The National Association of Insurance Commissioners

Presentation and Analysis of Results of VM-20 Impact Study on Principle-Based Reserves for Life Insurance Products

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Section 1: Executive Summary

Introduction and Background

The Life Actuarial Task Force ("LATF") of the National Association of Insurance Commissioners ("NAIC"), with the assistance of the American Academy of Actuaries ("AAA"), has developed a principle-based valuation methodology for the calculation of statutory reserves for life insurance products. A revised Standard Valuation Law was adopted by the NAIC in 2009 and the associated Valuation Manual, as it relates to life insurance statutory reserving, is near completion. The new life reserve standard, "VM-20", is expected to apply to all individual life insurance business, except pre-need and credit life business. It is expected that VM-20 will apply only to new business written on or after the effective date of the new standard; business written prior to the effective date will continue to use existing reserve standards.

The NAIC seeks to understand the impact of the proposed valuation methodology on the US life insurance industry as a whole, and specifically US life insurance companies writing a mix of life insurance new business. In accordance with our letter of engagement dated November 24, 2010, Towers Watson was engaged by the NAIC to assist in conducting an impact study of the proposed VM-20 principle-based approach to reserve valuations. Towers Watson worked with the Regulatory Testing Subgroup ("RTS") of LATF who provided oversight and direction for the project. The RTS consists of members of LATF representing the states of Alaska, California, Florida, Kansas, New York, Ohio and Texas.

Towers Watson also received input and comments about the data requests and initial results from representatives of the Life Reserve Workgroup ("LRWG") of the American Academy of Actuaries, interested parties who participated on regular NAIC conference calls on this subject and representatives of the American Council of Life Insurers ("ACLI"). Also, the LRWG and the ACLI assisted throughout the process addressing specific questions from participating companies about how to implement VM-20.

Selected US life insurance companies with products that will be within the scope of VM-20 were asked to calculate statutory reserves using the proposed principle-based valuation methodology under VM-20 using the working draft of VM-20 dated February 28, 2011 and report these results to Towers Watson (the "VM-20 Impact Study" or "Impact Study"). The impact of the proposed valuation changes was determined by comparing the reserves as calculated under the proposed principle-based valuation methodology prescribed in VM-20 with the reserves calculated under the current formula-based valuation methodology. The Impact Study was completed in two phases: Phase I compared baseline VM-20 results to current valuation results while Phase II involved various sensitivities related to VM-20 assumptions. Towers Watson also conducted a survey of the participants in order to gain insights into the challenges of implementation and their views on certain aspects of the methodology.

This document provides the results of the VM-20 Impact Study, a discussion of Towers Watson's observations about the results and our recommendations for the NAIC to consider.

Due to time and resource constraints of the Impact Study, no single company provided results for all of their life products being sold today. In addition, the companies included in the Impact Study may or may not provide a proper representation of all life insurance companies that will be subject to VM-20. Therefore, we did not estimate the impact on the US life insurance industry as a whole in this report. Readers of this report should use caution in extrapolating the results of this study to the entire life insurance industry. Details on company participation are provided in Section 4.

This report assumes the reader is familiar with the details of VM-20 and the VM-20 working draft as of February 28, 2011 which formed the basis of the calculations in the Impact Study. A high-level overview of VM-20 is provided in Appendix B and the February 28, 2011 draft is contained in Appendix I.

VM-20 Impact Study Participants

In October 2010, the NAIC sent invitations to 66 life insurance companies asking about their interest to participate in the Impact Study. The companies were selected based on size, mix of products sold and type of company (mutual, stock, fraternal, direct writer and reinsurer) with the intent of having a wide mix of companies (of varying size and types). Of the 66 companies asked to participate, 42 companies initially agreed to provide results for the Impact Study with 35 ultimately submitting results for Phase I and 24 submitting results for Phase II. The participating companies included large, midsize and small insurers. All of the results were from direct writers of insurance as no reinsurers provided results for the Impact Study (3 reinsurers initially agreed to participate but did not submit results in time to be included in this report).

Results of the Impact Study and Towers Watson's Observations

There were 14 objectives developed by LATF for the Impact Study. A summary of the Impact Study objectives, the results and Towers Watson's observations follows:

1. The effect of the proposed principle-based valuation methodology on US life insurance products and on the US life industry as a whole as compared to the current formula based reserves.

   Result of the Impact Study: The Impact Study instructed companies to calculate the VM-20 reserves under two alternatives for determining future expected asset cash flows on reinvestment assets in the stochastic and deterministic reserve calculations (there was no impact on the Net Premium Reserve ("NPR")). Alternative 1 was based on asset returns being a function of the appropriate U.S. Treasury interest rate plus a prescribed spread. Alternative 2 was based on deducting asset default costs and anticipated investment expenses from gross investment income. In general, Alternative 1 produces lower spreads than Alternative 2.

These alternatives primarily impacted the ULSG and term products as they were the main products where the stochastic or deterministic reserve was the minimum reserve under VM-20. The Impact Study results showed that Alternative 1 stochastic reserves were significantly higher for ULSG and term products than under Alternative 2. Based on the preliminary findings of the Impact Study and comments received from industry, LATF decided to adopt a modified version of Alternative 2 during the drafting of this report in January 2012. The modification is that the credit spreads would be the average of the A and AA S&P rated bonds instead of the average of A and BBB. Thus, the adopted spreads are lower than the Alternative 2 spreads presented in this study, which would have produced higher deterministic and stochastic reserves than shown in this report under Alternative 2.

On average, the reported VM-20 reserves for the hypothetical 1 year of new business and 5 years of new business were lower than CRVM[1] reserves for term products. For Universal Life with Secondary Guarantees, the results are provided on an individual company basis only. Providing results on an aggregate basis was felt to be potentially misleading given the varying practices on calculating CRVM reserves under Actuarial Guideline 38 . For the other products tested, (traditional whole life, simplified issue whole life, universal life without secondary guarantees and variable universal life), the reported VM-20 reserves were at similar levels compared to current rules-based CRVM reserves.

The level of VM-20 reserves relative to CRVM for term and ULSG varied significantly on a company-by-company basis with several companies reporting much higher or lower reserves than the average results. It should be noted that in some cases the early duration reserves are small which can lead to large percentage differences for small absolute dollar differences.

The results of the Impact Study relating to this objective (including showing the company-by-company reported results) are provided in Section 5.

2. The effectiveness of the exclusion tests.

Result of the Impact Study: The Impact Study asked companies to provide the results of the Stochastic Reserve Exclusion Test ("SRET"), the Deterministic Reserve Exclusion Test ("DRET") and all of the VM-20 reserve components (stochastic, deterministic and net premium reserve), even if they were not required to perform the stochastic or deterministic reserve calculations due to passing the SRET and/or the DRET. As expected, companies reported that some of the term products and all of the ULSG products failed the SRET. One variable universal life product failed the SRET, but all of the other products (traditional whole life, simplified issue whole life and universal life without secondary guarantees) passed both the SRET and the DRET.

Towers Watson also examined whether the Impact Study results contained any "false positives" or "false negatives". For the purposes of this report, a false positive was defined as a product that passed an exclusion test but then would have been required to hold the reserve subject to the

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[1] Throughout this report we refer to CRVM (Commissioners Reserve Valuation Method) as the current regulatory standard for life insurance products. This includes "Regulation XXX" and Actuarial Guideline 38.

exclusion test as the minimum reserve if the test had not been used to bypass the calculation (e.g., the product passed the SRET but the stochastic reserve reported as part of the Impact Study was larger than the minimum reserve determined excluding the stochastic reserve) . From a regulatory perspective, too many false positives would suggest that the exclusion test should be modified to require more products to be subject to the VM-20 reserve calculations (i.e., not allowed to bypass the calculation). There were no false positives related to the DRET in the Impact Study; however, there were false positives for the SRET for some of the term products and one of the VUL products. The sample size was very is small (we did not get all of the information required from the other reporting companies) so we were not able to determine if these results are an aberration or part of a trend. Also, it is possible that the false positives could be the result of large mortality margins in the stochastic reserve calculation. If VM-20 is modified in the future to lower these mortality margins, the false positives may be eliminated.

A false negative was defined as a situation in which a product did not pass the exclusion test but the minimum reserve required was not the reserve for which the exclusion test was designed to exclude (e.g., a product failed the SRET but the stochastic reserve was not the minimum reserve). This result could concern companies as they would have to do the work to determine the stochastic or deterministic reserve but these reserves did not contribute to the minimum reserve. The instance of a false negative could be because the exclusion the test ratio is too low, or the other reserve requirements are too high (the deterministic reserve or the net premium reserve in the case of the SRET, or the net premium reserve in the case of the DRET). There were some false negatives for ULSG products and a very small number of false negatives for term products.

The high level results by product were within expectations and appear to support the effectiveness of the exclusion tests. However, the false positives reported for term products are of some concern. There are quite a few false negatives for ULSG products and a few for term products, which would be a concern to companies that would have to put forth the effort of calculating the reserves, but ultimately report another component as the minimum. LATF will need to balance requiring companies to perform the stochastic or deterministic calculations when they ultimately prove not to be required against identifying all circumstances when the stochastic or deterministic reserve would prevail. False negatives can also be caused by deterministic reserves or NPR values being too conservative. LATF may need to review the level of conservatism included in these calculations.

It’s important to understand that the level of aggregation may be a factor in whether or not an exclusion test is passed or failed. Individual products may not pass the SRET and/or DRET, but when grouped with other products, the aggregate block may pass the applicable exclusion test. Companies may determine the level of aggregation that is most advantageous (i.e. the lowest level of reserves). Two companies with the exact same portfolio and same assumptions may report different reserves due to aggregation.

The results of the Impact Study relating to this objective are described in additional detail in Section 6.

3. The effectiveness of the Net Premium Reserve component as a floor for the minimum reserve.

   Result of the Impact Study: The NPR calculation in the VM-20 draft used in the Impact Study applied only to term and ULSG products. In the Impact Study for all other products, the NPR was assumed to be equal to the current rules-based CRVM reserve. From company-to-company, the Impact Study showed significant volatility in the NPR as a percentage of CRVM. Although there may be other reasons to include the NPR in VM-20, this variability may suggest that the NPR is ineffective as a floor for the minimum reserve. For term products, the NPR was the maximum VM-20 reserve component in the majority of cases. This may be an undesirable result since the reported reserve in these cases will still be based on a formula-based method (i.e. the NPR) instead of a principle-based calculation as provided by the deterministic and stochastic reserve components. We also note that having a rules-based floor like the NPR opens the possibility that products will be designed in the future to obtain specific NPR results by varying product features.

   The results of the Impact Study relating to this objective are described in additional detail in Section 7.

4. The effectiveness of the AAA Economic Scenario Generator

   Result of the Impact Study: Towers Watson compared the mean returns that were returned by the AAA economic scenario generator ("ESG") to historical returns. Our analysis of the AAA ESG showed it to be generally effective with a few areas that we would recommend to be evaluated. The generator produced a lower number of inverted scenarios than what has been seen historically over the past 50 years. The AAA ESG is generally technically accurate and was found to be robust and easy to use.

   Simulated treasury rates were compared to actual historical rates. The average simulated interest rates are below historical levels covering the period from 1960 to 2009 by approximately 1.9% for 1- and 5-year rates, 1.8% for 10- and 20-year rates and 1.6% for the 30-year rate. This is likely influenced by the current low interest rate environment and level of the mean reversion strength parameter in the ESG. A higher strength parameter would cause the expected long term rate to approach the mean reversion point earlier in the projection period, giving less weight to the current interest rate environment. The differences between historical and simulated rates are reduced by approximately 0.8% to 0.9% if the years 1978 through 1985, which was a period of very high interest rates, are excluded from the historical rates.

   Simulated equity returns were also compared to historical returns. The simulated returns are on a total return basis (i.e. includes the effect of dividends) while the historical returns exclude dividends. The historical average equity total return from 1960 to 2009, excluding dividends, was 6.02%. The 50-year geometric average simulated total equity return, including dividends, was 7.55%. Since dividends yields have averaged close to 2% historically, simulated equity returns appear reasonably consistent with historical levels.

The results of the Impact Study relating to this objective are described in additional detail in Section 8.

5. The impact of reinsurance on the level of the principle-based reserves.

   Result of the Impact Study: Although several reinsurance companies were invited to participate in the study and three originally accepted, no reinsurers ultimately submitted results. This prevented any analysis of the impact of VM-20 from a reinsurance company perspective. However, many of the companies participating in the Impact Study had reinsurance arrangements on their products and reported the Impact Study results on both a gross and net of reinsurance basis.

   Overall, the inclusion of reinsurance did not change the direction of the impact of the VM-20 reserves. If the gross VM-20 reserve was greater than CRVM on a direct basis, it was generally greater than CRVM on a net basis. The VM-20 reserve credit as a percentage of the direct reserve was generally consistent with the CRVM reserve credit, with a few exceptions. The ULSG VM-20 reserve credit was significantly higher under VM-20 for two of the six companies that provided reinsurance results; although, the net VM-20 reserve was still higher than the net CRVM reserve for these companies. The overall reserve credit for term products was modestly higher under VM-20 primarily due to one or two companies skewing results; however, most of the companies reported reserve credits for term that were similar to CRVM reserve credits.

   We note that there is a potential incentive to reinsure life insurance business under VM-20 for certain companies. Companies that do not have highly credible mortality experience data will be required to blend more with the industry table in their VM-20 reserve calculations than reinsurers with more credible experience data. We also note that a modified approach for determining the VM-20 mortality experience assumption was discussed on the February 2, 2012 LATF call which would impact our observation above about the future incentive for reinsurance under VM-20. Quantification of the impact of this change is outside of the scope of this report.

   Participants varied on their approach to YRT premium margins; some applied a margin to the YRT premiums to be more consistent with the margin applied to the mortality rates while others applied no margin.

   The results of the Impact Study relating to this objective are described in additional detail in Section 9.

6. Understanding how companies will determine anticipated experience assumptions and establish margins.

   Result of the Impact Study: In general, setting best estimate assumptions was not reported as an issue for the participants. However, setting the overall margins and in particular, the mortality assumption and blending with the industry table was reported by the participants as being very difficult. It was also reported by the participants that the blending of the mortality assumption with the industry table added a significant amount of additional conservatism (i.e., an implicit margin) to the overall reserve.

Additional details regarding the impact of the mortality margin sensitivities from Phase II of the Impact Study and how participants set best-estimate assumptions from the participant survey is presented in this report in Section 10.

7. Understanding how companies determine the level of granularity used in combining or grouping assets and liabilities into model cells.

Result of the Impact Study: As part of Phase II, companies were asked to provide a sensitivity assuming the liability model was created with half as many model cells as was used in the calculation. The results showed very little change to the term and ULSG minimum reserves and no change to the minimum reserves for any of the other product lines (as all of the other product lines held the NPR reserve). In some of the other product lines, there were significant changes to some of the deterministic and stochastic reserve components but since the NPR was the minimum reserve for both the baseline and sensitivity, there was no change to the minimum reserve.

Another concept related to granularity that was analyzed was product aggregation. Impact Study participants were instructed to perform the VM-20 calculations for a specific product type (e.g., ULSG or term). This led every company to use product type as a liability group (called model segment in VM-20). However, VM-20 requires the use of “model segments consistent with the company’s asset segmentation plan, investment strategies, or approach used to allocate investment income for statutory purposes.” It is very likely that some companies will create VM-20 model segments that include more than one product type.

Term was the only product for which data was submitted on both an individual and combined basis. We requested companies to provide stochastic results for term products both individually for 10, 15, 20 and 30 year level premium periods and in aggregate with all of the term periods combined in one calculation (“aggregate term”). Three companies provided results both separately and in aggregate. On average, the minimum VM-20 reserve for the aggregate term block was 26% lower than the simple sum for 1 year of business and 7% lower for 5 years of issues under Alternative 1. However, there was one instance in which the aggregate reserve was greater than the simple sum. This occurred because 2 of the 3 products included in this company’s results passed the SRET on an individual basis even though the stochastic reserve was actually higher than the minimum reserve reported (i.e. false positives). When all 3 products were aggregated, the SRET failed and the stochastic reserve was the maximum reserve component.

The fact that the aggregate term reserve is less than the sum of the individual reserves in many cases is not a flaw in VM-20 but the result of the combination of different risk profiles in the calculation. Aggregating risks leading to lower overall risk is a standard concept in risk management (also called diversification). In this case, the diversification does not come from combining different product risks, but from the length of the premium guarantee period leading to different levels of exposure to long term market risks. We would expect companies to include multiple product lines in their models when implementing VM-20 if the product lines meet the criteria of a model segment in VM-20. Having multiple product lines combined may lead to lower required reserves under VM-20 for product lines where the minimum reserve is the stochastic or deterministic reserve than if the calculations were performed separately and added together. However, we do not have enough data from the Impact Study to estimate this impact.

Additional details on the level of granularity and the impact of aggregation are provided in Section 14.

8. Understanding how companies determine the number of economic scenarios that should be modeled.

Result of the Impact Study: Based on the submitted results and results of the survey of the participants of the Impact Study, the number of modeled economic scenarios in the stochastic reserve was primarily determined by run time required and by resources available to validate the output produced. No company submitted results for more than 1,000 scenarios with about 1/2 of the companies running 1,000 scenarios and more than 1/3rd running only 50 scenarios. The number of scenarios varied greatly by product with ULSG having the largest number and percentage of companies (more than 75%) running 1,000 scenarios (with no companies running only 50 scenarios). It is not clear whether companies would run more scenarios if VM-20 was actually in effect or if more time had been given to complete the Impact Study.

