mortality curve through annual segments, the new 10-year term with 10-year segment in the PLTP does not explicitly follow such a curve.

Figure 10 illustrates the same premium patterns for a male issue age 55, where the new LTP begins at the steeper part of the mortality curve.

FIGURE 10: XXX RESERVES PER UNIT DEMONSTRATION – ISSUE AGE 55

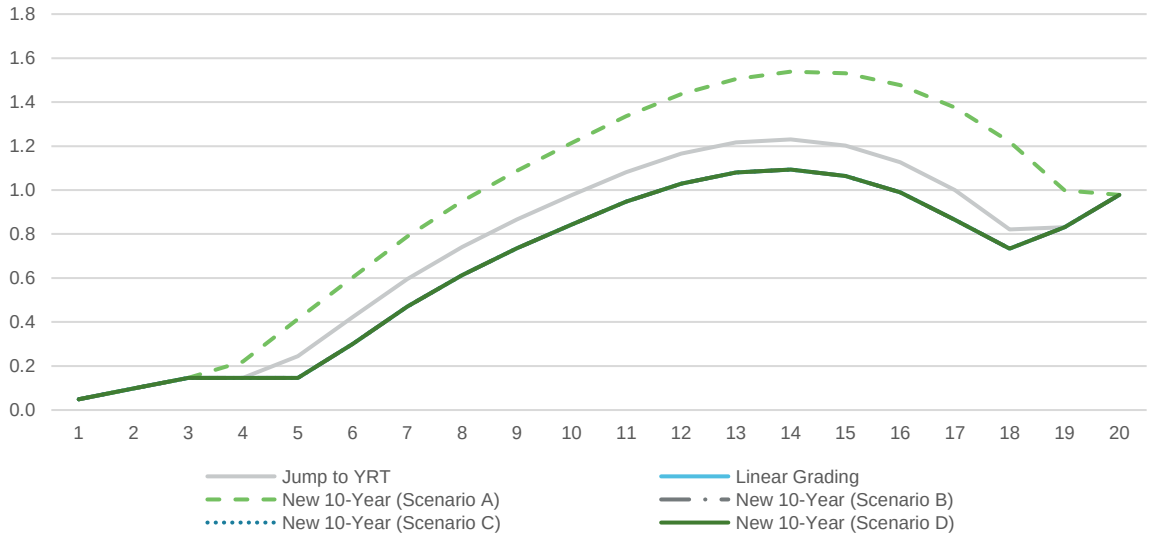


Similar to the issue age 35 pricing cells, compared to the immediate jump to YRT, the linear grading pattern has minimal impact on XXX reserves. However, three of the four new LTP scenarios increase reserves during the LTP. Scenarios C and D have a significant impact on reserves.

This effect would appear at even younger issue ages using the 2001 CSO, which has a steeper curve at the older ages than the 2001 CSO. While use of the 2017 CSO will not overlap with the requirement to compute XXX reserves, the switch to the 2017 CSO in isolation would have alleviated some of this effect at younger issue ages under the XXX framework.

The following charts illustrate the minimum reserves for the same products under the VM-20 framework, starting with the issue age 35 pricing cell.

