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# Impact of VM-20 on Life Insurance Product Development—Phase 2

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The Society of Actuaries’ (SOA) Product Development Section, Smaller Insurance Company Section, Reinsurance Section and the Committee on Life Insurance Research engaged Milliman to examine the impact of the new reserve standard for the product development actuary. The research is organized in two phases. The objective of Phase 1 was to investigate the changes to the product development process as a result of VM-20 through the development of case studies for term and universal life with secondary guarantees (ULSG) products.

Phase 2 of the research expands on the Phase 1 case studies and includes additional case studies focused on smaller companies and the impact of reinsurance. Phase 2 also discusses the industry’s preparedness for pricing under VM-20 and identifies pricing and product design issues through interviews and discussions with product development actuaries.

This article highlights some key excerpts from Phase 2 of this research. Phase 1 was addressed in an article in the June 2017 issue of *Product Matters!* For the sake of brevity, certain details of the research have been omitted from this article. Please

reference the research report (<https://www.soa.org/research-reports/2016/2016-impact-of-vm20-product-development/>) for a complete description of our methodology.

## SMALL COMPANY CASE STUDIES

The Phase 1 case studies reflected characteristics of a large company in that the mortality experience was assumed to be fully credible, with a 15-year Sufficient Data Period (SDP). Fully allocated expense factors were in line with large company profiles, and the company wrote enough business to justify financing excess statutory reserves. This Phase 2 small company sensitivity presents the situation for a small company by changing relevant assumptions and demonstrating the impact on VM-20 pricing for term insurance and ULSG.

### Term Small Company Case Study

Figure 1 outlines the stepwise assumption changes from Phase 1 Situation 5 to the Phase 2 small company sensitivity for term. Phase 1 Situation 5 is the pricing situation in which 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 2017 CSO table. The bolded item is the change for each step.

Starting with the Situation 5 pricing results from Phase 1, Figure 2 shows the pricing results of the stepwise implementation of each of the characteristics noted previously. We performed the study on four term product varieties—a 10-year and 20-year level term period on both a low band (\$350k) and high band (\$1.2M) face amount. The results for the 20-year term, high band model office are shown in Figure 2. Each row of the table includes the changes in the preceding steps.

Changes observed in Figure 2 include the following:

1. Step 1 drives profitability lower by introducing additional Year 1 expenses. In all four term product varieties in this

Figure 1  
Term Small Company Assumption Changes

Step	Acquisition Expense per Unit	Mortality Credibility and Sufficient Data Period	Reinsurance
Phase 1	\$0.20	100% and 15 years	Non-Guaranteed YRT, \$1,000,000 Retention
Step 1	<b>\$1.00</b>	100% and 15 years	Non-Guaranteed YRT, \$1,000,000 Retention
Step 2	\$1.00	<b>28% and 3 years</b>	Non-Guaranteed YRT, \$1,000,000 Retention
Step 3	\$1.00	28% and 3 years	<b>80% Coinsurance with \$100,000 limit on retention</b> Expense allowances are 100% first year, 11% renewal years

Figure 2  
Pricing Results—Small Company—20-Year Term

Small Company 20-Year Level Term	Pretax Profit Margin <sup>1</sup>	After-Tax Profit Margin <sup>2</sup>	Adjusted After-Tax Profit Margin <sup>3</sup>	Surplus Strain	IRR Adjusted After-Tax
<b>High-Band Model Office</b>					
Phase 1 Situation 5	19.9%	11.9%	6.7%	-147%	10.4%
Step 1: Increase Per Unit Acquisition to \$1.00	14.7%	8.5%	3.3%	-178%	7.1%
Step 2: Inner Loop Mortality 28% Credibility; Three-Year SDP	14.7%	1.0%	-4.5%	-472%	4.2%
Step 3: Coinsurance	8.1%	1.9%	-0.5%	-75%	4.5%

<sup>1</sup> Pretax profit margin is calculated with discount at the pretax net investment earnings rate (NIER).

<sup>2</sup> After-tax profit margin is calculated with discount at the pretax NIER.

<sup>3</sup> Adjusted after-tax profit margin includes target capital effects and is calculated with discount at the pretax NIER.

case study, this increases surplus strain, reduces profit margin metrics and reduces IRR.