We asked companies to provide the stochastic reserve results for each scenario so we could evaluate the impact of running additional scenarios and the convergence (or lack thereof) of the stochastic reserve as the number of scenarios used increased. We could only calculate this for a few products. For the ones that we were able to calculate, reducing the number of scenarios did not have a material impact on the stochastic reserve.

Only one of the study participants reported using additional scenario reduction techniques other than the ESG's built in representative scenario picking tool. No further information was given on the scenario reduction technique this participant used. Practice regarding scenario reduction techniques will likely evolve as companies begin to forecast stochastic reserves and have to address the issue of nested stochastic model runs.

Additional details on how participants determined the number of scenarios is presented in Section 11.

9. Understanding how companies use sensitivity testing in the determination of the principle-based reserves.

Result of the Impact Study: Companies typically use sensitivity testing to determine the overall importance of certain assumptions and their impact on reserve levels. Sensitivity testing can also be used to set the level of margins. Companies may also use sensitivity testing to determine the direction of the margin; for example, it is sometimes necessary to run a test to determine if an increase or decrease to lapse rates will increase the reserve.

In Phase II of the Impact Study and the survey, participants were asked how they used sensitivity testing in determining margins. These results are contained in Section 12.

10. Understanding reporting and documentation of reserve results, modeling assumptions, experience assumptions, margins and sensitivity testing.

    Result of the Impact Study: During the initial planning of the Impact Study, it was anticipated that participants would be requested to provide detailed documentation of their calculation methods, assumptions and sensitivity testing. However, as the study progressed it became clear that participants would be unable to produce this documentation given the timeframe required to complete the Impact Study. Feedback from participants suggests that the proposed documentation requirements are believed to be large and somewhat redundant with current actuarial opinion and memorandum documentation requirements.

    Survey responses related to this topic are presented in Section 15.

11. Identifying possible regulatory benchmarks and/or metrics to be used in determining a company's compliance with the principle-based valuation provisions of the standard valuation law and valuation manual.

    Result of the Impact Study: Given the complex nature and principle-based approach of VM-20, it is difficult to establish benchmarks or metrics that can be applied widely to all companies to determine compliance with the provisions of the standard valuation law and valuation manual.

    Given the variability of results reported by participants during the Impact Study, even within the same product groups, it appears common patterns or relationships between companies will be difficult to identify.

    Over time, as more data is gathered and industry practice for determining reserves under VM-20 is established, it may be possible to develop useful benchmarks and metrics. Regulators can examine how assumptions and margins change from one calculation to the next and what part of the calculation prevails as the minimum reserve (the stochastic, deterministic or NPR). Also, certain analytics, such as trend reports, will aid in the analysis of results.

12. The ease of implementation of the proposed methodology.

    Result of the Impact Study: It is clear from the survey results that implementing VM-20 for the first time is a significant exercise. The participants found that it was challenging in multiple ways: interpreting VM-20, developing assumptions and margins, modifying their financial modeling software and finding resources to perform the calculation. However, it seems likely that after the calculation is performed for the first time future calculations will be significantly easier.

Of course as we have seen with other principle-based methods (for example, with AG-43 for variable annuities), there is still quite a bit of work required to validate and understand the calculation results each time the calculation is performed. The results can be impacted greatly by changes in company experience, policyholder behavior and in the economic environment. Large amounts of data are produced (in particular for the stochastic reserve) which will put demands on the valuation actuaries to review and approve the results in time frames required for financial reporting.

Ease of implementation is addressed in Section 13 of this report.

13. Areas where further refinements or changes, if any, to the methodology are needed or suggested.

    Result of the Impact Study: There were many suggested clarifications and changes that were reported by the Impact Study participants. The input from the participating companies is provided in Section 16.

    Towers Watson has also identified a number of revisions and clarifications for LATF to consider. These suggestions are summarized on the following page.

14. Areas where further clarification of the proposed methodology or processes are needed in order to facilitate a smooth implementation.

    Result of the Impact Study: In addition to the items in Section 16 and Towers Watson's suggestions below, several areas of VM-20 where there were minor errors or clarifications required have been communicated to the NAIC and are located at the end of Appendix H.

Towers Watson's Recommendations

As part of our review of the Impact Study results reported by the participating companies, Towers Watson believes that LATF should consider the following:

1. The adequacy of the overall level of reserves produced by VM-20 is a question for LATF to answer. We recommend that LATF keep in mind that the under principle-based reserves the level of reserves will respond to changes in experience and the economic environment. Under rules-based reserves, the reserve amount is set at issue and never changes (unless additional reserves are required under cash flow testing or other requirements). Under principle-based reserves both the initial level and responsiveness of the reserve to changes in experience need to be taken into account when considering adequacy.

2. As there were some false positives in the stochastic reserve exclusion tests for term products, we recommend LATF consider requiring companies with products that pass the SRET for a number of consecutive years to provide a demonstration that the stochastic reserve is not higher than the minimum reserve held. For example, this could be a requirement that after 3 consecutive years of passing the SRET, the company must provide the stochastic reserve after the third year. If the demonstration shows that the stochastic reserve was higher than the minimum reserve, then the company would be required to hold the stochastic reserve and be required to provide the demonstration each future year. If the stochastic reserve was lower than the minimum reserve, then no further demonstration would be required.

3. LATF should consider clarifying whether the term product gross premiums used in the DRET should be over the level premium period and/or over the entire contract as this was a point of confusion for many participants.

4. We recommend LATF modify the term NPR calculation so it works more effectively as a floor instead of being the maximum VM-20 reserve component as it was in the majority of cases for the term product. We also recommend that any modification to the NPR address the variability reported relative to the minimum reserve in both the tern and ULSG products. LATF may also want to consider making the calculation of the deterministic reserve a requirement for some or all products; that is, eliminate the DRET for those products. This would ensure that there is a principle-based reserve that can be compared to the NPR assuring that the minimum reserve is at least as large as the deterministic reserve (which is principle-based) rather than only relying on a formula-based reserve (NPR) to be the only value calculated.

5. The Impact Study results showed that the level of the initial yield curve had a significant impact on the VM-20 results for those products where the stochastic or deterministic reserve prevailed. This implies the VM-20 reserves will fluctuate based on the current economic conditions and may create significant volatility on financial results, especially given the fact that the majority of assets held by life insurance companies are reported on a book value basis. Towers Watson recommends that the LATF review the appropriateness of the ESG on a regular basis. Our

review found a few areas where the ESG produced results that were different than historical averages that could be areas of focus for LATF.

6. Due to the inconsistent application in the Impact Study about whether or not margins should be applied to yearly renewable term (YRT) reinsurance premium rates, we recommend that LATF clarify the intent in VM-20 through a guidance note or change in wording.

7. The mortality margins due to the mortality blending process were quite large as a percentage of the overall reserve. We recommend that the mortality blending process and appropriate level of margin in the mortality assumption be reviewed for improvements and potential modifications. We note that a modified approach for determining the VM-20 mortality experience assumption was discussed on the February 2, 2012 LATF call which would change the mortality blending process under VM-20. Quantification of the impact of this change is outside of the scope of this report.

8. LATF should consider allowing documentation requirements for VM-20 to use the format as asset adequacy reports and actuarial memoranda, if possible, to minimize the same information having to be reported multiple times to the same regulators.

9. LATF should consider decreasing the implementation difficulty for VM-20 by increasing the corridor of the starting assets in the deterministic and stochastic reserves to be within 5% instead of 2%. Based on the results of the survey, this would significantly decrease the required iterations to meet this requirement. The Phase II results showed that there would be some change to the level of the stochastic reserve; assuming the results are linear – i.e., half of the 10% sensitivity - this change would lead to an increase in the stochastic reserve in the range of +/- 5 – 10% if the corridor is widened as recommended with virtually no change to the deterministic reserve.

10. The participants provided many specific suggestions for improvements and clarifications as part of the Impact Study. Section 16 provides the details of the Impact Study participants' suggestions. Towers Watson recommends that LATF review these suggestions for ideas on how to improve VM-20.

More detail on each of these recommendations is contained in the remainder of this report.

Acknowledgments

Towers Watson and the NAIC would like to express its appreciation to all of the participating companies. The Impact Study required a significant effort to complete and included two data request phases and a follow up questionnaire over the span of more than a year. Every participating company completed the work required in a careful and thoughtful manner and cooperated with Towers Watson when we asked for follow up information or had questions about their submissions.

Towers Watson would also like to express appreciation to the AAA and the members of the LRWG for addressing questions raised by the participating companies about some VM-20 sections and to the

ACLI for addressing questions about the NPR calculation. We would like to specifically thank Dave Neve, the Chair of the LRWG, and John Bruins, the lead contact from the ACLI, for their valuable and important assistance to Towers Watson and the participating companies in the completion of the Impact Study.

Section 2: Objectives

The LATF with the assistance of the AAA has been working on developing a principle-based valuation methodology for the calculation of reserves for life insurance products for several years. A revised Standard Valuation Law was adopted by the NAIC in 2009 and the associated Valuation Manual, as it relates to life insurance reserving, is near completion. The new life reserve standard, VM-20, is expected to apply to all individual life insurance business, except pre-need and credit life business, written after the adoption of the valuation manual. The AAA has finished its work on VM-20 and in the summer of 2010, it was decided by LATF to commission a study of the impacts of VM-20.

There were 14 key objectives developed by LATF that were expected to be addressed as a result of the VM-20 Impact Study. The objectives are as follows:

1. The effect of the proposed principle-based valuation methodology on US life insurance products issued as new business, US life insurance companies writing different product mixes of new business, and the US life insurance industry as a whole compared to the current formula based valuation methodology.

11. The effectiveness of the Exclusion Tests (deterministic and stochastic) as a risk measurement tool in determining the ultimate level of minimum reserves that must be established based upon the underlying risks assumed.

12. The effectiveness of the Net Premium Reserve Component as a floor for the minimum reserve.

13. The effectiveness of the American Academy of Actuary's Economic Scenario Generator in exposing asset and liability risks embedded in a life insurance company's balance sheet given different future economic environments.

14. The method of recognizing different forms of reinsurance, both proportional and non-proportional agreements, determination of pre- and post- reinsurance amounts and reinsurance reserve credits.

15. The most effective processes in understanding how companies will determine anticipated experience assumptions and establish margins for adverse deviation and company variation using credibility theory and sensitivity testing.

16. The most effective processes in understanding how companies determine the level of granularity used in combining or grouping assets and liabilities into model cells so that all major risk characteristics are reflected or captured.

17. The most effective processes in understanding how companies determine the number of economic scenarios that should be modeled so results have statistical confidence. Such processes may take into account scenario reduction or stratified sampling techniques.

18. The most effective processes in understanding how companies use sensitivity testing in identifying the major risk components of a company's balance sheet.

19. The most effective reporting and documentation of reserve results, modeling assumptions, experience assumptions, margins and sensitivity testing.

20. The most effective regulatory benchmarks and/or metrics to be used in determining a company's compliance with the principle-based valuation provisions of the standard valuation law and valuation manual.

21. The ease of implementation of the proposed methodology taking into account human resources, information technology resources, computer modeling run times and required sensitivity analysis. The ease of implementation should take into account available scenario reduction techniques or processes that may be implemented.

22. Areas where further refinements or changes, if any, to the methodology are needed or suggested based on the results of the modeling or analysis to improve the risk measurement functionality of the methodology.

23. Areas where further clarification of the proposed methodology or processes is needed in order to facilitate a smooth implementation.

Section 3: Reliances and Limitations

In developing this report, Towers Watson relied upon data and information supplied by the companies that participated in the Impact Study. A discussion of industry participation in the Impact Study is provided in the next section of this report.

All data provided to Towers Watson was provided through the Insurance Department of the State of Ohio. We relied upon the general accuracy of the data and information provided without independent verification or an audit of the results.

The principal material relied upon was:

- Responses to the Phase I Instructions and Data Template
- Responses to the Phase II Instructions and Data Template
- Written and oral communications about the responses to Phases I and II from the companies, either as clarifications provided to their results or answers to specific questions asked by Towers Watson.
- Responses from the ACLI and AAA where Towers Watson and the RTS asked for clarifications about certain parts of VM-20.

Each company performed its own independent calculation and interpretation of the VM-20 methodology and requirements using the VM-20 draft as of February 28, 2011. Towers Watson answered questions submitted by the participants regarding the study requirements but did not provide any expert advice, interpretations or any guidance on how to implement VM-20. All questions relating to how to implement VM-20 or how to interpret specific VM-20 language were forwarded to the RTS or LATF. The RTS, the AAA subgroup involved with VM-20 and the ACLI provided additional guidance to participants to answer their questions. Review or analysis of this guidance was not within the scope of the Towers Watson engagement.

Additionally, Towers Watson did not validate, audit or independently check the accuracy of the calculations or results provided and presented as part of this report. We did perform high-level reviews of the data and information provided for reasonableness as part of the study and asked follow-up questions in cases where we did not understand certain portions of their submissions or if the results seemed to be an outlier. This was done in order to seek clarity on the participants' submissions and not to identify any compliance or non-compliance with VM-20.

The VM-20 Impact Study was completed under hypothetical conditions using assumptions and approximations which enabled completion of the study in the required time frame. There may be product changes in the future that could have a material impact on the results shown in this study. As such, there is no guarantee that the results presented will be representative of the actual results when VM-20 is implemented in the future. There may be changes in the VM-20 language from the working draft dated February 28, 2011 used in the Impact Study that would have a material impact on the results shown in this report. In particular, the results related to the ULSG product may not be representative of overall industry results and should not be used as a basis for discerning the overall impact of moving from current AG 38 requirements to VM-20 requirements.

In addition, the results are primarily shown in the aggregate rather than on a company-specific basis. Towers Watson has attempted to identify areas where any participating company's results differ widely from the average of the aggregate results but we have not attempted to discern the nature of the difference other than to ask follow-up questions as noted above.

This report is being provided to the NAIC for use in its internal discussion about how companies might calculate statutory reserves under the VM-20 draft dated February 28, 2011. However, we do agree to the release of this document in the public domain under the following conditions:

- The report is distributed in its entirety;
- Any press release or other announcement related to the release of the report in the public domain which is developed by the NAIC must be reviewed and approved in writing by Towers Watson prior to its use by the NAIC so that Towers Watson may ensure that the language utilized by the NAIC accurately reflects the services we performed in developing this report; and
- Towers Watson will direct all specific press inquiries related to this report to the NAIC Communications Department. Notwithstanding the foregoing, Towers Watson will cooperate with the NAIC in formulating responses to media inquiries regarding the report.

Further reference to, distribution of or other use of this report, or any portion thereof without prior written consent of Towers Watson and the NAIC is unauthorized.

Towers Watson has prepared this report in conformity with its intended utilization by persons technically competent in the areas addressed and for the stated purposes only. The impact of unanticipated events subsequent to the date of this report is beyond the scope of this report.

Section 4: Participation

Number of Participants

In October 2010, the NAIC sent an invitation to participate in the Impact Study to 62 US Life Companies. The companies were selected in consultation with the RTS based on size, mix of products sold and type of company (mutual, stock, fraternal, direct writer and reinsurer) with the intent to have a wide mix of companies (of varying size and types). Companies were asked whether they would participate, whether there were other companies in their Insurance Group that would be willing to participate, and to provide specific information about 2009 first year direct and ceded premiums for their various products.

Of the 62 companies that received an invitation to participate, 51 companies responded to the survey. Of the 51 companies that responded, 39 indicated they would be interested in participating and 12 indicated they would not participate.

An additional four companies not in the original invitation were subsequently invited to participate in the survey with three indicating they would be interested.

Overall, 42 companies agreed to participate in the Impact Study with 26 ultimately submitting results for Phase I and 18 also submitting results for Phase II. Although we asked three reinsurance companies to participate in the study, no reinsurance companies provided results for either Phase I or Phase II of the Impact Study.

Products Modeled

As part of the invitation to participate, Towers Watson was notified that companies would not model all of their life products being sold because the level of effort required would be too large in the timeframe required for the Impact Study's completion. Based on the direct premium information provided by companies, Towers Watson worked with the RTS to assign between one and three products to each of the participating companies to model in the study. We notified each of the companies and came to an agreement on the products that each company would model.

During the course of the study, some participants dropped out due to resource issues. Also, some companies provided several iterations of their Phase I and/or Phase II submissions, most of which were had relatively immaterial impacts on the results. Reasons for submitting revised results included the following:

- More time/resources allowed for completion of parts of our template that had not been completed before
- Assumption revisions

- Correction of modeling errors

The table below details the product coverage for the Phase I and Phase II data submissions. These are based on product segments, not on participants, where product segment is defined to be a unique company / product type combination. For example, a company modeling both Term and ULSG would count as two product segments.