FIGURE 11: VM-20 RESERVES PER UNIT DEMONSTRATION — ISSUE AGE 35

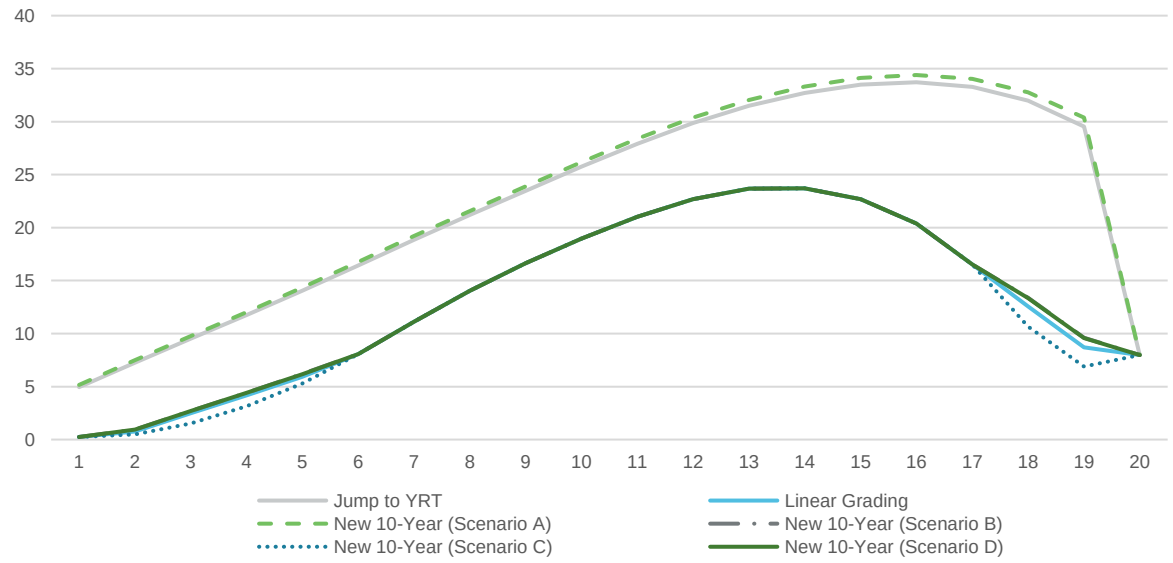


Note first that the per unit reserves under the VM-20 framework are significantly lower than under the XXX framework, peaking at under 1.6 per unit for VM-20 compared to over 11 for XXX.

Here for the issue age 35 pricing cell, the reserves are the same for 4 of the 6 PLT premium patterns. As mentioned above, PLT cash flows can only serve to increase, not decrease, the DR. The PLT premium pattern itself has no effect on the DR during the LTP if the PLT present value of cash inflows exceeds the present value of cash outflows. This is the case for all patterns with the exception of the immediate jump to YRT and new 10-year term scenario A patterns.

Additionally, it is important to note that an increase in reserve during the LTP does not necessarily indicate expected PLT losses. The reserve calculation contains margins for conservatism, which can result in the present value of cash outflows exceeding the present value of cash inflows in the reserve calculation, where this would not be expected under best-estimate assumptions.

FIGURE 12: VM-20 RESERVES PER UNIT DEMONSTRATION — ISSUE AGE 55



As is the case with XXX reserves, the steepness of the curve at older ages does have an impact on the VM-20 reserve. For the issue age 55 pricing cell in the chart above, only the new 10-year term scenario C sees no additional reserves driven by the PLT cash flows during the LTP. For the other five patterns, the present value of PLT cash outflows exceed the present value of PLT cash inflows for all or part of the LTP resulting in various levels of mostly minor reserve differences.

While VM-20 also has additional reserves during the LTP driven by the PLTP, note the different relative levels of the six patterns in Figure 12 compared to the same for XXX. In the XXX case, the new 10-year term scenarios C and D generate the highest level of additional reserves during the LTP. Under VM-20, these two patterns have the lowest, or near the lowest, level of reserves during the LTP. Similarly, the immediate jump to YRT generates the lowest level of additional reserves during the LTP under the XXX framework but generates the highest level of additional reserves during the LTP under the VM-20 framework.

Table 10 summarizes the impact on pricing of these reserve dynamics under both XXX and VM-20 for the issue age 35 pricing cell.