- Step 2 changes the level and pattern of VM-20 statutory reserves because the Deterministic Reserve (DR) is affected by the much lower credibility measurement and shorter SDP of the smaller company sensitivity. Because the pre-tax profit margin is discounted at the pre-tax NIER, the pre-tax profit margin does not materially change, while other profit metrics are reduced due to the additional reserve margins.
- Step 3 reflects the implementation of a coinsurance agreement that small companies might consider to lower surplus strain. Coinsurance changes the shape of the profit pattern by reducing the surplus strain (increasing first year profits) and reducing renewal profits. For the 20-year plan \$1.2M policy size, the after-tax profit margins and IRR are higher than for Step 2 because after coinsurance is implemented, the tax basis reserve is equal to the statutory basis reserve for all but the latest durations, whereas for the Step 2 situation, the statutory basis reserve was considerably higher than the tax basis reserve.

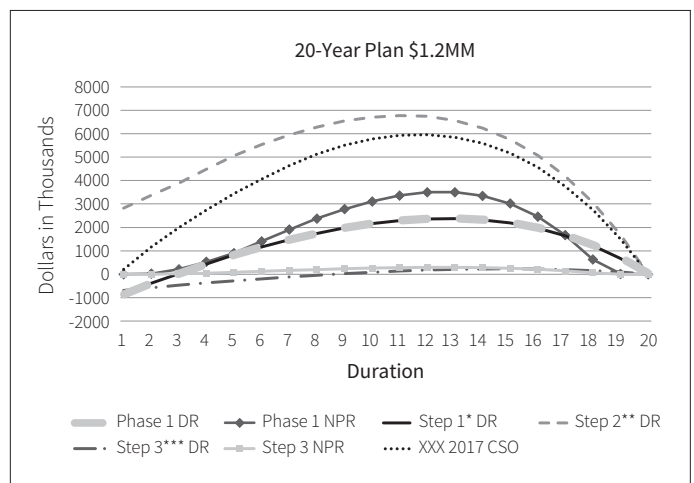
In this small company sensitivity, reserve relationships change from the Phase 1 case studies. This section looks at the change in reserves under each of the steps implemented for the small company sensitivity.

- Step 1 does nothing to change the Net Premium Reserve (NPR) or DR, because acquisition costs are assumed to be incurred at time of issue and are not included in the cash flows for the DR forecast for the end of the first year.
- Step 2 illustrates the impact of lower mortality credibility and shorter SDP. The NPR for Step 2 is the same as the

Phase 1 NPR, because mortality credibility and SDP do not impact the determination of the NPR. The characteristics of less credible mortality experience and shorter SDP for the smaller company increase the Step 2 DR as compared to the Phase 1 (and, as noted above, the Step 1 DR) higher credibility DR. In fact, under these conditions, the Step 2 DR is as great as, or greater than, XXX method reserves in many durations for each of the four term product varieties.

- Step 3 is where 80 percent coinsurance with a \$100,000 limit on retention is implemented. Because the majority of the risk is now ceded away, and a coinsurance expense allowance becomes part of the DR cash flows, the level of

Figure 3  
Reserve Levels—20-Year Term, High-Band



\* Step 1: Higher Acquisition Expenses  
\*\* Step 2: Lower Mortality Credibility  
\*\*\* Step 3: Coinsurance

the DR changes in a material way. The NPR is affected as well, because the NPR needs to allow for only the insurance amount retained.

Graphs of all the reserve streams for the 20-year plan, high band are shown in Figure 3. In these graphs, the DR is unfloored, consistent with the graphical presentations of DR in Phase 1.

### ULSG Small Company Case Study

Figure 4 shows the stepwise results from Phase 1 to the Phase 2 small company sensitivity for ULSG. The small company assumption changes are the same as shown for term except that the acquisition expense step is not shown, because its impact was minimal relative to the following two steps.

Changes observed in the projections summarized in Figure 4 include the following:

- Moving from Phase 1 Situation 5 to the Step 2 small company assumptions increases the DR, resulting in considerable additional surplus strain and noticeably lower profit margins.
- The Step 3 reflection of coinsurance reduces surplus strain considerably. For Step 3, the impact to IRR is noticeably different between the low band and high band products that were tested. The DR per unit of face in the high band is less than in the low band because the coinsurance allowance is the same, while the high band has a higher ceded percentage but lower expenses to cover (as a percent of premium). As a result, the low band experiences only a modest IRR increase, while the high band shows a considerable increase in IRR.
- The impacts on profit margins in the high band and low band are more similar than the IRR impacts, indicating that the IRR is a more sensitive profit measure at the lower retained amounts in these studies.

### GUARANTEED YRT CASE STUDIES

The purpose of this sensitivity is to examine the potential impact to pricing results should the YRT reinsurance agreement guarantee the YRT premium rates. The following details provide additional context to understand the sensitivity.