TABLE 4.1 – Product Coverage

Count of Product Segments

Product	Original Count	Revised Count*	Phase I submitted	Phase II submitted
ULSG	10	10	9	6
UL without SG (ULwo)	5	4	2	2
Term	13	12	12	8
Traditional Whole Life (TWL)	5	5	5	2
Simplified Issue Whole Life (SIWL)	4	3	3	3
Variable Universal Life (VUL)	6	5	4	1
Indexed Universal Life (IUL)	2	0	0	0
Reinsurance companies	3	3	0	0
Total	48	42	35	22

* Revised count reflects participants who had to drop out of the study due to resource issues

Not all companies participating in Phase I participated in Phase II. In addition, those companies performing the Phase II sensitivities did not run all sensitivities. A priority list for the sensitivities was provided for Phase II. Table 4.2 lists the sensitivities requested and Table 4.3 lists the submissions for each product by each of the sensitivities.

TABLE 4.2 – Sensitivity Description

Sensitivity Number	Sensitivity Description
1	Mortality Rates +10%
2	Mortality Margin Component Analysis
3	Margins (Zero and Double)
4	Lapse Rates +/- 20%

TABLE 4.2 – Sensitivity Description

Sensitivity Number	Sensitivity Description
5	Dynamic Lapses
6	Expenses +10%
7	ULSG Funding Patterns
8	Net Premium Reserve
9	Starting Assets +/- 10%
10	Lower Spreads
11	Double Defaults
12	Negative Cash Flow Strategy
13	ESG Starting Yield Curve
14	ESG Parameters
15	Eliminate Post-Level Term Amounts
16	Double Compression of Model Points
17	Expand to 10 and 15 Years of Issues

TABLE 4.3 – Phase II Product Coverage by Sensitivity

Count of Product Segments

Product	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ULSG	4	6	4	4	1	3	4	2	3	1	3	3	4	0	0	2	2
ULwo	1	2	0	0	1	1	0	1	1	1	1	1	2	2	0	1	1
Term	12	13	11	12	0	3	0	3	4	1	2	3	13	4	4	4	7
TWL	1	1	0	0	0	1	0	1	1	0	1	1	1	0	0	1	1
SIWL	1	1	0	0	0	1	0	2	0	0	1	1	1	0	0	1	3
VUL	1	1	0	0	0	1	0	0	1	1	1	0	1	0	0	1	1

Those companies participating in the study prepared several sets of runs using VM-20 and the results of those runs were compared to the current formulaic statutory reserves for the applicable product, whether it was CRVM, UL CRVM, XXX, or AXXX. The companies used their 2009 production levels for the products they modeled as a proxy for the 1 year of new business. The 5 years of new business assumed the same amount of business issued each year, with a persistency rate assumed (where applicable) of 95% per year.

Survey Participation

At the end of the Phase I and Phase II data submissions, Towers Watson performed a survey to gather information on how the calculation was performed and other qualitative feedback. The survey addressed items such as the ease of implementation, resource requirements, model run times, and suggestions for how the proposed methodology or processes could be improved or clarified to facilitate a smooth implementation.

The survey was sent to the primary contact at each of the 26 companies that submitted Phase I results on December 6, 2011. A complete list of the survey questions is provided in Appendix F.

We received survey responses from 20 companies with one company sending separate survey responses for both of the products they modeled (leading to 21 survey responses). However, not all participants responded to every question and in many cases the total responses on any specific question are significantly less than 21. This occurs because not every company calculated the stochastic or deterministic reserve due to passing the exclusion tests (so would not be able to answer questions about how they determined mortality margins for example) and because some companies did not provide an answer to every question in their response.

Participant Resources

The following resources were available to participating companies to assist in completing the field testing exercise:

Questions to Towers Watson

Results, questions, comments, and other such matters were sent by participants to Towers Watson. Towers Watson responded directly to questions or passed along questions or clarifications requested to the Regulatory Testing Subgroup (to be answered by the members of LATF or passed to the AAA or the ACLI) for review and response.

Project Bulletin Board

A special internet-based OnePlace bulletin board was set up for the Impact Study. Participants were able to check this bulleting board for updates and announcements. All resources needed to participate in VM-20 including exposure drafts, practice notes, spreadsheet tools, ESG files, and the Q&A were posted to the OnePlace site.

Training Seminar

A training seminar was held for participants and interested parties on Thursday November 18 and Friday November 19, 2010 in Kansas City, Missouri. At this seminar, personnel from Towers Watson, the NAIC, the American Academy of Actuaries, and the American Council of Life Insurers (“ACLI”) led technical discussions regarding VM-20 and the VM-20 Impact Study.

Webcast

Subsequent to the training seminar in Kansas City, a webcast was held for those participants unable to attend the seminars in Kansas City. The purpose of this webcast was to review the instructions, summarize key discussions and findings from the Kansas City meeting and to provide a forum for companies that could not attend to ask questions and to provide input.

VM-20

The October 16, 2010 exposure draft of VM-20 was initially used for Phase I of the field testing. After several questions were sent to the RTS, a revised working draft was released and participants were instructed to use a newer draft for the VM-20 Impact Study that included several clarifications and cross reference errors corrected. The revised draft used for Phase I and Phase II is the working draft of VM-20 dated February 28, 2011. The draft version of VM-20 used in the Impact Study is contained in Appendix I of this report.

Section 5: VM-20 Results Compared to CRVM

Summary of Results and Towers Watson's Observations

One of the objectives of the Impact Study was to compare principle-based reserves under the proposed VM-20 methodology as of the February 28, 2011 working draft to current regulatory reserves. The VM-20 reserves relative to current rules-based reserves under CRVM are shown in Tables 5.1 (for 1 year of new business) and Table 5.2 (for 5 years of new business). The results are average values giving equal weight to each participating company. Alternatively, the averages could have been weighted by face amount or account value modeled. We believe it is more appropriate to weight by company as the intent of the study was to ask each participating company to have the same starting amount of business in the model (although this constraint was eliminated based on company comments on the initial Impact Study structure). Also, due to time and resource constraints of the Impact Study, no companies provided results for all of their life products being sold today. Therefore, it was not possible to determine the impact on the US life insurance industry as a whole from the information provided.

In this section, results are first presented for each product line in aggregate except for the ULSG results which are provided on an individual company basis only. Providing results for ULSG on an aggregate basis was felt to be potentially misleading given the varying practices on calculating CRVM reserves. The individual participant results are presented after the aggregate results.

Each participant was requested to provide results based on their actual products written during 2009. The values shown as "1 Year of New Business" represent the results as of December 31, 2009 for modeled business issued in 2009. The values shown as "5 Years of New Business" represent a hypothetical in force block of business representing issue years 2005 – 2009. Participants were instructed to produce this model by duplicating the 1 year of business model each calendar year from 2005 through 2009 modified for expected persistency and policy features, with an assumed valuation date of December 31, 2009.

The Impact Study participants were instructed to project expected reinvestment asset cash flows in the VM-20 stochastic and deterministic reserve calculations under two alternatives. Alternative 1 was proposed by New York and limits credit spreads to 4% of treasuries (treasury rate times .04) plus an additional spread of 25 basis points. No defaults are included in Alternative 1. Alternative 2 is based on deducting asset default costs and anticipated investment expenses from the expected gross investment income rate, similar to the approach used for cash flow testing in connection with the NAIC's Actuarial Opinion and Memorandum regulation. In general, Alternative 1 produces lower spreads than the method used for Alternative 2.

The results for 1 year of business compared to CRVM under Alternative 1 and Alternative 2 are shown in Table 5.1. Table 5.2 shows the results for 5 years of business.

The percentage change from CRVM shown in the tables below is based on the average per 1,000 amounts for CRVM and VM-20, where the averages per 1,000 are weighted equally by participant. For many of the products, the results vary widely from company to company. The results for each company are presented later in this section.

All of the results in this section of the report are shown on a direct basis (without any impact of reinsurance). The results with the impact of reinsurance are shown in Section 9.

Also note that the product segment referred to as "Aggregate Term" includes a combination of level term period products. Some companies provided results for term on both an individual product basis as well as on an aggregate basis, while others provided results on only an individual product basis or only on an aggregate basis. Therefore, the Aggregate Term results are not equal to the sum of the individual term product results.

TABLE 5.1 – Comparison of VM-20 to CRVM Total Reserves for 1 Year of New Business

Overall Impact – Direct Written Business

Product	Number of Participants	CRVM Reserve Average Per $1,000	VM-20 Alt 1 Reserve Average Per $1,000	Change from CRVM	VM-20 Alt 2 Reserve Average Per $1,000	Change from CRVM
Simplified Issue WL	3	2.4	7.8	218%	5.8	138%
Traditional WL	5	2.2	2.2	0	2.2	0
ULSG	8	Results shown on an individual company basis only				
UL without SG	2	67.0	67.0	0	67.0	0
VUL	4	27.8	27.7	0	27.7	0
Term 10	6	1.5	1.8	16	1.8	16
Term 15	3	2.1	1.5	-31	1.5	-31
Term 20	8	2.0	1.3	-38	1.1	-46
Term 30	6	3.7	1.8	-51	1.5	-60
Aggregate Term	6	3.0	2.2	-27	1.9	-36

Per $1,000's are averages across participants, weighted equally by participant

TABLE 5.2 – Comparison of VM-20 to CRVM Total Reserves for 5 Years of New Business

Overall Impact – Direct Written Business

Product	Number of Participants	CRVM Reserve Average Per $1,000	VM-20 Alt 1 Reserve Average Per $1,000	Change from CRVM	VM-20 Alt 2 Reserve Average Per $1,000	Change from CRVM
Simplified Issue WL	3	36.5	36.5	0%	36.5	0%
Traditional WL	5	24.9	24.9	0	24.9	0
ULSG	8	Results shown on an individual company basis only				
UL without SG	2	116.6	116.7	0	116.7	0
VUL	4	53.9	55.6	3	54.7	1
Term 10	6	4.9	2.7	-46	2.7	-46
Term 15	3	14.0	6.8	-51	5.0	-64
Term 20	8	7.4	4.4	-41	3.7	-50
Term 30	6	8.3	4.7	-43	3.7	-55
Aggregate Term	6	6.8	4.4	-35	4.2	-38

Per $1,000's are averages across participants, weighted equally by participant

The following are Towers Watson's observations on the direct results.

- The adequacy of the overall level of reserves produced by VM-20 is a question for LATF to answer. One thing that is very important to keep in mind about principle-based reserves is that the level of reserves will respond to changes in experience and the economic environment. Under rules-based reserves, the reserve amount is set at issue and never changes (unless additional reserves were required under cash flow testing or other requirements). Under principle-based reserves both the initial level and responsiveness of the reserve to changes in experience need to be taken into account when considering adequacy. Responsiveness to changes in experience was not tested in this impact study as it was not possible to include within the timeline for the study.

- For term, we asked for results on an individual product basis as well as on an aggregate basis. Except for the 10-year term product for 1 year of new business, VM-20 reserves were significantly lower than current CRVM reserves, both in aggregate and on an individual product basis.

  – The 10-year term for the 1 year of new business shows a 16% increase from CRVM while the 5 years of new business shows a 46% decrease from CRVM. Results vary widely from company to company for the 1 year of new business, with two companies showing VM-20 reserves that are essentially double current CRVM reserves, while another company is showing a decrease of about 70%. Results are more consistent with the 5 years of new business as all companies show a decrease in reserve under VM-20 as compared to CRVM reserves.

- Simplified Issue Whole Life shows only a small difference from CRVM for the 5 years of new business while the 1 year of new business shows the VM-20 reserve as much larger than the CRVM reserve. This is due to one company's result in which the 1 year reserve was significantly higher under VM-20. The product modeled for this company is not prevalent in the industry, but it is somewhat heavily weighted in the study due to it being one of just three products modeled.

- Traditional Whole Life was equal to CRVM as the SRET and DRET were passed in all cases. This result seems reasonable given the lack of interest sensitivity in traditional products, the dividend mechanism and relatively conservative levels of guarantees (interest and mortality).

- For Universal Life without Secondary Guarantees, the VM-20 reserves reported were equal to the current formulaic CRVM reserves.

- For Variable Universal Life, the VM-20 reserves were equal to the current formulaic reserves for the 1 year of new business as the deterministic and stochastic reserves were less than CRVM in all cases. For the 5 years of new business result, the average per 1,000 reserve was slightly higher under VM-20.

The rest of this section will discuss the product-specific results in detail.

VM-20 Reserve Components

Charts 5.1a and 5.1b show the reserve component that produced the maximum amount used for the VM-20 reserve under one year of business for credit spread Alternatives 1 and 2.

Chart 5.1a – VM-20 Maximum Reserve Component – One Years of Issues – Alt 1

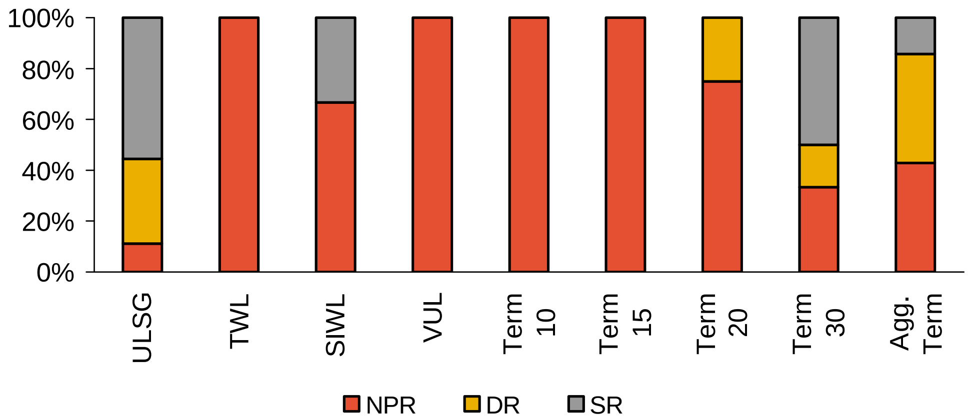
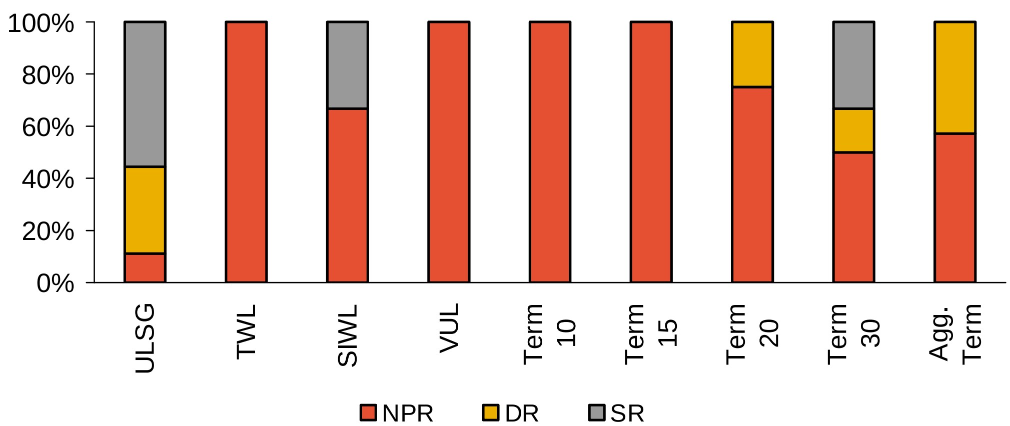


Chart 5.1b – VM-20 Maximum Reserve Component – One Years of Issues – Alt 2



The maximum reserve component does not change in the vast majority of cases between Alternative 1 and Alternative 2. The NPR is the always the dominant component for Traditional Whole Life, VUL, Term 10 and Term 15 and is often the maximum component for all other products, except ULSG.

Note that for the purposes of this study, the NPR is equal to the current CRVM reserve for all products other than ULSG and term products. The NPR is discussed in further detail in Section 7.

Tables 5.3 and 5.4 show the reserve per $1,000 for each of the VM-20 reserve components for cases in which the stochastic reserve was reported as the maximum reserve component. These tables provide the reported level of the NPR and deterministic reserve relative to the stochastic reserve.

TABLE 5.3 - VM-20 Reserve Components when Stochastic Reserve is Dominant

Direct – 1 year of business

Product	Participant	CRVM per 1,000	NPR per 1,000	Det. Reserve		Stoch. Reserve		Min. Reserve	
				Alt 1	Alt 2	Alt 1	Alt 2	Alt 1	Alt 2
ULSG	2	53.64	20.87	96.01	73.93	102.12	81.70	102.12	81.70
ULSG	4	72.93	38.50	46.02	34.78	66.29	57.15	66.29	57.15
ULSG	7	24.43	0.00	31.17	20.99	32.51	23.91	32.51	23.91
ULSG	8	67.33	69.55	79.22	58.70	94.16	80.73	94.16	80.73
Term 30	10	3.14	1.33	5.19	3.72	5.27	4.59	5.27	4.59
Term 30	22	1.99	0.36	0.36	0.36	0.44	0.38	0.44	0.38
Term 30	5	4.66	0.29	0.46	-0.47	0.57	0.01	0.57	0.29
Term Agg	10	2.87	2.22	3.93	2.99	3.94	2.96	3.94	2.99

TABLE 5.4 - VM-20 Reserve Components when Stochastic Reserve is Dominant

Direct – 5 years of business

Product	Participant	CRVM per 1,000	NPR per 1,000	Det. Reserve		Stoch. Reserve		Min. Reserve	
				Alt 1	Alt 2	Alt 1	Alt 2	Alt 1	Alt 2
ULSG	2	101.35	45.17	127.71	107.28	141.90	122.03	141.90	122.03
ULSG	4	96.82	62.78	63.09	52.97	79.88	71.80	79.88	71.80
ULSG	7	49.42	0.00	49.25	40.85	52.26	43.79	52.26	43.79
ULSG	8	148.31	0.00	115.19	91.86	143.37	127.68	143.37	127.68
Term 15	22	27.31	5.86	8.76	4.70	15.53	10.05	15.53	10.05
Term 20	22	12.79	2.52	5.52	2.87	9.07	5.46	9.07	5.46
Term 30	10	8.85	2.72	8.43	6.89	10.23	10.07	10.23	10.07
Term 30	22	8.47	0.95	3.25	0.95	4.59	1.25	4.59	1.25
Term 30	5	9.07	1.64	2.59	1.44	2.73	1.44	2.73	1.64
Term Agg	10	8.41	3.69	7.36	6.44	9.12	9.10	9.12	9.10

For ULSG, a bit more than half of the participants reported that the stochastic reserve was the maximum reserve component. One participant reported that the NPR was the maximum with the rest having the deterministic reserve as the maximum reserve component.