TABLE 10: PRICING RESULTS — ISSUE AGE 35

	VM-20			XXX		
DESCRIPTION	STATUTORY IRR	PRE-TAX PROFIT MARGIN	AFTER-TAX PROFIT MARGIN	STATUTORY IRR	PRE-TAX PROFIT MARGIN	AFTER-TAX PROFIT MARGIN
YRT Pattern 200% 2017 CSO	8.2%	6.1%	4.2%	5.4%	6.1%	3.8%
Five-Year Grading 200% 2017 CSO	10.7%	13.1%	9.7%	6.3%	13.1%	9.4%
New Term – 200% 2017 CSO (Scenario A)	7.1%	5.4%	3.6%	5.3%	5.4%	3.2%
New Term – 160% 2017 CSO (Scenario B)	10.4%	10.5%	7.7%	6.0%	10.5%	7.3%
New Term – 240% 2017 CSO (Scenario C)	11.2%	13.2%	9.8%	6.4%	13.2%	9.4%
New Term – 100% 2017 CSO (Scenario D)	10.4%	10.6%	7.7%	5.0%	10.6%	6.4%

Note on pre-tax profit margin: While the statutory IRRs are materially different under the two different reserve frameworks, there is no impact on the pre-tax profit margin.

The only difference between the pricing runs are the reserves. Differences in gains and losses from period to period driven by the differences in reserves are a matter of timing. The only difference in income beyond this is the change in investment income generated on the difference in reserves. Since the discount rate used to present value the profit exactly aligns with the earned rate generating additional investment income earned on any additional reserves held, the time value related to the timing of reserves is eliminated. Therefore, on a pre-tax, present value basis, $1 in additional reserves is offset by exactly $1 of reserves released in the future. Thus, there is no impact on the total PV of income, regardless of the reserve framework.

Analyzing profitability attributable to the LTP and PLTP provides additional insight. Table 11 shows the present value of after-tax profit for both the LTP and PLTP.

TABLE 11: LEVEL TERM PERIOD VS POST-LEVEL TERM PERIOD PV STATUTORY PROFIT – ISSUE AGE 35

	VM-20		XXX	
DESCRIPTION	PV PROFIT LTP	PV PROFIT PLTP	PV PROFIT LTP	PV PROFIT PLTP
YRT Pattern 200% 2017 CSO	146,172	16,928	132,405	16,981
Five-Year Grading 200% 2017 CSO	146,709	272,247	132,339	272,067
New Term – 200% 2017 CSO (Scenario A)	145,027	(8,192)	132,339	272,067
New Term – 160% 2017 CSO (Scenario B)	146,711	165,729	132,404	165,544
New Term – 240% 2017 CSO (Scenario C)	146,710	269,077	132,404	268,754
New Term – 100% 2017 CSO (Scenario D)	146,710	171,738	94,213	170,918

The following table shows the IRR over the LTP only.

TABLE 12: LEVEL TERM PERIOD STATUTORY IRR – ISSUE AGE 35

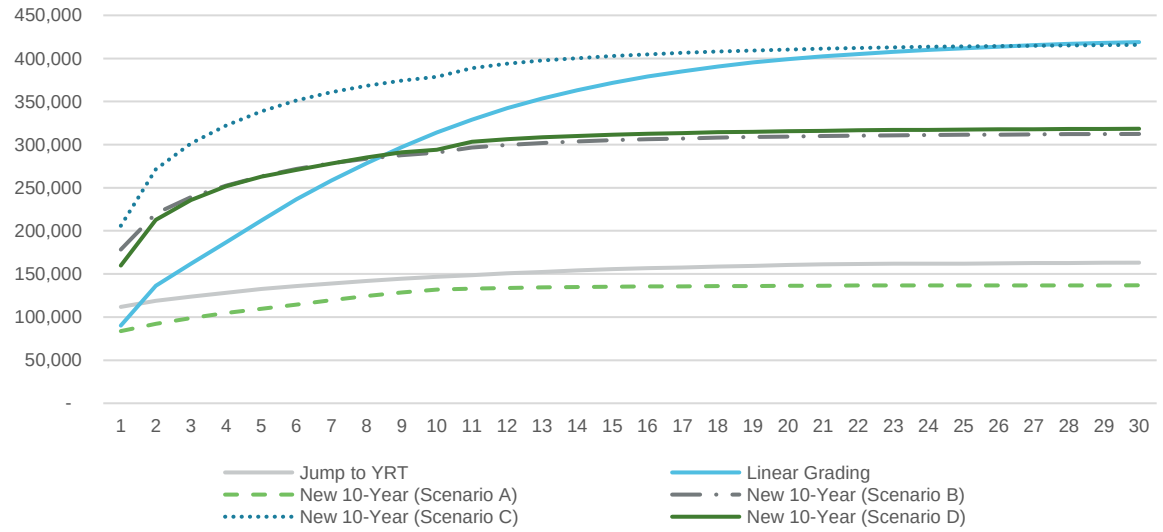
	VM-20	XXX
DESCRIPTION	LTP STATUTORY IRR	LTP STATUTORY IRR
YRT Pattern 200% 2017 CSO	8.0%	5.3%
Five-Year Grading 200% 2017 CSO	8.5%	5.3%
New Term – 200% 2017 CSO (Scenario A)	7.3%	5.3%
New Term – 160% 2017 CSO (Scenario B)	8.5%	5.3%
New Term – 240% 2017 CSO (Scenario C)	8.5%	5.3%
New Term – 100% 2017 CSO (Scenario D)	8.5%	4.8%

