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Impact of VM-20 on Life Insurance Product Development

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INTRODUCTION

A team of Milliman consultants was recently engaged by the Society of Actuaries to perform research on the impact of Chapter 20 of the National Association of Insurance Commissioners (NAIC) Valuation Manual (VM-20) on life insurance product development. This article highlights some key excerpts from this research. For the sake of brevity, certain details of the research have been omitted from this article. Reference the research report¹ for a complete description of our methodology.

This research summarizes changes to the product development process because of the introduction of principle-based reserves (PBR) as required under VM-20 through the development of case studies for term and universal life with secondary guarantees (ULSG) products. The products studied are hypothetical and the illustrative results are only applicable to the specific products, premiums levels and assumptions used in the case studies. While similar results may not be expected for other products using different assumptions, the case studies highlight some of the issues of pricing under VM-20. The case studies capture the impact on profitability of various changes in the pricing situation, starting with the Model 830 reserves and the 2001 Commissioners Standard Ordinary (CSO) table with no reserve financing, then reflecting the impact of financing arrangements, the introduction of the 2017 CSO table and the introduction of PBR.

HIGH-LEVEL SUMMARY OF VM-20 REQUIREMENTS

This article will use the following terms and their acronyms as defined in VM-20:

- Net premium reserve (Section 3 of VM-20): NPR
- Deterministic reserve (Section 4 of VM-20): DR
- Stochastic reserve (Section 5 of VM-20): SR

The reader should refer to the full research paper for more detail, or VM-20 for a complete description of these reserve amounts and required calculations. This section of the article

provides a high-level description of these VM-20 reserve components and considers how the basis for those reserves may change after a policy is issued. Changes after issue date may impact future reserves and may be considered in pricing under a VM-20 reserve framework. Note that references made in this article to VM-20 are based on the version of VM-20 applicable at the time research was in publishing.

In pricing products under a VM-20 framework, companies will need to consider how to reflect the variability in VM-20 reserves and consider the pricing impact of potential reserve volatility. To illustrate these concepts, we have developed term and ULSG case studies. Both case studies are based on the same five pricing situations, as summarized in Figure 1.

TERM CASE STUDIES

Product Design and Model Office

The foundation for the term model office is a top quartile (as measured by today's standards) of a 10- and 20-year level premium term plan with an insurance benefit period to attained age 95. Issue ages range from 20 to 65 for the 10-year product, and from 20 to 55 for the 20-year product. There are four nonsmoker classes and two smoker classes. The product is gender-distinct. Following the level premium period, the premiums increase to 250% of the 2017 CSO age nearest birthday (ANB) Ultimate mortality rates per \$1,000 on the preferred table basis. We developed the level period premiums by averaging the per unit rates of select top-quartile companies. There is a \$60 policy fee. Two policy sizes are represented: \$350,000 and \$1,200,000.

The company is assumed to cede amounts in excess of \$1 million to a third-party reinsurer through yearly renewable term (YRT) mortality risk reinsurance. Net reinsurance premiums for YRT reinsurance are \$0 in the first policy year, and in renewal years are set equal to the direct writer's anticipated mortality experience, including mortality improvement, with a 10% profit charge included.

Commission rates and general insurance expenses are consistent with the top-quartile companies represented. For statutory reserves under Model 830 XXX, X-factors are developed to minimize or eliminate any deficiency reserve. There are no cash values that develop for this product. Target surplus factors representing 325% to 350% of company action level (CAL) risk-based capital (RBC) are assumed in the pricing, as well as a tax rate of 35%.

The model office assumes a distribution across the issue age range, the underwriting classes and genders. Four products are represented: Term 10 \$350,000, Term 10 \$1,200,000, Term 20 \$350,000 and Term 20 \$1,200,000. The projection horizon is equal to the level term period: 10 or 20 years.