The stochastic reserve did not produce the maximum reserve component for any participant for the TWL, SIWL and VUL product lines.

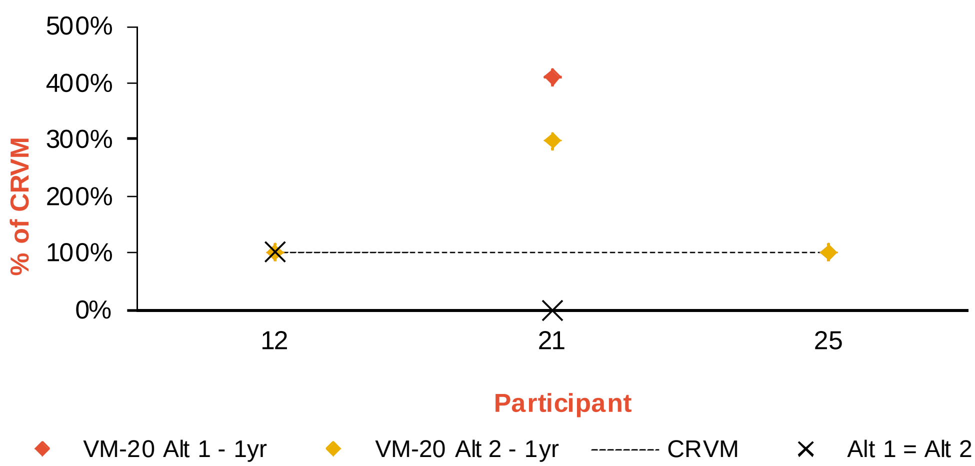
VM-20 Results to CRVM for One Year of Issue

The charts in this section show the company-specific results by product under both Alternative 1 and Alternative 2 for one year of issue. The VM-20 reserve amounts as a percent of CRVM are shown for each company. The results show that there is significant variability of the VM-20 reserve as a percent of CRVM on a company-by-company basis for ULSG and term products.

Simplified Issue Whole Life Insurance

Three companies submitted results for Simplified Issue Whole Life. Of those, two companies end with a VM-20 Reserve equal to CRVM. The other company reported VM-20 reserves much greater than CRVM. This company's product is a final expense product and may contain product features, such as benefits tied to inflation rates that are causing the stochastic reserve to be higher than the NPR for 1 year of business. After 5 years, all companies have reserves equal to CRVM.

Chart 5.2 – Simplified Issue Whole Life Results by Participant – One Year of Issues



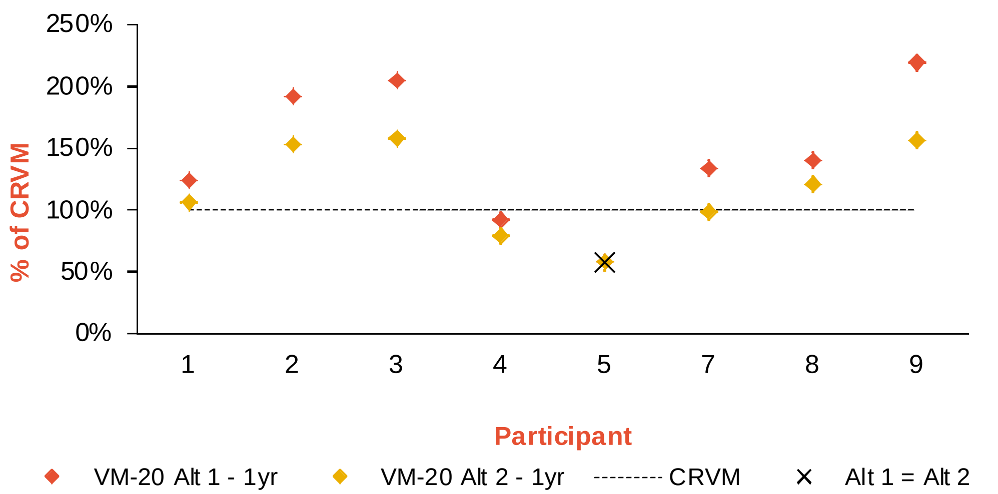
Traditional Whole Life Insurance

Five companies modeled Traditional Whole Life for the Impact Study. For all participants, the reported VM-20 reserves equal CRVM.

Universal Life with Secondary Guarantees

Chart 5.3 shows the results for those companies that provided ULSG results. The reported VM-20 reserves are higher than reported CRVM reserves for 6 of the 8 companies for Alternative 1. Alternative 2 reserves are lower than Alternative 1 reserves in all but one case (where they are equal) and in most cases significantly lower.

Chart 5.3 – Universal Life with Secondary Guarantees Results by Participant – One Year of Issues



The results for each ULSG participant are shown in Table 5.5.

TABLE 5.5 – UL with Secondary Guarantees Participant Results Direct Written Business – CRVM vs VM-20 – 1 Year of Issues					
Participant	**Per 1,000 Amounts**			**VM-20 / CRVM**	
	CRVM per 1,000	**Min Res Alt 1**	**Min Res Alt 2**	**Min Res Alt 1**	**Min Res Alt 2**
1	94.51	116.35	99.72	123%	106%
2	53.64	102.12	81.70	190	152

TABLE 5.5 – UL with Secondary Guarantees Participant Results Direct Written Business – CRVM vs VM-20 – 1 Year of Issues					
Participant	Per 1,000 Amounts			VM-20 / CRVM	
	CRVM per 1,000	Min Res Alt 1	Min Res Alt 2	Min Res Alt 1	Min Res Alt 2
3	75.15	152.96	117.90	204	157
4	72.93	66.29	57.15	91	78
5	65.66	38.12	38.12	58	58
7	24.43	32.51	23.91	133	98
8	67.33	94.16	80.73	140	120
9	47.25	103.64	73.65	219	156

The CRVM per 1,000 amounts range from $24 to $95 for the 1 year of issues. This wide range of results may be due to a variety of factors, including current funding level, shadow account design, and level of guaranteed charges. This may also be due to different approaches taken by the participants with respect to determining CRVM reserves or different interpretations of AG 38. Towers Watson did not perform any review of the CRVM reserves provided by the companies and simply reported what we were provided. As it is a limited sample, the results of the Impact Study related to ULSG should not be considered to be a representation of the expected impact on reserves for overall industry.

Universal Life without Secondary Guarantees

Both of the companies that provided results for the Impact Study reported the VM-20 reserve equal to CRVM.

Variable Universal Life Insurance

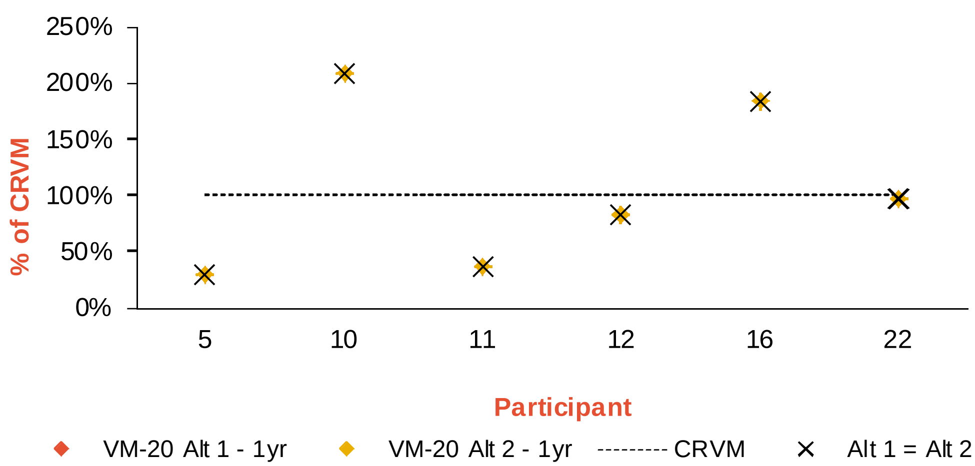
Four companies modeled VUL for the Impact Study. In all cases, the VM-20 minimum reserve defaulted to the CRVM reserve as the deterministic and stochastic reserves were less than current reserves. Note that the VM-20 NPR is not yet defined for VUL other than being equal to current CRVM reserves.

Term Insurance

Twelve companies provided Term Insurance results for the Impact Study. Companies modeled various level premium periods of 10 years, 15 years, 20 years and 30 years (not every company provided results for all level premium periods). Most companies also provided results for the entire term model (all level premium periods modeled together in one model segment) which is referred to as Aggregate Term in this report.

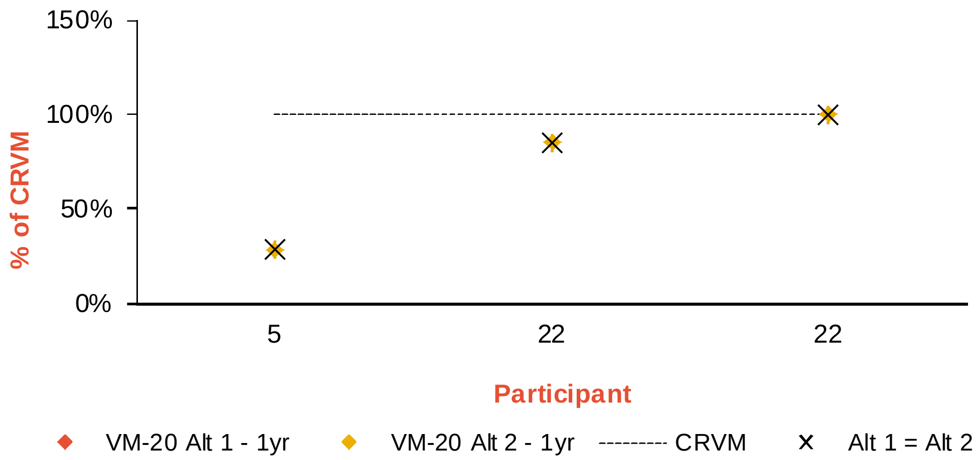
The results varied significantly by level premium period and by company for the most part. For 10-year level premium term, two companies reported VM-20 reserves much higher than CRVM, two companies reported reserves close to CRVM (with one a bit lower) and two reported reserves much lower than CRVM. The NPR was the maximum VM-20 reserve component in all cases for the 10-year term product.

Chart 5.4 – 10 Year Level Premium Term Results by Participant – One Year of Issues



Only two companies (one company modeled two blocks) provided 15 year level premium term. One block had VM-20 reserves equal to CRVM, one was slightly lower than CRVM and one block had VM-20 reserves much lower than CRVM reserves.

Chart 5.5 – 15 Year Level Premium Term Results by Participant – One Year of Issues

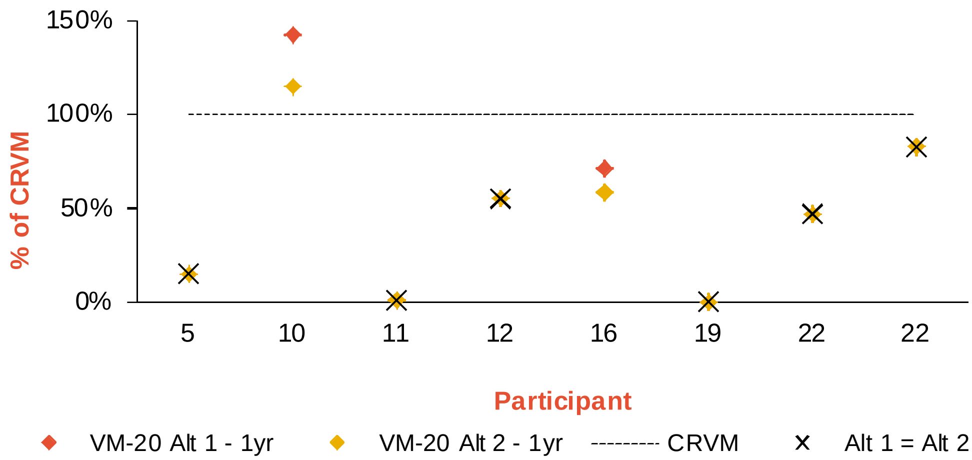


Seven companies (eight blocks) provided 20 year level premium term results. One block had VM-20 reserves higher than CRVM, one was slightly lower than CRVM and 5 reported significantly lower VM-20 reserves than CRVM reserves (2 of the 5 blocks had VM-20 reserves equal to or essentially at $0).

For the one company (#10) where the VM-20 reserve was higher than CRVM, the dominant reserve was the deterministic reserve. The stochastic reserve was calculated but was lower than the deterministic reserve. The NPR was approximately 64% of the CRVM reserve.

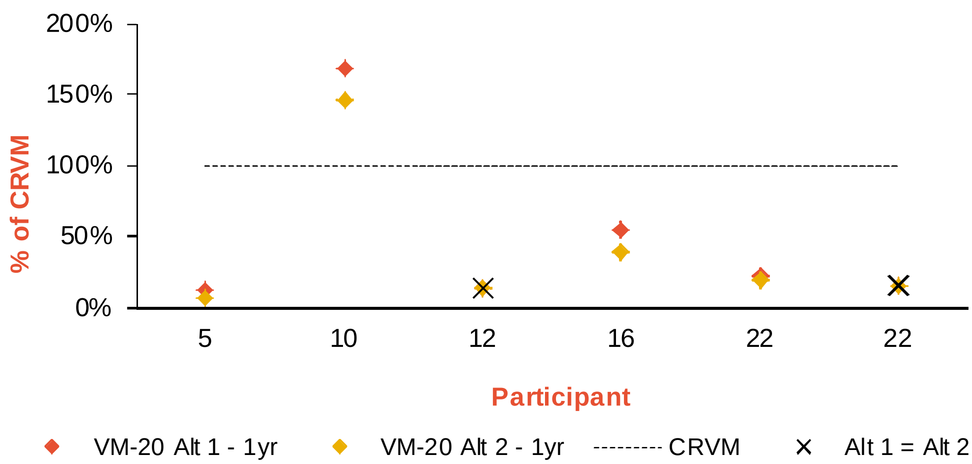
For the companies in which Alternative 1 is equal to Alternative 2, the NPR is the dominant reserve component.

Chart 5.6 – 20 Year Level Premium Term Results by Participant – One Year of Issues



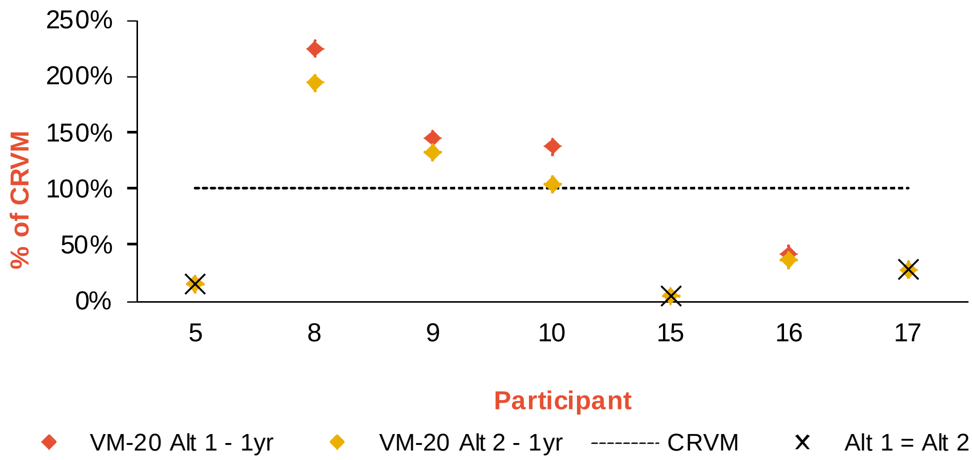
Five companies (six blocks) reported 30 year level premium term. Four out of six reported VM-20 reserves that were less than 25% of the CRVM reserve. One company (#10) reported significantly higher VM-20 reserves than CRVM; the stochastic reserve was the dominant reserve for this company. This is the same company that reported higher VM-20 reserves than CRVM for the 10-year and 20-year term products.

Chart 5.7 – 30 Year Level Premium Term Results by Participant – One Year of Issues



Seven companies reported results for aggregate term. Three companies reported higher VM-20 reserves than CRVM and four companies significantly lower than CRVM. For the three companies reporting higher reserves, the dominant reserve is either the deterministic or stochastic reserve; the NPR is significantly lower than CRVM.