These results illustrate several key dynamics:

1. While the five-year grading pattern has lower premiums than the immediate jump to YRT for the first five years, and then the same thereafter, it is shown to be significantly more profitable. This is a direct result of the significantly lower shock lapse. This has two material impacts on profitability:
   a) A lower shock lapse significantly reduces anti-selection. Mortality experience in the PLTP is materially better, generating profits in the PLTP.
   b) A lower shock lapse also means there is more business remaining throughout the profitable PLTP to generate additional profits.
2. While the premiums are decreasing from scenarios A through D of the new LTP patterns, the profitability increases as the premiums decrease from scenarios A to C. Scenario D still shows more profitability than all scenarios other than scenario C, despite having the lowest premiums. Similar to the linear grading pattern, the lower premium jumps result in smaller spike lapse and less anti-selection. This both increases profitability in the PLTP, and results in more business remaining through the PLTP to generate additional profits.

   However, as premiums continue to decrease, profitability begins to decrease again as the premium levels become insufficient to generate profit in the PLTP regardless of the level of shock lapse and anti-selection.
3. Under either reserve framework, a new 10-year term pattern under scenario C has the highest statutory IRR despite the linear grading pattern resulting in the highest present value of profits overall and in the PLTP. Much of the profit emerges later in the projection, as can be seen in Figure 13.

FIGURE 13: CUMULATIVE PV STATUTORY PROFIT — ISSUE AGE 35



Drawing from the chart above, this timing of profits drives the IRR downward for the linear grading pattern. While this is true under both reserve frameworks, the impact of this timing is more clearly captured under the VM-20 framework. Under the XXX framework, linear grading is the best option among all new 10-year term scenarios other than scenario C. However, under VM-20, the IRR for the linear grading is closer to both scenarios B and D.

Lastly, under the VM-20 framework, a new 10-year term under scenario D would be considered a viable option behind scenario C along with scenario B and the linear grading pattern. However, driven by the higher reserves generated during the LTP, under the XXX framework scenario D is the clear worst alternative among the six.

1. The IRR during the LTP illustrates a material difference between the two frameworks. Under the VM-20 framework, where poor economics exist in the PLTP, the profitability is penalized during the LTP. The immediate jump to YRT and new 10-year term scenario A demonstrate the worst economic value in the PLTP, and these two also have the lowest IRR generated during the LTP. Under the XXX framework, however, there is generally no impact to the IRR during the LTP for poor PLT economics. The pattern with the lowest IRR during the LTP is the new 10-year term scenario D pattern, which under these assumptions offers among the best economic value.