- The Phase 1 Situation 5 reflects nonguaranteed yearly renewable term (YRT) reinsurance on insurance amounts in excess of a \$1,000,000 retention limit, with YRT premiums set at 110 percent of the pricing mortality.
- For the Phase 1 DR and SR calculations, YRT premiums are 110 percent of the VM-20 mortality assumption. For the Phase 1 case studies, we did not assume any delay in the reinsurer’s premium increase.
- We ran this Phase 2 case study for high band (\$1.2M Face Amount), and the retained amount is assumed to be reduced to \$200,000 to better observe the impact.
- The final change made within this sensitivity is to test the impact of setting the guaranteed YRT rates at specified levels. For term, we ran sensitivities assuming YRT premiums equal to 115 percent and 120 percent of expected mortality. For ULSG, we ran only a sensitivity assuming YRT premiums equal to 120 percent of expected mortality. These are illustrative only and not indicative of the level of rates that would be available in the market.

Figure 5 provides the pricing result for this series of runs for the ULSG case study.

In moving from Situation 5 from the Phase 1 report to the Revised Baseline with \$200,000 retention:

Figure 4  
Pricing Results—Small Company—ULSG

Small Company ULSG	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b>High-Band Model Office</b>					
Phase 1 Pricing Situation 5	19.5%	4.4%	2.6%	-285%	5.9%
Step 2: Small Company Acquisition and Reserve Assumptions	18.5%	-1.1%	-3.0%	-503%	4.9%
Step 3: Small Company with Coinsurance	4.9%	2.5%	2.3%	-31%	13.4%

\*Pretax profit margin 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.

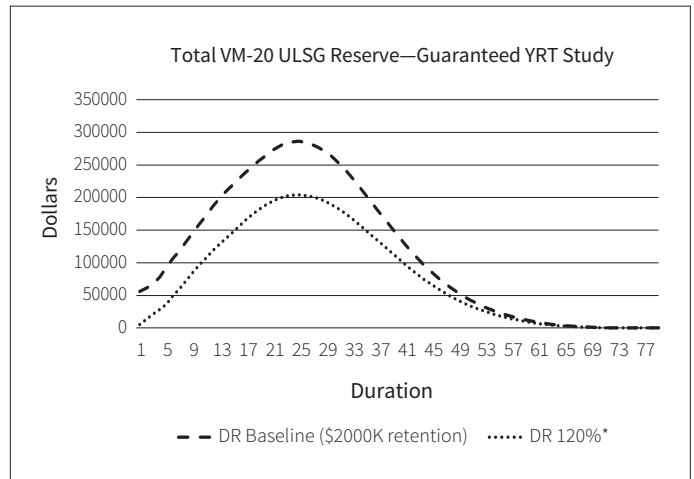
- Surplus strain is increased because reinsurance has a net cost, and the net cost of ceding additional business is reflected in the initial DR and SR.
- Increased investment income on the higher reserve levels helps offset the total impact, but profitability is still down across all measures due to the additional cost of ceding the business.
- The long-term nature of ULSG results in considerable long-term DR and SR mortality margins (in particular, assuming no mortality improvement beyond each valuation date), which are reflected in the nonguaranteed YRT rates in Phase 1. Guaranteeing the YRT rates effectively removes these considerable margins from the DR and SR calculations, so the IRR impact of the 10 percent increase in YRT premium compared to Phase 1 is more than offset by the reserve relief due to the guaranteed YRT rates.

Moving from the revised baseline to YRT premiums guaranteed at 120 percent of best estimate mortality, profitability improves considerably. The increase in YRT premiums on its own decreases profitability, but it is more than offset by the decreased reserve strain realized by not including margins on the YRT reinsurance premiums. The profit margins are increased marginally, but the decreased surplus strain results in considerably higher IRRs.

Figure 6 shows the VM-20 reserve on the revised baseline compared to the guaranteed YRT premium situation for the high-band (\$1.2M) product. The total reserve continues to be driven by the DR with a small excess SR.

We performed the same sensitivity for term. For the term products, there was a tension between the cost of the assumed increase in YRT premiums versus the impact of the guaranteed

Figure 6  
Reserve Levels—Guaranteed YRT—ULSG



\* 120%: Guaranteed YRT Premiums Equal to 120% of Expected Mortality

premiums on the VM-20 reserves, producing varying impacts on profitability and depending on the product and profit metric under consideration. For the ULSG block, the increase in YRT premiums on its own decreases profitability, but it is more than offset by the decreased reserve strain realized by not including margins on the YRT reinsurance premiums.