Chart 5.8 – Aggregate Term Results by Participant – One Year of Issues



VM-20 Results to CRVM for Five Years of Issues

The charts in this section show the company-specific results by product under both Alternative 1 and Alternative 2 for 5 years of issues. The VM-20 reserves as a percent of CRVM are shown for each company.

Simplified Issue Whole Life Insurance

For all participants, the VM-20 reserves equal CRVM.

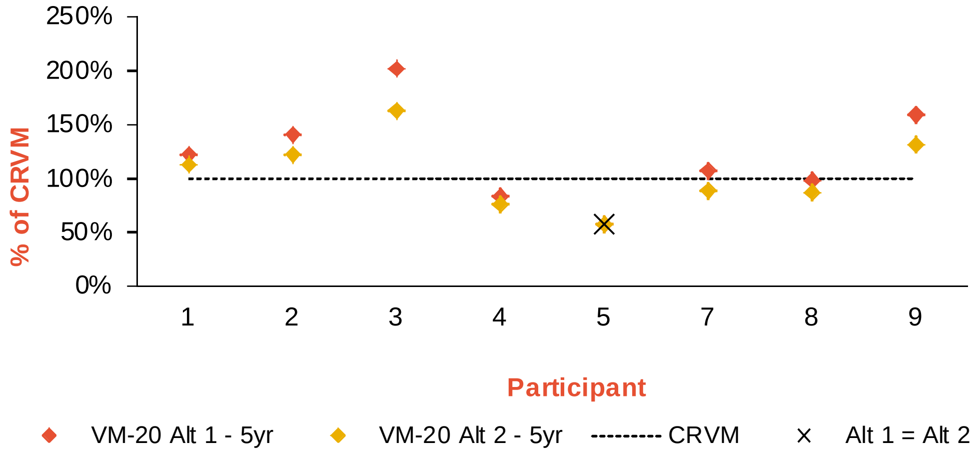
Traditional Whole Life Insurance

For all participants, the VM-20 reserves equal CRVM.

Universal Life with Secondary Guarantees

Chart 5.9 shows the comparison of VM-20 reserves to CRVM reserves for the 8 participants that provided ULSG results for 5-years of new business. Four of the companies reported VM-20 reserves higher (with several significantly higher) than CRVM while the other four reported reserves close to or lower than current requirements.

Chart 5.9 – Universal Life with Secondary Guarantees Results by Participant – Five Years of Issues



The results for each ULSG participant are shown in Table 5.6.

TABLE 5.6 – UL with Secondary Guarantees Participant Results

Direct Written Business – CRVM vs VM-20 – 5 Years of Issues

Participant	Per 1,000 Amounts			VM-20 / CRVM	
	CRVM per 1,000	Min Res Alt 1	Min Res Alt 2	Min Res Alt 1	Min Res Alt 2
1	121.10	147.63	134.72	122%	111%
2	101.35	141.90	122.03	140	120
3	91.92	184.47	149.42	201	163
4	96.82	79.88	71.80	83	74
5	118.30	66.02	66.02	56	56
7	49.42	52.26	43.79	106	89
8	148.31	143.37	127.68	97	86
9	85.89	135.76	112.50	158	131

The CRVM per 1,000 amounts range from $49 to $148 for the 5 years of issues. This wide range of results may be due to a variety of factors, including current funding level, shadow account design, and level of guaranteed charges. This may also be due to different approaches taken by the participants with respect to determining their CRVM reserves or different interpretations of AG 38. Towers Watson did not perform any review of the CRVM reserves provided by the companies and simply reported what we were provided. The results of the Impact Study related to ULSG should not be considered to be a representation of the expected impact on reserves for overall industry.

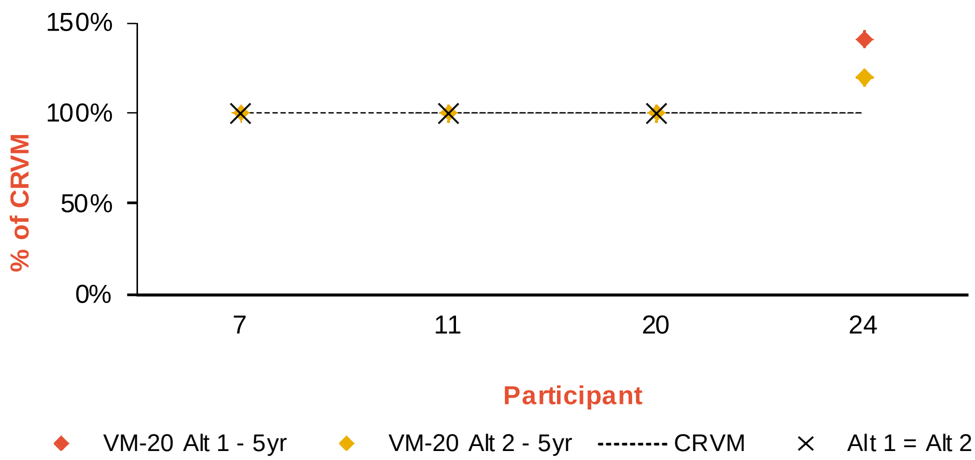
Universal Life without Secondary Guarantees

Both of the companies that provided results for the Impact Study reported the VM-20 reserve equal to CRVM.

Variable Universal Life Insurance

Four companies reported VUL results. The reported VM-20 reserve was equal to CRVM for three of the companies and one had VM-20 reserves higher than CRVM.

Chart 5.10 – Variable Universal Life Results by Participant – Five Years of Issues

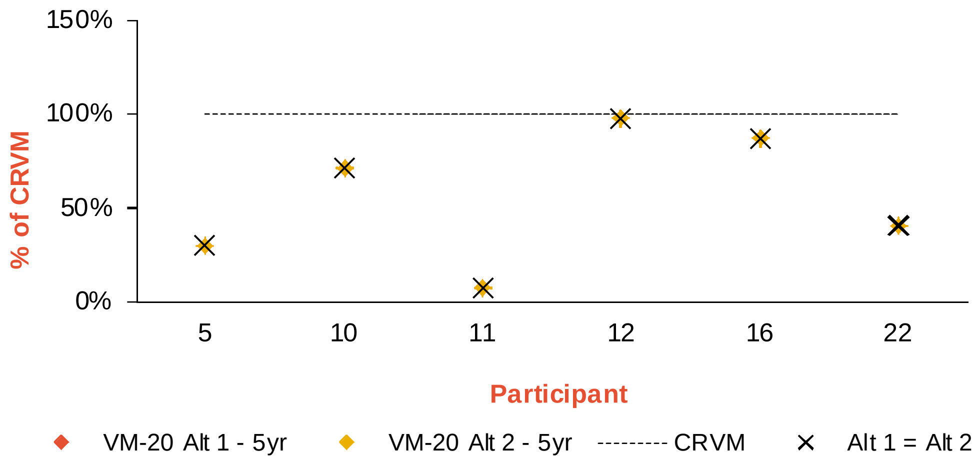


Term Insurance

Twelve companies provided Term Insurance results for the Impact Study. Companies modeled various level premium periods of 10 years, 15 years, 20 years and 30 years (not every company provided results for all level premium periods). Most companies also provided results for the entire term model (all level premium products modeled together in one model segment) which is referred to as Aggregate Term in this report.

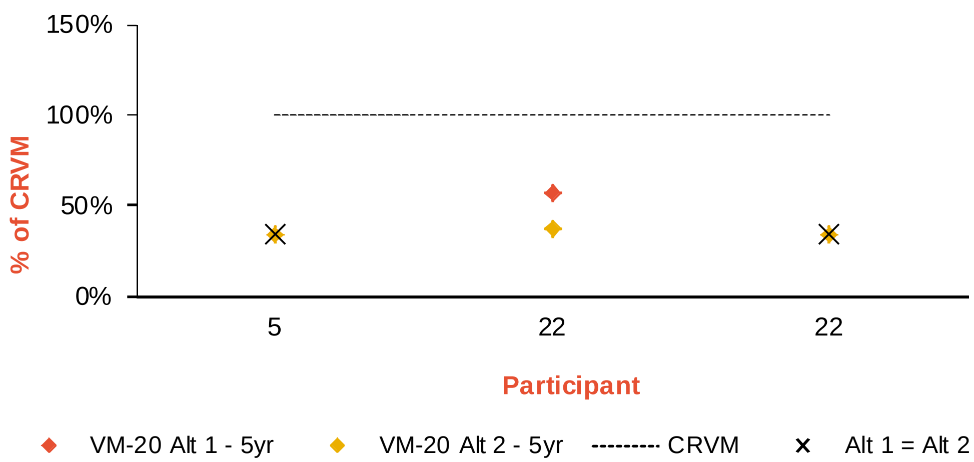
The results varied significantly by level premium period and by company for the most part. For 10-year level premium term, all companies reported VM-20 reserves below CRVM; however, the results varied quite a bit with some companies reporting VM-20 reserves close to CRVM and others reporting VM-20 reserves significantly below reserves for the 5 years of new business modeled. The NPR was the dominant reserve in all cases.

Chart 5.11 – 10 Year Level Premium Term Results by Participant – Five Years of Issues



Only two companies (three blocks) provided 15 year level premium term. All companies reported VM-20 reserves significantly lower than CRVM.

Chart 5.12 – 15 Year Level Premium Term Results by Participant – Five Years of Issues



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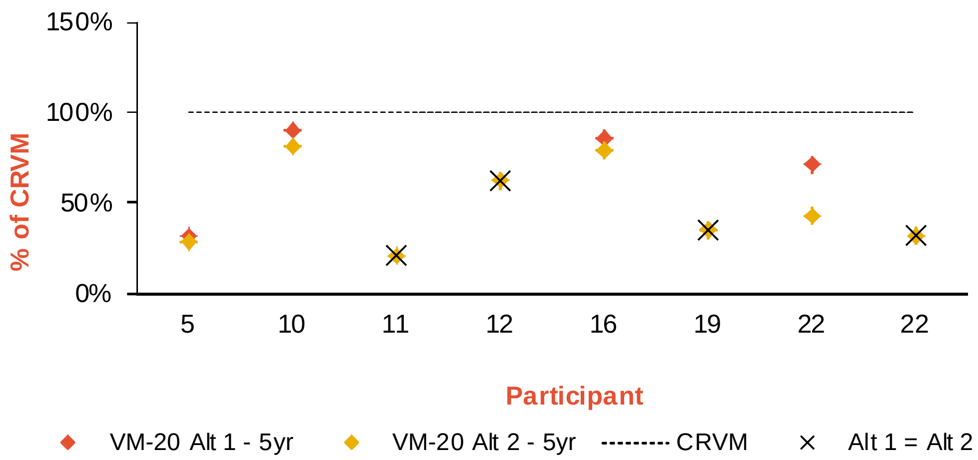
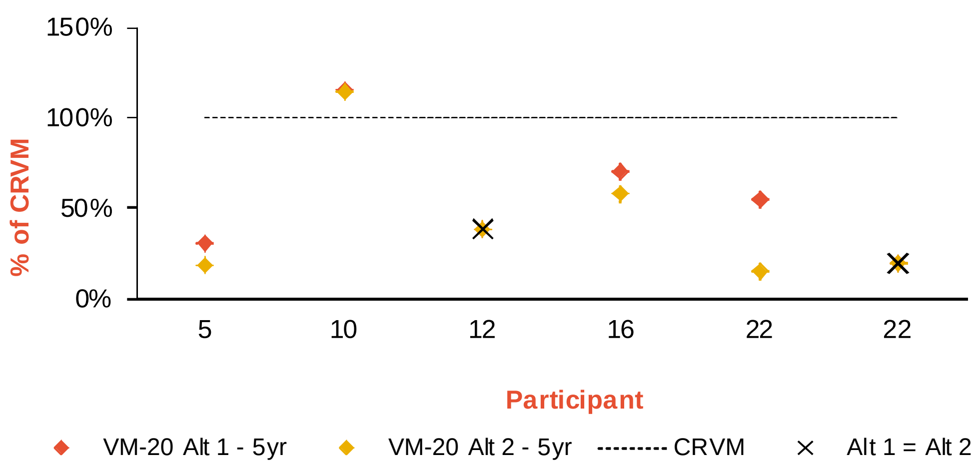
Seven companies (eight blocks) provided 20 year level premium term results. All of the companies reported VM-20 reserves lower than CRVM with many companies significantly lower than CRVM. The NPR was the dominant reserve for four of the eight blocks.

Chart 5.13 – 20 Year Level Premium Term Results by Participant – Five Years of Issues



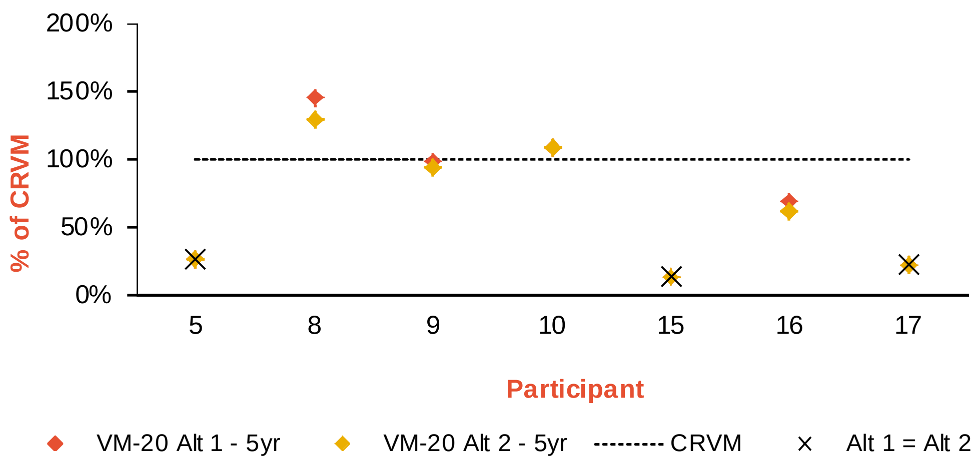
Five companies (six blocks) reported 30 year level premium term results, with almost every block showing VM-20 reserves significantly lower than the CRVM reserve. One block had higher VM-20 reserves than CRVM.

Chart 5.14 – 30 Year Level Premium Term Results by Participant – Five Years of Issues



Seven companies reported results for aggregate term with the VM-20 reserves being significantly lower than CRVM for 4 of the 7 companies.

Chart 5.15 – Aggregate Term Results by Participant – Five Years of Issues



Several participants also provided results for 10 and 15 years of issues as part of Phase II of the Impact Study.

Description of Sensitivity Test:

Participants were asked to extend the projections to durations 10 and 15. This could be accomplished by layering on an extra 5 or 10 years of issues or, if modeling systems had the capability, use one year of issues and project the reserves out to these extended durations.

Results of Sensitivity Test:

TABLE 5.7a – MR/CRVM Ratios

Layering 1 Year of New Business for N Years, Alternative 2, Net of Reinsurance

Product	Participant	1 Year	5 Years	10 Years	15 Years
SIWL	21	201%	100%	100%	100%
Term 20	19	n/a	34	47	54
Term Agg	10	101	109	99	99
TWL	23	100	100	100	100

TABLE 5.7a – MR/CRVM Ratios					
Layering 1 Year of New Business for N Years, Alternative 2, Net of Reinsurance					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
ULwo	19	100	100	106	110

TABLE 5.7b – MR/CRVM Ratios					
Forecasting 1 Year of New Business to Duration N, Alternative 2, Net of Reinsurance					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
Term Agg	9	138%	77%	68%	68%
Term AGG	17	40	n/a	36	n/a
ULSG	3	127	141	123	113
ULSG	9	119	97	95	90

Additional details are provided in Appendix E.

Section 6: Exclusion Tests

Introduction

VM-20 includes two tests to identify groups of policies where companies would not be required to perform the stochastic or deterministic reserve calculation. The intent of the tests is to eliminate one or both of the reserve calculations for certain groups of policies that do not have material interest rate or equity risk or that have gross premiums that are sufficiently higher than the net premium. Companies do not have to calculate the stochastic reserve for groups of policies passing the Stochastic Reserve Exclusion Test (SRET). Groups of policies that pass both the SRET and the Deterministic Reserve Exclusion Test (DRET) do not require the calculation of the stochastic reserve or the deterministic reserve (i.e., the Net Premium Reserve amount is the minimum reserve). If a group of policies fails the SRET, the company must calculate both the stochastic and deterministic reserve even if the group of policies passes the DRET.

An objective of the Impact Study is to determine the effectiveness of the exclusion tests (deterministic and stochastic) as a risk measurement tool in determining the ultimate level of minimum reserves that must be established based upon the underlying risks assumed.

Stochastic Reserve Exclusion Test

The SRET test statistic is defined as (b – a) / c where (b) is the largest adjusted deterministic reserve under any of the 15 economic scenarios prescribed by VM-20 for the purpose of the SRET, (a) is the adjusted deterministic reserve using the baseline economic scenario and (c) is an amount calculated from the baseline economic scenario that represents the present value of benefits for the policies, adjusted for reinsurance by subtracting ceded benefits. The adjusted deterministic reserve in each scenario is determined using anticipated experience assumptions with no margins. If the SRET test statistic is less than 4.5%, then the group of policies passes the SRET and stochastic reserves are not required to be calculated for that group of policies.

Though companies with segments passing the test would not be required to calculate the stochastic reserve, as part of the Impact Study we asked participants to provide the stochastic reserve calculated results. This is our basis for measuring the effectiveness of the SRET.