As the impact of the steeper mortality is magnified for older ages, this also plays out in the pricing results. The tables below summarize the pricing results for the issue age 55 pricing cell,

TABLE 13: PRICING RESULTS – ISSUE AGE 55

	VM-20			XXX		
DESCRIPTION	STATUTORY IRR	PRE-TAX PROFIT MARGIN	AFTER-TAX PROFIT MARGIN	STATUTORY IRR	PRE-TAX PROFIT MARGIN	AFTER-TAX PROFIT MARGIN
YRT Pattern 200% 2017 CSO	5.7%	6.1%	3.8%	5.5%	6.1%	3.7%
Five-Year Grading 200% 2017 CSO	9.9%	9.7%	6.8%	6.1%	9.7%	6.6%
New Term – 200% 2017 CSO (Scenario A)	5.6%	6.0%	3.7%	5.5%	6.0%	3.6%
New Term – 160% 2017 CSO (Scenario B)	9.5%	9.5%	6.7%	5.9%	9.5%	6.4%
New Term – 240% 2017 CSO (Scenario C)	10.5%	10.5%	7.5%	5.3%	10.5%	6.6%
New Term – 100% 2017 CSO (Scenario D)	9.4%	9.5%	6.7%	4.9%	9.5%	4.9%

TABLE 14: LEVEL TERM PERIOD VS POST-LEVEL TERM PERIOD PV STATUTORY PROFIT – ISSUE AGE 55

	VM-20		XXX	
DESCRIPTION	PV PROFIT LTP	PV PROFIT PLTP	PV PROFIT LTP	PV PROFIT PLTP
YRT Pattern 200% 2017 CSO	1,936,519	(915,484)	1,914,990	(913,834)
Five-Year Grading 200% 2017 CSO	1,992,203	7,009	1,912,120	8,402
New Term – 200% 2017 CSO (Scenario A)	1,933,848	(951,784)	1,931,973	(965,883)
New Term – 160% 2017 CSO (Scenario B)	1,992,524	(93,611)	1,916,635	(105,144)
New Term – 240% 2017 CSO (Scenario C)	1,994,538	103,111	1,765,452	104,132
New Term – 100% 2017 CSO (Scenario D)	1,992,802	(72,133)	1,470,267	(72,191)

TABLE 15: LEVEL TERM PERIOD STATUTORY IRR – ISSUE AGE 55

	VM-20	XXX
DESCRIPTION	LTP STATUTORY IRR	LTP STATUTORY IRR
YRT Pattern 200% 2017 CSO	6.5%	6.2%
Five-Year Grading 200% 2017 CSO	10.1%	6.1%
New Term – 200% 2017 CSO (Scenario A)	6.5%	6.2%
New Term – 160% 2017 CSO (Scenario B)	10.1%	5.9%
New Term – 240% 2017 CSO (Scenario C)	10.6%	5.2%
New Term – 100% 2017 CSO (Scenario D)	10.2%	4.9%

Many of the key dynamics here are similar to those of the issue age 35 pricing cell, but there are additional takeaways:

1. The results show significant PLT losses for both the immediate jump to YRT and new 10-year term scenario A patterns, and small losses for scenarios B and D. With the mortality curve steeper at the end of the LTP, the premium jump results in a shock lapse high enough that the anti-selection mortality is too high to be profitable.
2. The economics highlighted in number 1 above manifest very differently in the pricing results under the two reserve frameworks. The VM-20 IRRs highlight the economic realities, which are obscured in the XXX IRRs.
    a) Under VM-20, the immediate jump to YRT and new 10-year term scenario A generate the lowest IRRs of all six patterns by a significant margin. Under the XXX frameworks, their IRRs are not particularly worse than the other scenarios.
    b) Scenario C is clearly the most optimal of the six patterns on an economic basis. This is reflected in the IRR under the VM-20 framework, having the highest IRR of the six patterns. Under the XXX framework, it has the second worst IRR of the six patterns, even worse than the two patterns that demonstrate the least economic value.
    c) Under the VM-20 framework, the profitability of new 10-year term scenario D is in line with both scenario B and the linear grading pattern, and significantly better than the immediate jump to YRT and new 10-year term scenario A. Under the XXX framework, it has the worst IRR of the six options.
3. The IRR during the LTP again illustrates a material difference between the two frameworks with poor PLTP profitability impacting the LTP IRR under VM-20, but not under XXX. The new level-term pattern scenario D has the second-highest IRR under VM-20, but the worst IRR under the XXX framework. As with the issue age 35 pricing cell, the timing of the profitability lowers the IRR for the linear grading pattern relative to the other patterns. Again, this timing is more clearly highlighted under the VM-20 framework than the XXX.