Figure 1
Pricing Situations: Basis of Statutory and Tax Reserves

Pricing Situation	Description
1. 2001 CSO	Statutory and tax reserves are Model 830 reserves (XXX, AG38)* using the 2001 CSO table, and no financing is applied.
2. 2001 CSO AG48 Financing	Statutory reserves are Model 830 statutory reserves (XXX, AG38) using the 2001 CSO table with AG48 financing of reserves in excess of VM-20 reserves. Tax reserves are Model 830 tax reserves (XXX, AG38) using the 2001 CSO table. AG48 reserves are calculated as described below for PBR, but with the NPR component using adjustment factors specified in AG48.
3. 2017 CSO	Statutory and tax reserves are Model 830 reserves (XXX, AG38) using the 2017 CSO table, and no financing is applied.
4. 2017 CSO AG48 Financing	Statutory reserves are Model 830 statutory reserves (XXX, AG38) using the 2001 CSO table with AG48 financing of reserves in excess of VM-20 reserves. Tax reserves are Model 830 tax reserves (XXX, AG38) using the 2017 CSO table. AG48 reserves are calculated as described below for PBR.
5. 2017 CSO PBR	VM-20 statutory reserves are used based on an NPR component using the 2017 CSO table, and DR and SR following VM-20 requirements. Tax reserves are calculated as the NPR using the 2017 CSO table.

* Model 830 statutory reserves are commonly referred to as XXX for term or Actuarial Guideline 38 (AG38) for ULSG

Profitability Results

Pricing results tables are provided in Figure 2 for the high-band 10-year and 20-year level premium term to A95 products. Figure 2 summarizes the profit measures, including the internal rates of return (IRR), for the term model office over the five pricing situations described in Figure 1. Common investment portfolio rates are assumed in each pricing situation. The liability cash flows, including the premium, are unchanged between pricing situations, with the exception of the inclusion of financing costs under AG48. The changes in profitability are thus driven by the changes in reserve and surplus levels, the amount of investment income and the level of income taxes created by them.

In Pricing Situation 1, together with the experience assumptions assumed for a top-quartile product, produce IRRs in the 6% to 7% range. Pricing Situation 2 brings beneficial tax leveraging to the pricing, resulting in considerably higher IRRs. In Pricing Situation 3, the IRR metrics have increased in response to the pattern of reserves being lower overall. The financing arrangement depicted by Pricing Situation 4 helps the profitability, but does not provide as much tax benefit as under Pricing Situation 2. This is because the tax reserve, having been calculated using 2017 CSO, is a lower tax reserve than under 2001 CSO.

Pricing Situation 5 moves to full PBR implementation without financing. The PBR reserve is the same as the post-financing reserve under AG48 in Pricing Situation 4, while the profit margin metrics for Pricing Situation 5 are most like those of Pricing

Situation 3. The IRRs for Pricing Situation 5 fall in between pricing situations 3 and 4.

Observations

As we stepped through the progression of pricing situations for this case study, it became clear that the earlier emergence of earnings under the redundant reserve financing arrangements, while maintaining the Model 830 XXX tax reserves, brought the profit metrics back to industry targets. On a PBR valuation platform (Pricing Situation 5), these term products demonstrate improved IRRs when compared with pricing situations 1 and 3. For competitive term products with 100% credibility that were the basis for the case studies, companies not using financing transactions may see improved profitability under PBR, but companies that previously used financing may see deteriorating profitability under PBR. Such companies may find profitability too low and demand higher returns by continuing to seek out third-party or captive financing solutions.

ULSG CASE STUDIES

Product Design and Model Office

The foundation for the ULSG model office is a multi-tiered shadow account design intended to be representative of a product competitive at the top quartile of carriers as of early 2016. This hypothetical ULSG product offers minimal cash value accumulation potential and a lifetime secondary guarantee. The shadow account uses two sets of loads, depending on the timing