## INDUSTRY INTERVIEWS

### Background

An element of this phase of our research involved interviews with company actuaries within the industry who are, or will be, involved in the real-life exercise of pricing and product development in the context of VM-20.

Figure 5  
Pricing Results—Guaranteed YRT ULSG, High-Band

Guaranteed YRT ULSG	PT Profit Margin*	AT Profit Margin**	Adjusted AT Profit Margin***	Surplus Strain	IRR Adjusted After-Tax
<b>High-Band Model Office</b>					
Situation 5 from Phase 1 Report	19.5%	4.4%	2.6%	-285%	5.9%
Revised Baseline with \$200,000 Retention	14.0%	-2.6%	-4.2%	-393%	4.6%
YRT Premiums at 120% of Expected Mortality	10.1%	4.9%	3.7%	-64%	13.9%

\*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.

We spoke to actuaries at 14 companies of varying size that issue individual life business. For most of the conversations, several company actuaries participated. While the focus of the discussions was on pricing and product development, actuaries from valuation, corporate and modeling areas were often part of the conversations as well. For some small companies, these duties were represented by the same person.

In the following sections, we summarize the main findings from these interviews, categorized as follows:

### Preparedness

- There was an even mix between the pricing and valuation areas regarding where VM-20 expertise resided, and which area leads or led the effort to be VM-20-ready. Generally, companies that had executed or worked on reserve financing transactions were more prepared than companies that had not, and at those companies, the VM-20 knowledge in the valuation area was ahead of the pricing area. On the flip side, at companies that were looking to roll out VM-20 products in 2017 or early 2018, the pricing area led the learning curve. In companies where the corporate structure was organized across product lines rather than function, term was generally more VM-20-ready than ULSG.
- Most of the companies had done some form of VM-20 trial run, regardless of the company's timeline for moving to VM-20 reserves. In some cases, those were purely valuation exercises, and in other cases, they were more pricing-focused. Generally, companies expect their term business to pass the Stochastic Exclusion Test (SET).
- While some companies are planning to roll out products priced on a VM-20 basis in 2017 or early 2018, most companies are planning to wait until the end of the three-year transition period. Generally, companies expected to price and offer a VM-20 term product before ULSG. The pricing timeline is a factor in these roll-out plans; companies indicated a need to reprice multiple products by the end of the transition period.

### Concerns and Issues Regarding VM-20 Implementation

#### *Fluctuation in Reserve Levels*

- Many companies expressed concern over a now higher level of unpredictability and fluctuation in their reserves and anticipated profits under VM-20. This was regarding both the impact of unlocking assumptions (in particular, the interest assumptions) and potential regulatory changes in VM-20 methodology. There was consistent concern among interviewees regarding the future definition of tax reserves. One participant commented on the positive side of these fluctuation issues, in that it will allow for faster reactions or corrections than in the past.



#### *Limited Guidance*

- There was some concern regarding limited guidance within VM-20 and related PBR literature on appropriate assumptions, margin setting and covered risks (e.g., conversion privileges). This was true in general, and particularly regarding assumptions for new underwriting regimes with limited experience (e.g., accelerated underwriting).

#### *Complexity*

- More than half the participants raised concerns regarding the intensiveness and complexity of the computations necessary for VM-20. While most companies expressed satisfaction with their actuarial modeling system, it was clear that a significant effort needed to be exerted to make the systems VM-20-ready, either through customized coding, learning to use the VM-20 features or upgrading systems to take advantage of VM-20 capabilities. Other concerns around complexity included the following:
  - Extensive runtime, particularly for stochastic calculations
  - Separate assumptions for inner-loop versus outer-loop projections
  - Auditability of projected VM-20 calculations
  - Coordinating between use of multiple systems (e.g., one system to calculate the NPR, and another to calculate the DR and/or SR)
  - Moving to an asset/liability pricing approach versus a liability-only approach

- A couple of companies expressed concern that moving to VM-20 would slow the speed at which they can bring products to market. However, they also thought the increase in time-to-market would be highest at first, but over time, while it still may take longer to introduce a new product than it does now, it would not take as long as for the first VM-20 products the company introduces.

### **Profitability**

- Several companies commented on lower anticipated profitability upon moving to VM-20 reserving. This was particularly true for small companies with limited or near-zero mortality credibility, as well as for companies already engaged in reserve financing.

### **Collaboration and Coordination Between Functional Areas**

Almost universally, companies indicated that VM-20 will increase collaboration, cooperation and communication between areas of the company, primarily the pricing and valuation areas, but also the modeling, corporate and tax areas as well. There was general agreement that assumptions should be the same, at least initially, in the reserve calculations performed in these areas.