Thus, the two reserve frameworks can lead to very different pricing conclusions/decisions. Under VM-20, the conclusions clearly reflect the potential economic reality under this set of assumptions. The XXX framework, however, obscures these potential economics, which may have prevented companies from making the most optimal pricing decisions.

It is worth noting again that these differences/effects would have manifested at much younger ages under the 2001 CSO, which has a steeper mortality curve than the 2017 CSO. In the absence of VM-20, the change to the 2017 CSO would have alleviated this impact for younger issue ages.

The analysis in this case study offers several insights and considerations into the potential future of term product pricing and design:

1. XXX reserves obfuscated the economics of different PLT premium patterns, which led to choosing patterns that generate the highest accounting profitability but not the most economic value. VM-20 aligns the economic value with the accounting profitability. This is particularly true as issue age increases.
2. Companies with a heavy focus on reserve and capital strain can similarly be driven to sub-optimal economic decisions under the XXX framework. Under VM-20, reserves are aligned with the economics, creating a path to more optimal decisions.
    a) The immediate jump to YRT produces the lowest reserves during and after the LTP. However, at both issue ages tested, such a premium pattern offers the lowest level of economic benefit.

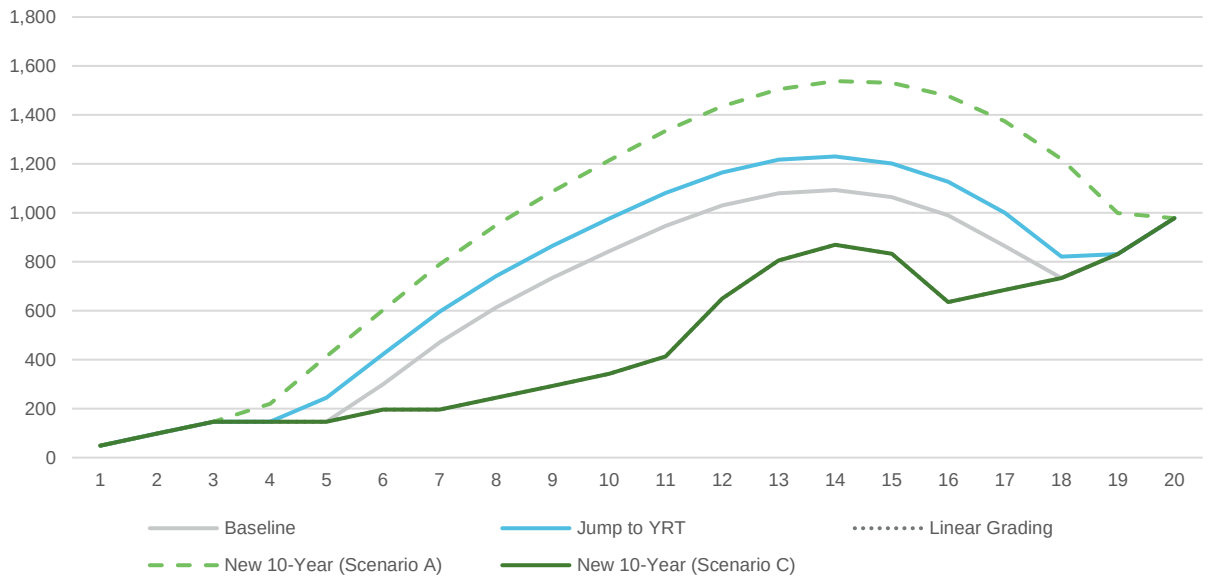
3. While PLT profits are, by their nature, speculative, which may lead companies to focus entirely on the LTP and attempt to drive as close to 100% shock lapse as possible, there are potential reasons to focus on the PLT as part of the product design.
    a) There is opportunity to generate additional profitability in the post-level period, particularly at younger issue ages.
    b) There is opportunity to increase the appeal of the product to the market by offering additional options for the PLTP.
        i. Additional term periods could be lower-cost conversion options to permanent insurance for those that wish to continue coverage.
        ii. Considering additional marketing appeal, it could be worth considering patterns with marginal expected losses in the post-level period.
    c) It is possible that lower-cost conversion options could result in lower levels of anti-selection in the permanent insurance alternatives. The less healthy conversions may be more likely to choose the lowest-cost alternative.