Figure 2
Pricing Results

	Pretax Profit Margin*	After-Tax Profit Margin**	Adjusted After-Tax Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
High-Band Model Office, 10-Year Level Premium Term to A95					
1) XXX Stat/Tax, 2001 CSO	16.3%	9.1%	1.9%	-112%	6.1%
2) AG48 Stat, XXX Tax 2001 CSO	15.2%	10.8%	3.7%	-112%	21.5%
3) XXX Stat/Tax, 2017 CSO	16.2%	9.0%	1.9%	-112%	6.3%
4) AG48 Stat, XXX Tax, 2017 CSO	15.4%	10.3%	3.2%	-112%	15.8%
5) PBR NPR+DR Excess Stat, NPR Tax, 2017 CSO	16.2%	8.8%	1.7%	-112%	7.6%
High-Band Model Office, 20-Year Level Premium Term to A95					
1) XXX Stat/Tax, 2001 CSO	19.9%	12.0%	6.5%	-169%	6.4%
2) AG48 Stat, XXX Tax 2001 CSO	16.0%	18.4%	13.2%	-147%	37.5%
3) XXX Stat/Tax, 2017 CSO	19.9%	11.9%	6.6%	-169%	7.1%
4) AG48 Stat, XXX Tax, 2017 CSO	17.8%	15.3%	10.1%	-147%	22.8%
5) PBR NPR+DR Excess Stat, NPR Tax, 2017 CSO	19.9%	11.9%	6.7%	-147%	10.4%

* Pretax profit margin is calculated with discount at the pretax net investment earnings rate (NIER).
 ** After-tax profit margin is calculated with discount at the pretax NIER.
 *** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.

of the premium payment and balance of the shadow account. This design is intended to encourage level gross premium payments while remaining compliant with AG38 8E. For this case study, we determined premiums as averages of rates for top quartile carriers, and set shadow account charges such that the level premium payments provided guaranteed coverage until age 110.

The premium levels were determined separately for policies with face amounts of \$350,000 and \$1,200,000. For the higher face version, per unit load charges for the shadow account were reduced compared with the low face version to meet the competitive target. Other charges remain the same between the two bands.

The ULSG model office is constructed of policies at two sizes—\$350,000 and \$1,200,000 of face amount. Each size is representative of an average face amount within a band and was evaluated independently. The model office also consisted of four issue ages—35, 45, 55 and 65, both genders, and three nonsmoker and two smoker underwriting classes. The weighting of the model office characteristics was based on observations

of in-force blocks and was kept the same for the low and high face versions.

Profitability Results

Figure 3 summarizes the profit measures for the ULSG model office over five pricing situations. Common investment portfolio rates are assumed in each situation. The liability cash flows, including the premium, are unchanged between pricing situations, with the exception of the inclusion of financing costs under AG48. The changes in profitability are thus driven by the changes in reserve and surplus levels, the amount of investment income and the level of income taxes created by them.

In Pricing Situation 1, there is considerable surplus strain in the first year, which holds down the IRR to a level that may be lower than a direct writer’s normal new business hurdle rate. In Pricing Situation 2, the first-year strain is greatly reduced and the IRR increases dramatically. Compared with Pricing Situation 1, our results showed a modest decrease in profitability when moving to use 2017 CSO mortality in Pricing Situation 3. This occurred because the underlying product design was not

Figure 3

Pricing Results ULSG With Level Premiums for Coverage to A110, High Band Only

	Pretax Profit Margin*	After-Tax Profit Margin**	Adjusted After-Tax Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
High-Band Model Office					
1) AG38 Stat/Tax, 2001 CSO	18.3%	9.0%	6.8%	-395%	6.3%
2) AG48 Stat, AG38 Tax, 2001 CSO	14.9%	14.8%	13.1%	-267%	11.5%
3) AG38 Stat/Tax, 2017 CSO	17.9%	4.9%	2.6%	-633%	5.6%
4) AG48 Stat, AG38 Tax, 2017 CSO	13.2%	13.0%	11.3%	-270%	10.2%
5) PBR NPR+DR+SR Stat, NPR Tax, 2017 CSO	19.5%	4.4%	2.6%	-285%	5.9%

* Pretax profit margin (PM) is calculated with discount at the pretax NIER.
 ** After-tax profit margin is calculated with discount at the pretax NIER.
 *** Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.

Key Observations:

1. Pretax, AG38 PMs are higher than AG48 (pricing situations 1 and 3 are higher than 2 and 4).
2. Pretax, PBR PMs are higher than AG38 (Pricing Situation 5 is higher than 3).
3. Adjusted After-Tax, AG48 profits are higher than AG38 (Pricing Situation 4 is higher than 3).
4. Adjusted After-Tax, AG38 PMs are like PBR (Pricing Situation 5 is similar to 3).
5. Adjusted After-Tax, PBR IRRs are slightly higher (Pricing Situation 5 is slightly higher than 3).

modified, resulting in an increase in deficiency reserves. In Pricing Situation 4, applying the AG48 financing transaction to the 2017 CSO basis resulted in a similar impact as with 2001 CSO.