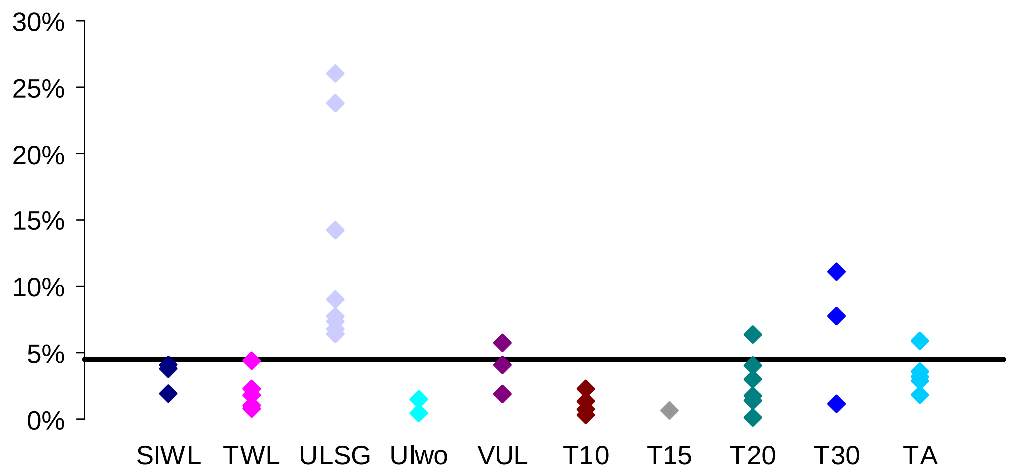
Impact Study Results of the Stochastic Reserve Exclusion Test

Chart 6.1 shows the company-by-company reported results of the SRET test statistic by product for 1 year of business under Alternative 2. All companies that modeled Universal Life with Secondary Guarantees reported that their block of policies failed the SRET. All companies that modeled Traditional Whole Life and Simplified Issue Whole Life reported that their block of policies passed the

SRET. For term products, the reported results show more failures of the SRET as the term period increases and in Aggregate Term.

There were several companies that reported results much higher than 4.5% that have not been included in the chart below for presentation purposes. These results include an Aggregate Term block with an SRET of 268%, a VUL block with 150%, a 10-year Term with 60% and a 30-year Term with 46%.

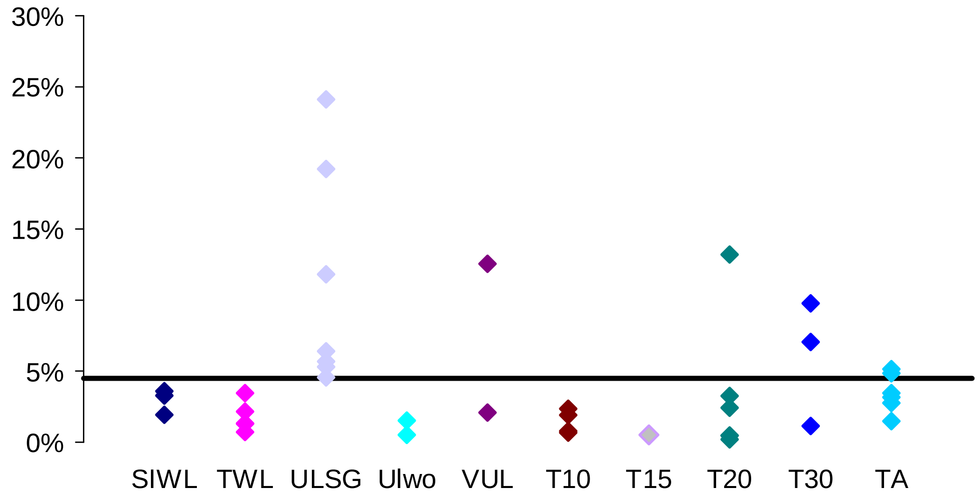
Chart 6.1 - Stochastic Reserve Exclusion Test Statistics by Product
Credit Spread Alternative 2, for 1 year of business



4 reported results > 30% not shown for presentation purposes ***TA = Aggregate Term***

Chart 6.2 shows the SRET results for 5 years of business for Alternative 2. There were several companies that reported results much higher than 4.5% that have not been included in the chart for presentation purposes. These results include a 10 year term product with an SRET statistic of 59%, a 30-year term product with a SRET statistic of 71%, and a VUL product with a SRET statistic of 103%. Also, three companies that provided the SRET results for 1 year of business did not provide it for 5 years of business.

Chart 6.2 – Stochastic Reserve Exclusion Test Statistics by Product
Credit Spread Alternative 2, for 5 years of business



3 reported results > 30% not shown for presentation purposes ***TA = Aggregate Term***

SRET Effectiveness

Towers Watson also examined whether the Impact Study results contained any "false positives" or "false negatives". For the purposes of this report, a false positive was defined as a product that passed an exclusion test but then would have been required to hold the reserve subject to the exclusion test as the minimum reserve if the test had not been used to bypass the calculation (e.g., the product passed the SRET but the stochastic reserve reported as part of the Impact Study was larger than the minimum reserve determined excluding the stochastic reserve). From a regulatory perspective, too many false positives would suggest that the exclusion test should be modified to require more products to be subject to the VM-20 reserve calculations (i.e., not allowed to bypass the calculation). There were no false positives related to the DRET in the Impact Study; however, there were false positives for the SRET for some of the term products and one of the VUL products. The sample size was very is small (we did not get all of the information required from the other reporting companies) so we were not able to determine if these results are an aberration or part of a trend. Also, it is possible that the false positives could be the result of large mortality margins in the stochastic reserve calculation. If VM-20 is modified in the future to lower these mortality margins, the false positives may be eliminated.

A false negative was defined as a situation in which a product did not pass the exclusion test but the minimum reserve required was not the reserve for which the exclusion test was designed to exclude (e.g., a product failed the SRET but the stochastic reserve was not the minimum reserve). This result could concern companies as they would have to do the work to determine the stochastic or deterministic reserve but these reserves did not contribute to the minimum reserve. The instance of a false negative could be because the exclusion the test ratio is too low, or the other reserve requirements are too high (the deterministic reserve or the net premium reserve in the case of the SRET, or the net premium reserve in the case of the DRET). There were some false negatives for ULSG products and a very small number of false negatives for term products.

Table 6.1 presents the false positives and false negatives related to the SRET for 1 year of business using Alternative 2. The SRET is passed if the test statistic is less than 4.5%. The results show that three term products passed the SRET, but when the stochastic reserve was calculated, it was higher than both the deterministic reserve and NPR.

TABLE 6.1 – False Positives and Negatives in Stochastic Reserve Exclusion Test

Direct, 1 Year of Business, Alternative 2

Product	Participant	Test Statistic	False Positive (FP)/False Negative (FN)
Term 20	10	4.0%	FP
Term Agg	9	1.8	FP
Term Agg	8	2.9	FP
Term 30	5	7.8	FN
Term Agg	10	5.9	FN
ULSG	1	6.8	FN
ULSG	5	7.7	FN
VUL	24	5.8	FN
VUL	11	150.0	FN

Table 6.2 quantifies what the increase in reserve would have been for the false positives had the SRET not been passed. The increase in reserve that would have been required if the SRET was not passed ranged from 3 – 11%. The largest false positive was for Participant 8 calculating an Aggregate Term. As shown in Table 6.1 above, the test statistic for this participant was 2.9%, well below the 4.5% threshold.

TABLE 6.2 – False Positives in Stochastic Reserve Exclusion Test (passed SRET but Stochastic Reserve was largest)

Direct, 1 Year of Business, Alternative 2

Product	Participant	Stoch Res per 1,000	Min Res per 1,000	% Increase
Term 20	10	3.72	3.57	4%
Term Agg	9	6.09	5.91	3
Term Agg	8	6.72	6.07	11

Table 6.3 compares the stochastic reserve to the minimum reserve reported for the false negative cases for 1 year of business. Although these product segments failed the SRET, the maximum reserve component was a component other than the stochastic reserve.

TABLE 6.3 – False Negatives in Stochastic Reserve Exclusion Test

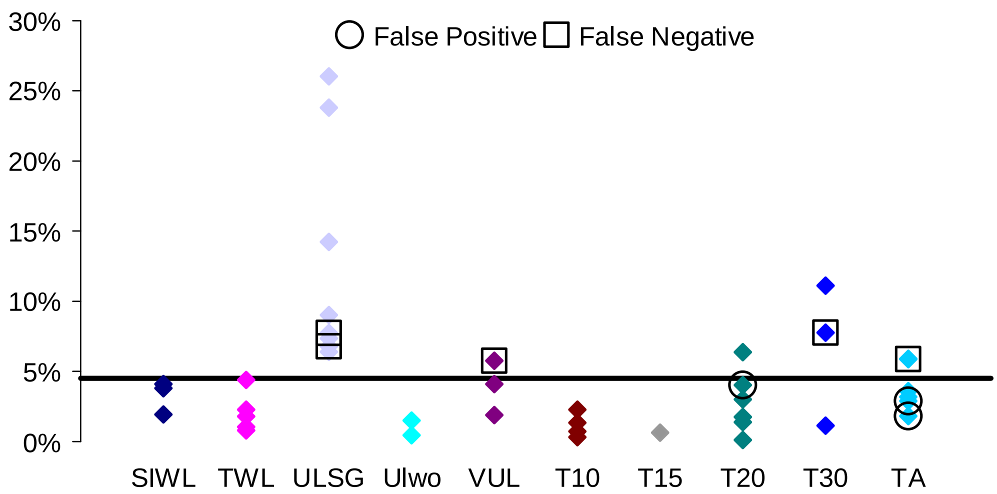
Direct, 1 Year of Business, Alternative 2

Product	Participant	Stoch Res per 1,000	Min Res per 1,000	Maximum Reserve
Term 30	5	0.01	0.29	NPR
Term Agg	10	2.96	2.99	DR
ULSG	1	95.49	99.72	DR
ULSG	5	3.28	38.12	NPR
VUL	24	0.13	11.31	NPR[1]
VUL	11	-1.93	3.35	NPR[1]

[1]For VUL, NPR = CRVM.

Chart 6.3 provides a graphical summary of the SRET test statistics for 1 year of business with the false positives and false negatives indicated in the chart.

Chart 6.3 - Stochastic Reserve Exclusion Test Statistics by Product (Alternative 2), for 1 year of business, with False Positives and False Negatives



4 reported results > 30% not shown for presentation purposes ***TA = Aggregate Term***

The false positives and false negatives for 5 years of business results are presented in Table 6.4. As with the 1 year of business results, there are a few term product false positives. Additionally, a VUL product produces a false positive.

TABLE 6.4 – False Positives and Negatives in Stochastic Reserve Exclusion Test

Direct, 5 Years of Business, Alternative 2

Product	Participant	Test Statistic	False Positive (FP)/False Negative (FN)
Term 10	10	0.7%	FP
Term 20	10	3.2	FP
Term Agg	9	1.5	FP
Term Agg	8	3.2	FP
VUL	7	2.1	FP
Term 30	5	7.0	FN
ULSG	1	4.6	FN
ULSG	5	6.4	FN
VUL	24	12.5	FN
VUL	11	103.4	FN

Table 6.5 quantifies what the reserve would have been had the SRET not been passed. There are two cases (both from the same company however) where the calculated stochastic reserve was significantly larger than the reported required minimum reserve due to the passing the SRET. The test statistics for the false positives were 0.7% for the Term 10 and 3.2% for the Term 20, well below the 4.5% threshold in each case (see Table 6.4 above).

TABLE 6.5 – False Positives in Stochastic Reserve Exclusion Test (passed SRET but Stochastic Reserve was largest)

Direct, 5 Years of Business, Alternative 2

Product	Participant	Stoch Res per 1,000	Min Res per 1,000	% Increase
Term 10	10	7.07	4.33	63%
Term 20	10	10.43	7.55	38
Term Agg	9	8.43	8.09	4
Term Agg	8	8.65	8.06	7
VUL	7	50.97	47.47	7

Table 6.6 shows the details of the false negatives for 5 years of business.

TABLE 6.6 – False Negatives in Stochastic Reserve Exclusion Test (failed SRET but Stochastic Reserve was not largest)

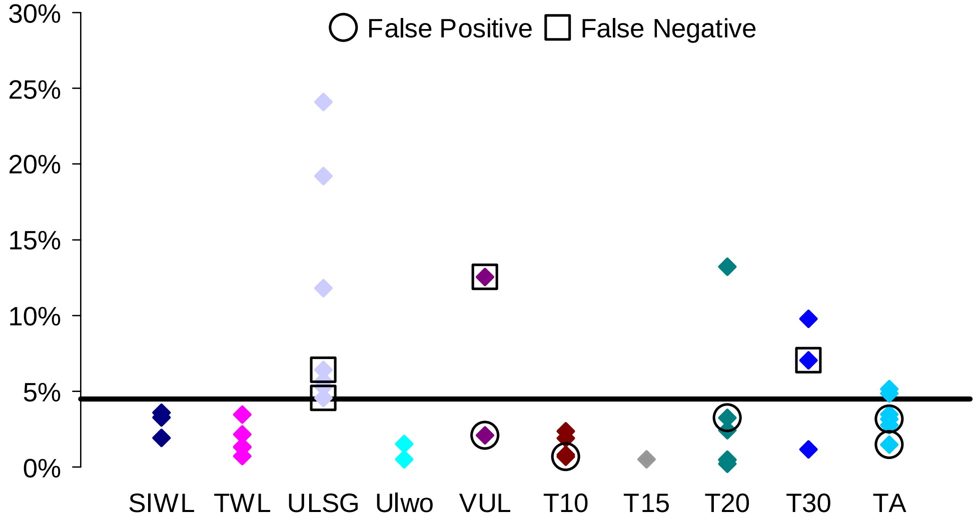
Direct, 5 Years of Business, Alternative 2

Product	Participant	Stoch Res per 1,000	Min Res per 1,000	Maximum Reserve
Term 30	5	1.44	1.64	NPR
ULSG	1	130.52	134.72	DR
ULSG	5	16.18	66.02	NPR
VUL	24	7.97	20.40	DR
VUL	11	-2.78	63.40	NPR[1]

[1]For VUL, NPR = CRVM.

Chart 6.4 provides a graphical summary of the SRET test statistics for 5 years of business with the false positives and false negatives indicated in the chart.

Chart 6.4 – Stochastic Reserve Exclusion Test Results by Product (Alternative 2), for 5 years of business, with False Positives and False Negatives



3 reported results > 30% not shown for presentation purposes ***TA = Aggregate Term***

Towers Watson's Observations - SRET

The high level results by product were within expectations and appear to support the effectiveness of the SRET. Companies reported that some of the term products and all of the ULSG products failed the SRET. This is an expected result as ULSG products and term products with longer period premium guarantees are considered to be interest-sensitive, which is the risk the SRET is attempting to capture. All of the companies testing the other product lines (traditional whole life, simplified issue whole life, universal life without secondary guarantees and variable universal life) reported passing the SRET.

The false positives for some products may be of some concern to the NAIC. There are quite a few false negatives for ULSG products and a few for term products, which would be a concern to companies that would have to put forth the effort of calculating the reserves, but ultimately report another component as the minimum. LATF will need to balance requiring companies to perform the stochastic calculations when they ultimately prove not to be required against identifying all circumstances when the stochastic reserve would prevail. False negatives can also be caused by deterministic reserves or NPR values being too conservative. The NAIC may need to review the level of conservatism included in these calculations.

Deterministic Reserve Exclusion Test

A group of policies passes the DRET if the company demonstrates that the sum of the valuation net premiums for the group of policies is less than the sum of the corresponding guaranteed gross premiums for such policies. Companies do not have to calculate the stochastic or deterministic reserves for groups of policies that pass both the SRET and DRET. In this case, the minimum reserve would be equal to the VM-20 Net Premium Reserve for term and ULSG products and default to current CRVM for other product lines since the NPR is not yet defined in VM-20 for products other than term and ULSG. As part of the VM-20 Impact Study, companies were asked to calculate the DRET even if the group of policies failed the SRET.

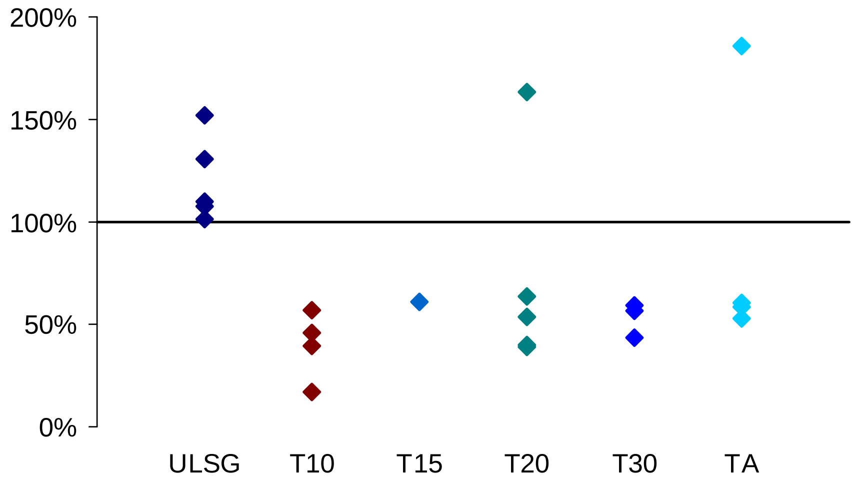
Note that the DRET results do not depend on the reinvestment strategy since it is a comparison of the sum of the gross premiums to the net premiums, not the present values. Thus, the results are the same for Alternatives 1 and 2.