DETERMINISTIC RESERVE CASE STUDY: INCLUSION OF PLT CASH FLOWS

Thus far, this analysis has focused on VM-20 DR reserve calculations for which LTP reserves cannot be decreased as a result of included PLTP cash flows. As mentioned, VM-20 dictates this for contracts issued after 1/1/2017. However, at some point the necessary credibility will exist and regulation will likely change. The following case study analyzes the impact of including PLT cash flows in the reserve during the LTP that decrease the reserve.

Figure 14 illustrates the impact on the reserves when including all PLT cash flows in the reserve calculation. It implicitly assumes 100% credibility of experience in the PLTP. This is to demonstrate the maximum increases or decreases in reserves that could be expected by including PLT cash flows. Note that the baseline is the VM-20 reserve including no PLT cash flows in the DR. In addition, for illustrative purposes, as the least and most profitable scenarios, only scenarios A and C for the new 10-year term pattern are included.

FIGURE 14: VM-20 RESERVE INCLUDING 100% PLT CASH FLOWS IN DR – ISSUE AGE 35



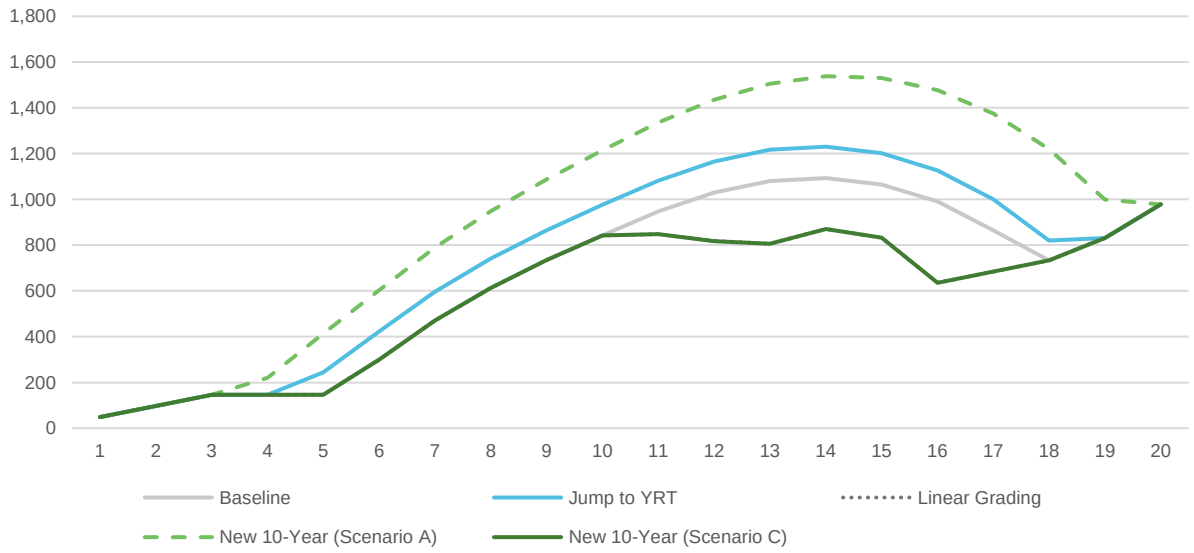
For both new 10-year term scenario C and the linear grading, including the PLT cash flows reduces the reserves during the LTP. Early in the projection, the minimum reserve is driven by the NPR for all patterns. The patterns then begin to diverge as the DR becomes the dominant reserve. As seen earlier, the immediate jump to YRT and new 10-year term scenario A patterns increase reserves. While all patterns with the exception of the new 10-year term scenario A are expected to be profitable in the PLTP, the margins added to the assumptions in the DR calculation are enough to result in the present value of cash outflows to exceed the present value of cash inflows for the immediate jump to YRT, thereby increasing the reserve.