Pricing Situation 5 shows the effect of the full PBR implementation as a decrease in after-tax IRR, an increase in pretax profit margin, and a decrease in after-tax profit margin compared with the AG48 financing results. Compared with AG38 results without financing, the PBR implementation caused an increase in after-tax IRR and pretax profit margin and a decrease in after-tax profit margin. The PBR reserve is the same as the post-financing reserve under AG48 in Pricing Situation 4, so the first-year strain continues to be reduced relative to AG38, which helps to improve the IRR. The removal of the financing costs required to hold the PBR reserve improved profitability relative to AG48 on a pretax basis. However, in some durations, after-tax profitability was hurt relative to the prior regimes by the change from an AG38 tax reserve to the use of a lower NPR as the deductible tax reserve basis under PBR.

OBSERVATIONS AND OTHER COMMENTARY

Impact on Product Development Process

As newly introduced regulation, industry practice regarding how companies will reflect VM-20 in the product development process is in early formation. Coming from a perspective where

life insurance pricing has been conducted at both single cell and model office levels, the prospect of having reserve requirements calculated on an aggregate basis introduces new challenges to the process.

The calculation of the NPR is not an issue in this regard, as the NPR portion of the reserve requirement is completed on a seriatim basis and can be applied to a pricing cell. Even the DR, while technically an aggregate reserve requirement, can be calculated at the pricing cell level as the present value of pricing cell cash flows discounted at the DR discount rates. However, DR and SR contributions to the VM-20 reserve are the excess, if any, of the aggregate DR or SR over the sum of the NPR for all policies. It is likely the excess of the DR or SR over the NPR will arise unequally from various issue ages, bands or risk classes for a given product. Decisions on how to allocate excesses may impact profitability.

It is likely that only NPR and DR calculations will be necessary for term products. For some pricing systems, this will permit “single pass” projection of all future reserve amounts. Analysis of an existing product (pretending it is being newly priced), should provide insight into the relative relationships of the NPR and the DR. One method for gaining this understanding could be to calculate a DR-like reserve on a seriatim basis and

compare it with the NPR. This exercise should provide some insight into which pricing cells are likely to generate a positive contribution to DR excess over the NPR, and provide a starting point for considering how to allocate any excess from the DR back to individual pricing cells.

For a ULSG product, the new paradigm is a bit more challenging, given the likely need for the SR. Handling of the NPR and DR could follow what is outlined for the term product above. Some pricing systems may require a multistep projection process for determining the future SR and/or an approximation mechanism for SR effects that are calibrated at a few future points in separate projections. For instance, it could be reasonable to choose five future valuation points at which estimations of the SR in relation to the NPR/DR have been completed. This relationship could be used throughout the pricing process, perhaps with occasional pauses to recalibrate the estimates if significant product features or risk parameters have changed. As cumbersome as this process sounds, companies will get a feel for how to include SR effects, making the process less of a hurdle as comfort is gained.

As with the DR, understanding which cells contribute significantly to a stochastic reserve will be a challenging but necessary step to appropriately allocate reserves at the cell level. It remains to be seen if this cell-level allocation will be attempted for the SR, or if all cells will get a pro rata increase to cell-level pricing reserves to account for SR impacts. From a theoretical standpoint, it stands to reason that some cells will generate more SR than others (and should support the SR more at the cell level). As a simplification, companies may get comfortable with the distribution risk of spreading the SR across all cells.

Impact on Product Premiums

General industry expectation of the impact of VM-20 is that it will allow for lower-priced premiums on some protection-oriented products. This expectation is born from the ability to use company-specific assumptions as well as an industry-presumed lessened need for reserve financing (because VM-20 reserves should be equal to or very like AG48 Actuarial Amounts).

In reality, however, assumptions (and the margins included in them) will vary by company. Smaller companies will lack the credibility of larger companies and may have larger pads and/or earlier grades to industry.