For the purposes of this report, we defined the DRET test statistic to be the sum of the net premiums divided by the sum of the gross premiums. If the test statistic is greater than one, then the DRET is failed.

Impact Study Results of the Deterministic Reserve Exclusion Test

Chart 6.5 shows the DRET statistic for ULSG and term products for 1 year of business. All ULSG products fail the DRET and most of the term products pass the DRET. For other products (Traditional Whole Life, Simplified Whole Life and VUL), the DRET was passed in all cases.

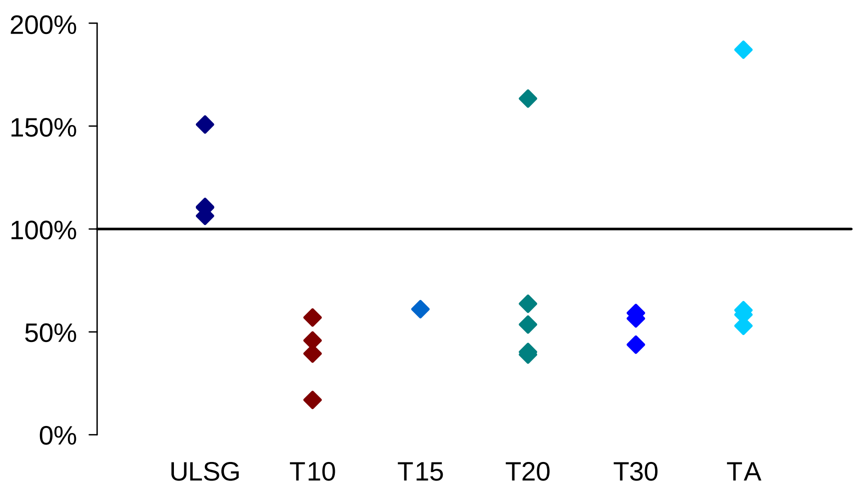
Chart 6.5 – Deterministic Reserve Exclusion Test Statistic by Product Direct, for 1 year of business



Products with DRET>100% fail the DRET

The DRET statistics for each participant for 5 years of business are provided in Chart 6.6. Similar to the 1 year results, all ULSG products failed the DRET, while most term products passed the DRET.

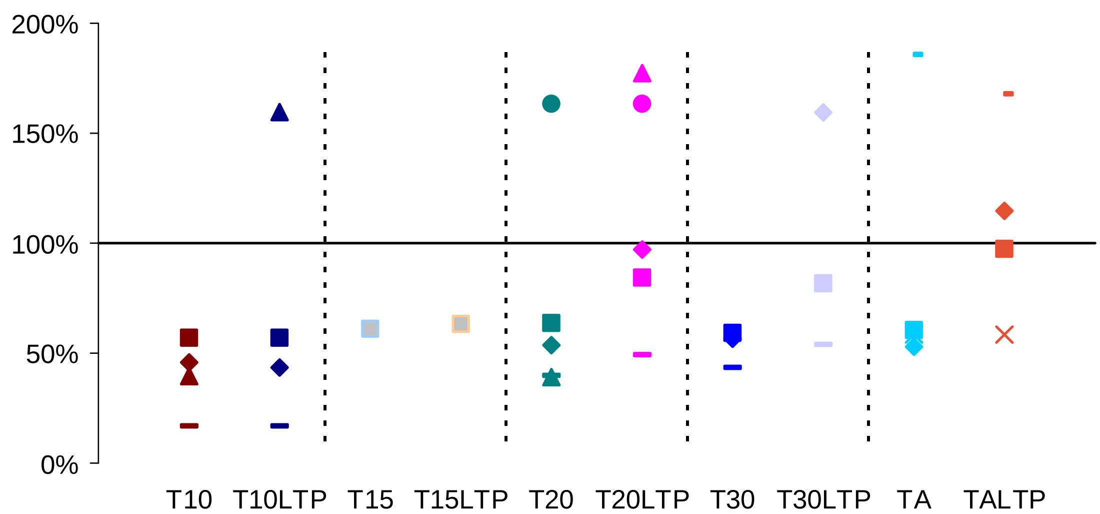
Chart 6.6 – Deterministic Reserve Exclusion Test Statistics by Product, 5 years of business



Some participants were confused whether the gross premium from the level term period is used in the DRET or an average premium over the entire contract. The confusion comes from Section 6.C.4.b.ii and iii of VM-20 where it appears to require the calculation to be performed twice – once considering the initial premium period and another considering the contract over the entire lifetime. After clarification from the AAA and LATF, it was communicated to the participants that the gross premium should be determined over the lifetime of the contract. Most, but not all, companies provided the DRET both with the gross premium over the entire contract and with the level premium period.

Chart 6.6 shows the DRET test statistic using both the entire contract and the level premium period for 1 year of business. Each individual company is represented by a specific symbol. This is shown so the reader can see the increase, if any, in the DRET statistic by company for each way the test statistic could be determined. For example, the company represented by the triangle reported an increase in the statistic for the 10 year level premium term product using the entire contract premium (T10 of below 50%) versus when calculating the statistic using just the level premium period (T10LTP of above 150%). The difference is shown for each level term period independently. Note that the results in between the dotted lines are grouped by product type to show the independent differences.

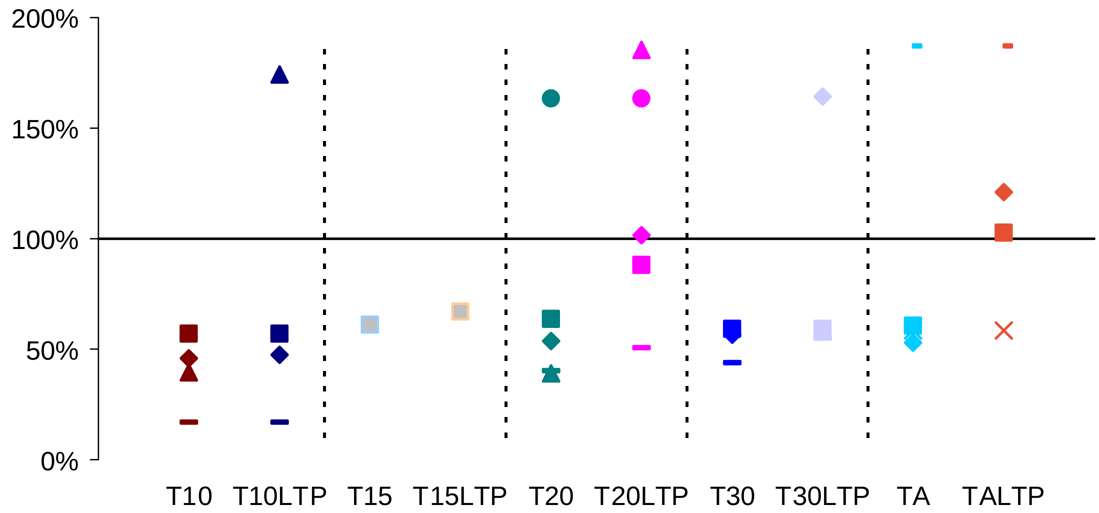
Chart 6.6 – Deterministic Reserve Exclusion Test Results for Term Business Direct, for 1 year of business



Each symbol represents an individual company. Results are shown grouped by product type between the dotted lines.

Chart 6.7 shows the DRET test statistic using both the entire contract and the level premium period for 5 years of business.

Chart 6.7 – Deterministic Reserve Exclusion Test Results for Term Business Direct, 5 years of business



Each symbol represents an individual company. Results are shown grouped by product type between the dotted lines.

DRET Effectiveness

The false negatives for the DRET for 1 year of business are shown in Table 6.7. In 3 of the 4 cases, the test statistic is well above 100%. Participant 5 also reported a false negative for ULSG with respect to the SRET. There were no false positives reported for the DRET.

TABLE 6.7 – False Positives and Negatives in Deterministic Reserve Exclusion Test Direct, 1 Year of Business, Alternative 2

Product	Participant	Test Statistic	False Positive (FP)/False Negative (FN)
Term 20	19	163%	FN
ULSG	2	131	FN
ULSG	4	101	FN
ULSG	5	152	FN

Table 6.8 provides a comparison of the deterministic reserve to the minimum reserve reported.

TABLE 6.8 – False Negatives in Deterministic Reserve Exclusion Test

Direct, 1 Year of Business, Alternative 2

Product	Participant	Det Res per 1,000	Min Res per 1,000	Maximum Reserve
Term 20	19	-3.40	0.00	NPR
ULSG	2	73.93	81.70	SR
ULSG	4	34.78	57.15	SR
ULSG	5	15.30	38.12	NPR

Chart 6.8 summarizes the DRET statistic and false negatives for 1 year of business.

Chart 6.8 – Deterministic Reserve Exclusion Test Results by Product
Direct, for 1 year of business, with False Positives and False Negatives

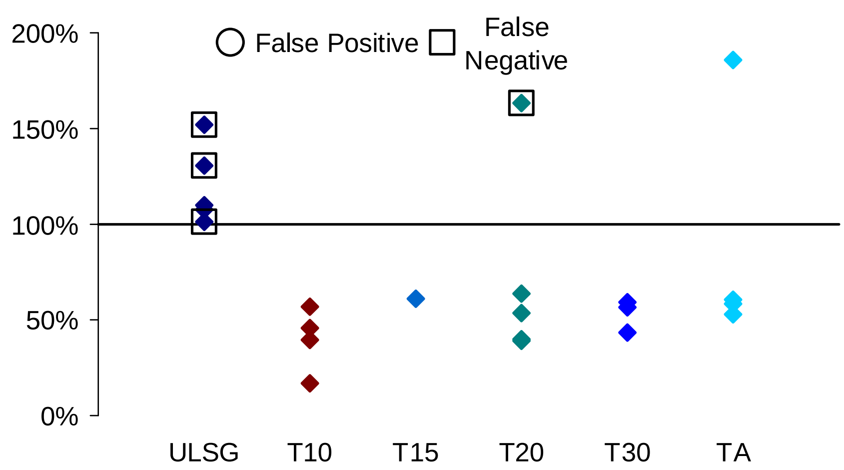


Table 6.9 shows the false negatives for the DRET for 5 years of business under Alternative 2. There were no false positives reported.

TABLE 6.9 – False Positives and Negatives in Deterministic Reserve Exclusion Test

Direct, 5 Years of Business, Alternative 2

Product	Participant	Test Statistic	False Positive (FP)/False Negative (FN)
Term 20	19	163	FN
ULSG	4	110	FN
ULSG	5	151	FN

Table 6.10 shows the deterministic reserve that was calculated for those participants that failed the DRET. The minimum reserve is significantly higher than the deterministic reserve in each case.

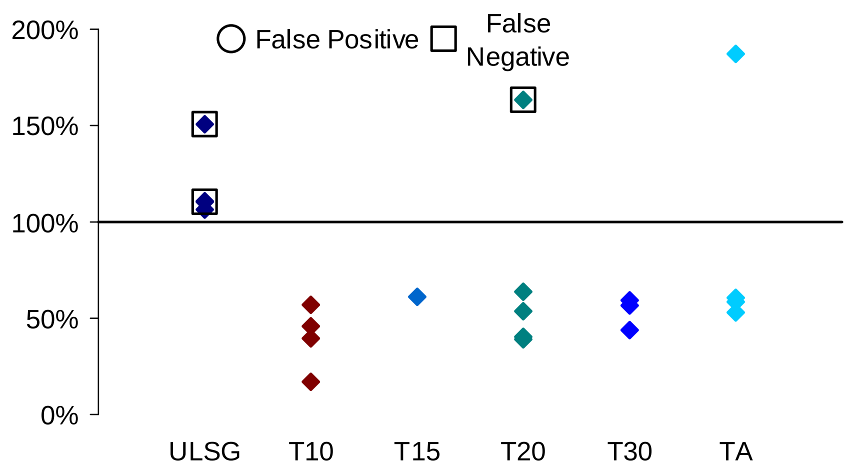
TABLE 6.10 – False Negatives in Deterministic Reserve Exclusion Test

Direct, 5 Years of Business, Alternative 2

Product	Participant	Det Res per 1,000	Min Res per 1,000	Maximum Reserve
Term 20	19	-2.42	2.33	NPR
ULSG	4	52.97	71.80	SR
USLG	5	37.05	66.02	NPR

Chart 6.9 shows the DRET statistic for each participant that provided results along with the false negatives indicated.

Chart 6.9 – Deterministic Reserve Exclusion Test Results by Product Direct, for 5 years of business, with False Positives and False Negatives



Towers Watson's Observations - DRET

The results above seem to demonstrate the effectiveness of the DRET. All of the Universal Life with Secondary Guarantee products failed the DRET and all of the Traditional Whole Life, Simplified Issue Whole Life, Universal Life without Secondary Guarantees and Variable Universal Life products passed the DRET. These results were consistent with the SRET and seem reasonable.

LATF should consider clarifying whether the term product gross premiums used in the DRET should be over the level premium period and/or over the entire contract as this was a point of confusion for many participants due to language in VM-20 that requires the NPR be calculated under both periods for purposes of determining the net premiums.

The companies participating in the Impact Study did not report many other problems in calculating the DRET.

Section 7: Net Premium Reserve

Background

The Net Premium Reserve ("NPR") was added to VM-20 to serve as the floor for the Minimum Reserve and for other reasons, such as a basis for tax reserves. The NPR was proposed and initially drafted by the ACLI. Towers Watson was asked by LATF to review the adequacy of the NPR as a minimum floor. The NPR defined within VM-20 applies to term and ULSG products only. For all other products, VM-20 defines NPR as equal to current CRVM. This means that non-term and non-ULSG model segments that pass the exclusion tests would continue to hold CRVM as the statutory reserve. This section focuses solely on the term and ULSG as they are the only products were the NPR is defined in VM-20

Our approach to the review of the effectiveness of the NPR was similar to how the effectiveness of the SRET and DRET was determined. We reviewed for what products and in what circumstances the NPR became the prevailing minimum reserve and examined the relationship of the NPR to the stochastic and deterministic reserves. We also compared the NPR to the rules-based CRVM reserve level to understand how it compared to current minimum reserve levels.

As participants implemented the NPR calculation, we received dozens of questions on how to interpret various elements of the NPR language in VM-20. Per our instructions from the RTS, these questions were referred to the ACLI and the ACLI responses were provided to the participants to assist them in calculating the NPR for the Impact Study.

A significant number of participants had issues implementing the NPR calculations, causing some participants to delay or forgo supplying us with NPR results.

We understand the ACLI is working on potential modifications to the NPR calculation. This report presents the results reported by the participating companies using the version of the NPR calculation defined in the February 28, 2011 VM-20 working draft. The impact of any modifications or changes to the NPR calculation subsequent to that draft is outside the scope of this report.

Summary of Results and Towers Watson's Observations

Role as Minimum Reserve Floor

From company-to-company, the Impact Study showed significant variability in the NPR as a percentage of CRVM and as a percentage of the deterministic and stochastic reserves. Although there may be other reasons to include the NPR in VM-20, this variability suggests that it is ineffective as a floor for the minimum reserve.

For term products, the NPR was the maximum VM-20 reserve component in the majority of cases (see Table 7.1 below). This may be an undesirable result since the reported reserve in these cases will still be based on a formula-based method (i.e. the NPR) instead of a principle-based calculation as provided by the deterministic and stochastic reserve components and many of the issues related to rules-based reserves would continue to exist.

We also note that having a rules-based floor such as the NPR does not guarantee that products will not be designed to obtain specific results by varying product features in the future. LATF should make sure that they are comfortable with the adequacy of the stochastic and deterministic reserves and not rely on the NPR to be a floor for solvency purposes.

LATF may want to consider making the calculation of the deterministic reserve a requirement for some or all products; that is, eliminate the deterministic exclusion test for those products. This would ensure that there is a principle-based reserve that can be compared to the NPR assuring that the minimum reserve is at least as large as the deterministic reserve (which is principle-based) rather than only relying on a formula-based reserve (NPR) to be the only value calculated.

NPR as the Dominant VM-20 Reserve Component

Some may consider a desirable characteristic of an effective floor for principle-based reserves to be that it is rarely in effect. That is, in most circumstances, the minimum reserve component should be based on a calculation that uses the principles provided in the regulation and not a formula-based calculation such as the NPR. If the NPR floor is the reported reserve in the majority of cases for certain products, then it seems that many of the issues that exist under current formula-based approaches could potentially continue to exist for these products.

Table 7.1 shows the VM-20 maximum reserve component for each product included in the Impact Study for Alternative 2 with 1 and 5 years of business.

TABLE 7.1 – VM-20 Maximum Reserve Component Number of Participants, Direct, Alpternative 2						
Product	**One Year of Business**			**Five Years of Business**		
	NPR	**DR**	**SR**	**NPR**	**DR**	**SR**
ULSG	1	3	5	1	1	7
Term 10	6	0	0	6	0	0
Term 15	3	0	0	2	0	1
Term 20	6	2	0	5	2	1
Term 30	3	1	2	3	1	2
Aggregate Term	4	3	0	3	3	1

The NPR was the maximum reserve for only one of the ULSG participants, however for term products, the NPR ends up being the maximum reserve in the majority of cases (and all of the cases for certain of the term products modeled). This suggests that the does not act as an effective floor with respect to term products.