For both the linear grading and new 10-year term scenario C patterns, including the PLT cash flows results in the NPR driving the minimum reserve throughout much of the projection.

While Figure 14 illustrates the impact of including all PLT cash flows starting immediately, it is more likely that credible experience will build up over time. While currently PLT cash flows are prohibited from decreasing the LTP reserve, it is highly possible that at some point in the lifetime of the product credible experience will emerge and the DR will decrease. Therefore, we performed analysis under this assumption.

Figure 15 illustrates our analysis under the assumption that as credible experience increases over time, a percentage of positive net cash inflows from the PLTP are allowed to reduce the DR. Beginning in the 11th year, we assume that 10% of positive net cash inflows from the PLTP are incorporated into the DR during the LTP. We assume that the percentage increases linearly to 100% over the remainder of the LTP.

FIGURE 15: VM-20 RESERVE GRADING TO 100% PLT CASH FLOWS IN DR — ISSUE AGE 35



This graph may represent a more realistic pattern of reserves. As would be expected, the immediate jump to YRT and new 10-year term scenario A are unaffected as the PV PLT of cash outflows exceed the inflows. The linear grading and new 10-year scenario C patterns follow the pattern of the DR by ignoring net positive cash inflows from the PLTP until the grading period begins, at which point the DR begins to decrease until the NPR becomes the driving reserve.

The pricing results for the issue age 35 pricing cell shown in the table below illustrate the expected impacts of the changes in reserves.

TABLE 16: PRICING RESULTS WITH PLTP CASH FLOWS IN DR – ISSUE AGE 35

	NO PLTP CASH FLOWS		WITH 100% PLTP CASH FLOWS		WITH PLTP CASH FLOWS W/ GRADING	
DESCRIPTION	**IRR**	**LTP IRR**	**IRR**	**LTP IRR**	**IRR**	**LTP IRR**
YRT Pattern 200% 2017 CSO	8.2%	8.0%	8.2%	8.0%	8.2%	8.0%
5-Year Grading 200% 2017 CSO	10.7%	8.5%	12.1%	10.1%	11.0%	8.9%
New Term – 200% 2017 CSO (Scenario A)	7.1%	7.3%	7.1%	7.3%	7.1%	7.3%
New Term – 160% 2017 CSO (Scenario B)	10.4%	8.5%	11.9%	10.1%	10.7%	8.9%
New Term – 240% 2017 CSO (Scenario C)	11.2%	8.5%	12.7%	10.1%	11.5%	8.9%
New Term – 100% 2017 CSO (Scenario D)	10.4%	8.5%	11.9%	10.1%	10.7%	8.8%

The results for the two patterns that generate higher LTP reserves resulting from PLT cash flows are unaffected. The overall and LTP IRRs for the remaining patterns increase when including PLT cash flows, with the results assuming increasing credibility of PLT experience falling between the assumptions of zero and full credibility.

Also note that the relative profitability between the linear grading pattern and new 10-year scenarios B and D converges slightly, and the relative profitability between the linear grading pattern and scenario C diverges slightly as the PLT net cash inflows are incorporated. Including these PLT cash flows in the DR during the LTP further captures the difference in timing of the emergence of profitability between these options.

As seen in the previous case study, the VM-20 framework better captures the true underlying economics of the product in pricing. As more net-positive PLT cash flows are incorporated into the LTP DR, the true economics of the various patterns will be captured to a greater extent, leading to even more economically optimal decision making.

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