For larger companies, level term premiums may decrease, as non-financed reserve levels should decrease. Non-financed reserves under VM-20 may not be as low as economic reserves under financing, however, so it is possible some companies may experience little ability to lower term premiums. It is also possible tax benefits from traditional financing (pre- or post-AG48)

may lead to less favorable results under VM-20 than under previous traditional financing arrangements.

ULSG will likely be an accentuated version of term regarding the effect of company-specific assumptions. Combining the effect of mortality/lapse pads with the product design risk (i.e., how quickly account value is depleted) should create substantial variability in company-specific VM-20 impact on product pricing (and resulting premium levels). VM-20 should have the effect of aligning reserve levels with product design risk, assuming models of the underlying product adequately reflect those risks.

Impact on Product Design

It goes without saying that product design effects of VM-20 are nebulous at this early stage. For base product design of term insurance, level term premiums will still be followed by some sort of annual renewable term (ART) scale, although the importance of having very high guaranteed ultimate rates to achieve the desired segmentation under XXX may subside somewhat. We expect the product design will evolve around encouraging favorable product cash flows and managing risks, rather than a design focused on formulaic reserve requirements.

For base ULSG, product designs can be expected to be widely re-evaluated. With the removal of AG38 mechanics from the equation, it is also possible shadow funds will see less emphasis in the market than in the recent past. Additionally, it is possible the new paradigm allows for designs with somewhat higher account value accumulations than some of the low-account value ULSG products of recent iterations. On one hand, very low account value designs may be able to pass the stochastic exclusion test (SET). On the other, higher account value designs could be impacted less by grading to Canadian term-to-100 lapse rates required by VM-20 after the period of credible lapse experience on policies with low surrender value.

Aside from base product design, it will be interesting to see how other benefits and riders are affected by VM-20. Does waiver of premium (WP) or other ancillary benefits change substantially under VM-20? Anecdotally, WP and other often-offered riders are seldom repriced (or included in the pricing process). Does this change under VM-20? Modeling efforts under VM-20 for base products are perceived to include substantial effort; modeling efforts under VM-20 when riders are included (when perhaps not even modeled previously) would accentuate the issues.

Implementation Strategy

Assuming tax reserves follow the statutory basis and assuming tax reserves under PBR are set at the level of NPR, the case studies suggest companies that finance statutory reserves may have incentive to delay implementation of VM-20 until required by 2020.

Impact on Pricing Systems

Through this pricing exercise, we have identified several areas where legacy pricing systems and approaches may need to evolve. State-of-the-art systems already have inner and outer loop logic to enable forecasting a DR and/or SR into the future. Here are possible ways pricing systems may evolve to facilitate product pricing under VM-20:

- The ability to project future deterministic scenarios launched from the point of a company's assumed baseline Treasury curve would facilitate the ability of a company to reflect its own best estimate of future risk-free interest rates and the deterministic scenarios that result from it.
- From each node's unique DR scenario, systems could add the functionality to determine the company's earned rates at each node based on that scenario and assuming the company's reinvestment strategy.
- Each of the first two bullet points can also be repeated for forecasts of the SR scenarios and the earnings rates thereon. Stochastic projections introduce a layer of complexity that may elevate run times. Systems could potentially accommodate simplifying this by providing options for the user to preselect the nodes at which the SR should be derived.

Allocating aggregate results back to the model cell will be important in managing distribution risk and avoiding soft spots in the pricing and design of insurance products.

WHAT'S COMING IN PHASE 2

Phase 2 of our research will expand upon the case studies shown in Phase 1 and include illustrative pricing examples for a variety of situations. Examples are a small company with limited data, guaranteed YRT premiums, level term product where post-level-term cash flows are assumed, a 30-year level term product, a simplified issue term product and a short pay ULSG product.

The Phase 2 report will provide additional commentary based on interviews with industry sources on other VM-20 issues, including:

- The industry's level of preparedness
- Particular VM-20 concerns or issues that have been identified
- Collaboration and coordination between functional areas within companies
- Expected changes to the pricing process
- Anticipated simplifications to be used when pricing under VM-20
- Use of reinsurance
- Allocation of the VM-20 aggregate reserve amounts to profit cells

- Changes in product design
- Product lines other than level term and ULSG. ■

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ENDNOTE

- 1 <https://www.soa.org/research-reports/2016/2016-impact-of-vm20-product-development/>