- For about half the participants, the increased collaboration, cooperation and communication were facilitated by regularly scheduled meetings. Some companies even formed separate VM-20 task forces with representation from various company departments. In other cases, this was handled on a more informal basis.
- A common theme we heard was that companies were already planning to further improve and formalize their existing governance and collaboration structures, particularly in the areas of model control and assumption ownership. The operative date of VM-20 has encouraged and accelerated implementation of those plans. Small companies as well as a couple of larger companies have used outside consulting assistance in developing these governance and collaboration structures. A few companies are at a stage where they are deliberating what the new structures should be and which areas would be responsible for each element of the VM-20 process. There was a wide spectrum in the level of formality around these governance structures.

### **Changes to Pricing Process and Product Design**

#### **Pricing Process**

Nearly all interviewees expressed the opinion that the pricing process would involve the same basic steps under VM-20 as currently. However:

- Almost all companies interviewed acknowledged that VM-20 would initially slow the pricing process, but companies

differed in their opinions regarding how much that would continue to be the case in the future. Items cited as contributing to the increased time to market included:

- Increased collaboration and communication between company areas and other parties (e.g., reinsurers, regulators)
- Deliberations regarding uncertainty in various aspects of the VM-20 calculations
- Increased model runtime
- More sensitivity testing
- Increased number of calculations to validate
- Updating to a new CSO table simultaneously with moving to VM-20

#### **Changes in Product Design**

While most companies acknowledged that there could be reasons to change their term or ULSG product designs under VM-20, few interviewees indicated they had worked through the details of changing product design under VM-20. Most companies were taking a “wait-and-see” approach.

#### **Reinsurance in VM-20 Context**

Most companies were at a beginning stage of thinking about how their use of reinsurance may change under VM-20. Some companies described themselves as listening to reinsurers’ thoughts and waiting for ideas from the reinsurers.

- A few companies mentioned the possibility of looking for reinsurance rate guarantees.
- There were some discussions regarding reinsurers helping companies increase the credibility of their mortality assumption (and therefore lower margins), but almost no concrete plans in that regard. This was especially true regarding mortality for new underwriting regimes such as accelerated underwriting.
- There was a mix of opinion regarding whether reinsurer input would be sought toward the end of the pricing process, or whether it would be earlier, more frequent and potentially an iterative element in the pricing process.
- There were few substantive comments regarding the company’s use of reserve financing on new issues once VM-20 was implemented within a company, though some companies indicated they would evaluate the possibility later.

#### **Product Lines Other Than Term and ULSG**

- In our discussions, companies generally indicated their plates were full enough regarding Term and ULSG, and that they have not given much thought to other products in a VM-20 context.

As this is a new frontier within the industry, it will be fascinating to watch how pricing actuaries' thoughts and reactions to VM-20 change in the next few years.

#### OTHER CASE STUDIES

The Phase 2 report addresses a handful of case studies in addition to those previously described. These additional case studies include:

- An attribution analysis of the margins on the Phase 1 Situation 5 Deterministic Reserve
- Analysis of 10 years of post-level term cash flows
- A single cell of a simplified issue product
- A 30-year level premium term single cell
- A short-pay ULSG single cell study

Some of the key conclusions from these additional cases studies are summarized as follows.

- When we analyzed the factors contributing to the excess of the DR over a best estimate gross premium reserve for the Phase 1 VM-20 case studies (Situation 5), we found that for both term and ULSG, moving from anticipated experience mortality to VM-20 mortality assumptions had the most significant impact on the level of reserve.
- Under the case study of specified post-level term assumptions, the post-level term period cash flows are clearly beneficial to the profitability metrics.
- For a company issuing a term product under a simplified issue (SI) underwriting program, the single-cell example in this report indicated that the adoption of VM-20 reserving methods together with current expectations for policy size and premium amounts imply a similar and perhaps improved IRR when compared to the IRR under Model 830 reserving methods. However, this outcome is dependent upon the chosen VM-20 assumption set, product design and premium levels.
- For the 30-year term single cell, the tax impacts together with the reduction in reserve requirements and material surplus relief make for a significant increase in profitability under VM-20.

- For the ULSG product, the case study indicated that a 10-pay premium pattern is less profitable than the level-pay situation, but the single-pay is more profitable. The higher single-pay profitability is driven largely by the initial strain, which is quite small in the single-pay situation. The reduced initial strain in the single-pay case is largely due to the commission level relative to the initial premium, which is a phenomenon not unique to a VM-20 pricing situation. ■



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