ULSG Phase I Results

Participating companies provided their calculation of the NPR reserve along with their calculated CRVM reserve and the stochastic and deterministic reserves. For ULSG, 7 of the 9 companies provided NPR values for the 1 year of business and 6 of 9 provided the NPR reserve for 5 years of business.

As is shown in Table 7.2 below for the ULSG 1 year of business, the calculated NPR as a percentage of CRVM varies significantly from company to company, with percentages ranging from 39% to 119%. Under Alternative 2, the relationship between the NPR and the VM-20 minimum reserve ranges from 61% to 86% for 5 of the 7 participants, there is one outlier with a ratio of 26% and the minimum VM-20 reserve for the remaining participant was the NPR. Alternative 1 produced similar ratios.

TABLE 7.2 – ULSG NPR Relationship

Direct Written Business, 1 Year of New Business

Participant	Per $1,000 Amounts				Ratios		
	CRVM	NPR	Min Res Alt 1	Min Res Alt 2	NPR/ CRVM	NPR/ Min Res Alt 1	NPR/ Min Res Alt 2
1	94.51	73.67	116.35	99.72	78%	63%	74%
2	53.64	20.87	102.12	81.70	39	20	26
3	75.15	71.35	152.96	117.90	95	47	61
4	72.93	38.50	66.29	57.15	53	58	67
5	65.66	38.12	38.12	38.12	58	100	100
8	67.33	69.55	94.16	80.73	103	74	86
9	47.25	56.33	103.64	73.65	119	54	76

Table 7.3 shows the results for 5 years of business. The range of results is similar to the range produced using 1 year of business.

TABLE 7.3 – ULSG NPR Relationship

Direct Written Business, 5 Years of New Business

Participant	Per $1,000 Amounts				Ratios		
	CRVM	NPR	Min Res Alt 1	Min Res Alt 2	NPR/ CRVM	NPR/ Min Res Alt 1	NPR/ Min Res Alt 2
1	121.10	95.91	147.63	134.72	79%	65%	71%
2	101.35	45.17	141.90	122.03	45	32	37
3	91.92	98.06	184.47	149.42	107	53	66
4	96.82	62.78	79.88	71.80	65	79	87
5	118.30	66.02	66.02	66.02	56	100	100
9	85.89	101.87	135.76	112.50	119	75	91

ULSG Phase II Results

The recalculation of the NPR was required for only two of the Phase II sensitivities due to the fact that the NPR is formulaic and does not depend on company experience or the economic environment. For Phase II, companies were asked to recalculate reserves with 10 and 15 years of business. Only two ULSG companies responded to this sensitivity but they provided a single year of issues forecasted out to years 10 and 15 instead of multiple years of issues. Tables 7.4 and 7.5 below show the results for the two companies.

TABLE 7.4 – NPR Relationship for Participant 3

Alternative 2, Direct Basis

Duration	NPR/CRVM	NPR/DR	NPR/SR
1	95%	61%	61%
5	112	68	67
10	121	87	85
15	113	93	91

TABLE 7.5 – NPR Relationship for Participant 9

Alternative 2, Direct Basis

Duration	NPR/CRVM	NPR/DR	NPR/SR
1	119%	76%	77%
5	130	109	111
10	133	117	119
15	127	117	115

Another Phase II NPR sensitivity was divided into three parts, two of which applied to ULSG:

- Part 1 changed the NPR ULSG lapse rate formula in 3.C.3.c.ii from

  $L_{x+t} = 0.01R_{x+t} + 0.005(1 - R_{x+t})r_{x+t}$

  to

  $L_{x+t} = 0.03R_{x+t} + 0.015(1 - R_{x+t})r_{x+t}$

This essentially increased the assumed lapse rate by a factor of three. Only one ULSG participant provided results for this sensitivity and they indicated the NPR decreased by 16% due to the increase in the lapse assumption.

- Part 2 changed the valuation rate from 5% to 4% for the no-CSV benefit streams, and from 4% to 3% for the with-CSV benefit streams. Two ULSG product results were submitted. One participant reported an increase to the NPR of 23% and the other reported an increase of 18%. This shows that the ULSG NPR is quite sensitive to the assumed valuation rate.

Term Phase I Results

Participating companies provided their calculation of the NPR reserve along with their calculated CRVM, stochastic and deterministic reserves. The results are shown by the period of the level premium guarantee period since the length of the premium guarantee had a significant impact on the reserve level. For Term, 10 of the 12 companies provided NPR values for the 1 year of business and all 12 provided the NPR reserve for 5 years of business.

The results for Term are presented in Appendix G where there are tables showing how the NPR compares to each VM-20 reserve component and the CRVM reserve for 1 and 5 years of issues. The relationship of the NPR to the CRVM reserve, deterministic reserve and stochastic reserve varies widely in each case for term products.

Term Phase II Results

Only one company provided term NPR reserves for one year of business projected for 15 years. The results are shown below in Table 7.6. The stochastic reserve exclusion test was passed and, therefore, this company did not calculate the stochastic reserve for this exercise. Although this is only one company, the pattern of the NPR as a percent of CRVM and the deterministic reserve shows that the NPR does not appear to work well as a reserve floor at the later durations.

TABLE 7.6 – NPR Relationship for Participant 9

Alternative 2, Direct Basis

Duration	NPR/CRVM	NPR/DR
1	38%	28%
5	55	70
10	66	95
15	22	33

As described above in the ULSG section, one of the NPR sensitivities was divided into three parts, one of which applied to term products:

- The valuation rate was changed from 5% to 4% for the no-CSV benefit streams. We received results for three term products for this sensitivity. Two participants submitted 20 year level premium period product results and indicated increases of 4% and 5%. One participant submitted results for aggregate term and the NPR increased by approximate 2%.

Section 8: Economic Scenario Generator

Introduction

Currently, the NAIC has proposed to use the American Academy of Actuaries Economic Scenario Generator (“AAA ESG”) as the prescribed ESG in VM-20. As part of the Impact Study, we were asked to review the AAA ESG. This section presents the results of our review.

There were also two sensitivity tests as part of the Impact Study related to the ESG. The results of these tests are provided at the end of this section.

Risks Covered

The AAA ESG is intended to test interest rate and equity risks. It is not intended to test spread risk, credit risk, or currency risk.

Evaluation

We evaluated the following characteristics of the AAA ESG:

- Completeness (i.e., it addresses all of the risks)
- Realism (i.e., it produces economic scenarios that are plausible)
- Technical Accuracy (i.e., the tool follows the formula accurately)
- Robustness (i.e., it is appropriate under a wide range of initial conditions)
- Usability (i.e., specific expertise is not necessary to generate results)

To perform the evaluation, we created 10 sets of 10,000 simulations of monthly interest and equity rates for 50 years using the AAA ESG. The scenarios were created using the following initial yield curve:

TABLE 8.1

Initial Yield Curve

Maturity	Rate
3 Month	0.06%
6 Month	0.20
1 Year	0.47
2 Year	1.15
3 Year	1.72
5 Year	2.77
7 Year	3.54
10 Year	4.07
20 Year	5.03
30 Year	5.00

Towers Watson's Observations

Our analysis of the AAA ESG showed it to be generally effective and covers the relevant risks, with a few areas that we would recommend to be evaluated. The generator produced interest rates that were generally lower than historical levels and there were a lower number of inverted scenarios than what has been seen historically over the past 50 years. The AAA ESG is generally technically accurate and was found to be robust and easy to use.

Simulated treasury rates were compared to actual historical rates. The average simulated interest rates are below historical levels covering the period from 1960 to 2009 by approximately 1.9% for 1- and 5-year rates, 1.8% for 10- and 20-year rates and 1.6% for the 30-year rate. This is likely influenced by the current low interest rate environment and level of the mean reversion strength parameter in the ESG. A higher strength parameter would cause the expected long term rate to approach the mean reversion point earlier in the projection period, giving less weight to the current interest rate environment. The differences between historical and simulated rates are reduced by approximately 0.8% to 0.9% if the years 1978 through 1985 (years with very high historical interest rates) are excluded from the historical rates.

Simulated equity returns were also compared to historical returns. The simulated returns are on a total return basis (i.e. includes the effect of dividends) while the historical returns exclude dividends. The historical average equity total return from 1960 to 2009, excluding dividends, was 6.02%. The 50-year geometric average simulated total equity return, including dividends, was 7.55%. Since dividends yields have averaged close to 2% historically, simulated equity returns appear reasonably consistent with historical levels.

Completeness

For an ESG to exhibit completeness, all of the relevant risks must be addressed. The relevant risks for the purpose of this review were defined as interest rate (which includes reinvestment rate risk) and equity risk.

Interest rate risk is the risk of changes in values of assets or liabilities (or to reinvestment rates) due to changes in interest rates. The AAA ESG generates two points on the treasury yield curve, the one-year and 20-year Treasury rates, and interpolates to obtain the full yield curve. A stochastic process is used that generates a range of interest rate levels.

Equity risk is the risk of changes in values of assets or liabilities due to changes in equity markets. The AAA ESG generates total returns, that is, returns include both capital gains and dividends, for multiple equity indices and significant movements in growth rates for these indices are reflected.

Our review found that the AAA ESG adequately generates scenarios that can be used to test both changes to interest rates (reinvestment rates) and equity returns covering both required risks.

Realism

We evaluated if the AAA ESG generated results were consistent with historical rates.

The consistency with historical market rates was evaluated by reviewing the range of results produced by the model to a range of historical rates over the last 50 years on a monthly basis (i.e. calendar years 1960 through 2009). The historical Treasury rates were obtained from the AAA ESG.

Table 8.2 below shows the minimum (1st percentile), 25th percentile, 50th percentile, 75th percentile, maximum (99th percentile), and the geometric average across all scenarios of selected maturities for both the simulated results and the observed historical data. The level of the simulated Treasury interest rates is lower than the level of the observed historical rates in all cases. Since the historical rates include periods of very high interest rates, such as the late 1970s and 1980s, we also reviewed the level of simulated interest rates to historical results excluding the extremely high interest rates from 1978 through 1985. These results are shown in Table 8.3 and show that the simulated interest rates are still lower than historical levels even excluding the historically high interest rate period.

TABLE 8.2 – Distribution of Historical Treasury Rates Compared to Simulated Rates[1]

Historical Period: 1960-2009

Maturity	Dataset	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile	Geometric Average
3 Month	Historical	0.14%	3.54%	5.12%	6.86%	14.81%	5.40%
	Simulated	0.01	2.12	3.32	4.88	12.76	3.77
1 Year	Historical	0.47	3.92	5.51	7.44	15.08	5.88
	Simulated	0.27	2.39	3.52	5.01	12.65	3.97
5 Year	Historical	2.02	4.46	6.13	7.88	14.39	6.52
	Simulated	1.73	3.21	4.17	5.50	12.45	4.63
10 Year	Historical	3.21	4.63	6.36	8.03	14.14	6.76
	Simulated	2.10	3.65	4.51	5.78	12.51	4.97
20 Year	Historical	3.84	4.92	6.57	8.32	14.09	7.00
	Simulated	2.28	3.93	4.79	6.01	12.72	5.22
30 Year	Historical	3.83	4.88	6.48	8.22	13.84	6.92
	Simulated	2.33	4.02	4.89	6.10	12.89	5.31

[1]Simulated figures are calculated as the average of the ten sets of 10,000 simulated interest rate scenarios

TABLE 8.3 – Distribution of Historical Treasury Rates Compared to Simulated Rates[1]

Historical Period: 1960-2009, excluding 1978-1985

Maturity	Dataset	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile	Geometric Average
3 Month	Historical	0.14%	3.23%	4.78%	5.73%	8.69%	4.53%
	Simulated	0.01	2.12	3.32	4.88	12.76	3.77
1 Year	Historical	0.47	3.59	5.11	6.25	9.02	4.94
	Simulated	0.27	2.39	3.52	5.01	12.65	3.97
5 Year	Historical	2.01	4.16	5.72	6.97	9.06	5.63
	Simulated	1.73	3.21	4.17	5.50	12.45	4.63
10 Year	Historical	3.16	4.41	5.86	7.33	9.14	5.91
	Simulated	2.10	3.65	4.51	5.78	12.51	4.97
20 Year	Historical	3.81	4.79	6.06	7.53	9.42	6.18

TABLE 8.3 – Distribution of Historical Treasury Rates Compared to Simulated Rates[1]

Historical Period: 1960-2009, excluding 1978-1985

Maturity	Dataset	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile	Geometric Average
	Simulated	2.28	3.93	4.79	6.01	12.72	5.22
30 Year	Historical	3.76	4.72	6.00	7.48	9.17	6.11
	Simulated	2.33	4.02	4.89	6.10	12.89	5.31

[1]Simulated figures are calculated as the average of the ten sets of 10,000 simulated interest rate scenarios

To evaluate if the simulated equity returns were consistent with returns observed historically. It is important to understand that that the AAA ESG is calibrated with the intent to simulate total equity returns; that is, including both the effects of capital gains and dividend yields (the effect of reinvesting dividends back into the index). The historical returns presented in this report do not include the effect of dividends and are based on the change in index only.

We reviewed the 1st percentile, 25th percentile, 50th percentile, 75th percentile, and the 99th percentile of the simulated equity returns, along with the historical S&P 500 rates. This is shown in Table 8.4.

TABLE 8.4 – Distribution of Historical Equity Rates Compared to Simulated Rates[1]

Monthly Returns, Historical Period: 1960-2009

Index	Dataset	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile
S&P 500	Historical	-10.99%	-1.87%	0.90%	3.44%	11.05%
	Simulated	-11.68	-1.55	0.88	3.14	11.56

[1]Simulated figures are calculated as the average of the ten sets of 10,000 simulated equity rate scenarios

Tables 8.5a compares the simulated equity total returns to the historical return over different time horizons. The historical returns are the index-only equity returns for the S&P 500 from n years prior to December 2009. The simulated returns are the average of the ten sets of simulated equity scenarios from the valuation date to n years in the future. Based on this analysis, the simulated returns are approximately 55 basis points lower than historical over a 30-year time period and approximately 155 basis points higher over a 50-year horizon. One of the reasons the simulated 40 and 50-year averages are higher is because simulated rates include dividend yields, whereas the historical rates in Table 8.5a are based on change in index only and do not include the effect of dividends. The ESG simulates a total S&P return that includes both capital gains and dividends. To help understand the effect of the dividend yield, Table 8.5b shows the total historical return for the last 10 and 20 years prior to

December 2009, and then shows the index only return; the difference is the dividend yield. Averaging roughly 2% over the last 20 years, the dividend yield is a significant component of total equity return should be considered when comparing the average returns in Table 8.5a.

TABLE 8.5a – Distribution of Historical Equity Rates Compared to Simulated Rates[1]

Geometric Average, Period Begins from Valuation Date

Index	Dataset	30 Years	40 Years	50 Years
S&P 500	Historical[2]	8.09%	6.43%	6.02%
	Simulated[3]	7.55	7.55	7.55

[1]Simulated figures are calculated as the average of the ten sets of 10,000 simulated equity rate scenarios
[2]Historical rates are based on the change of index only and do not include the dividend yield
[3]Simulated rates include both capital gains and the dividend yield

TABLE 8.5b – Impact of Dividends on Historical Equity Rates

Geometric Average, Period Begins from Valuation Date

Index	Return	10 Years	20 Years
S&P 500	Total Return	-0.95%	8.21
	Index Only	-2.72	5.91
	Difference = Dividend Yield	1.77	2.29

We also reviewed the shape of the simulated interest rate curve versus the shape of observed historical interest rate curves. We calculated the percentage of inverted and upward sloped curves observed historically compared to those in the simulated results. The results are shown in Table 8.6 below. The following definitions were used:

- Inverted curves were measured as periods where the 1-yr rate was higher than the 20-yr rate.
- All other curves were considered upward sloping

TABLE 8.6 – Percentage of Inverted Yield Curves Historical Period: 1960-2009	
Dataset	**% of Inverted Curves**
Historical	19.50%
Simulated	11.94

The percentage of simulated inverted curves is lower than has been observed historically.

We reviewed the volatility implied in historical market prices compared to that used in the generator to simulate interest rate scenarios. Tables 8.7 and 8.8 below compare the volatilities observed for the one-year and 20-year Treasury interest rates and equities that are used to generate the ten sets of 10,000 economic scenarios produced. Interest volatility was calculated as the standard deviation of the change in yields multiplied by square root of 12. Equity volatility was calculated as the standard deviation of the monthly returns multiplied by the square root of 12. The Treasury rates were represented as bond equivalent yields and the equity rates were represented as the monthly returns. The average volatility is lower than what we have observed historically for the Treasury rates, but in line with the historical equity volatility.

TABLE 8.7 – Comparison of Treasury Rate Volatilities Historical Period: 1960-2009		
Dataset	**1-Year Treasury**	**20-Year Treasury**
Historical	1.73%	1.51%
Simulated	1.13	0.72

TABLE 8.8 – Comparison of Equity Rate Volatilities Historical Period: 1960-2009	
Dataset	**S&P 500**
Historical	14.96%
Simulated	15.03

Technical Accuracy

The model must follow the documented formula correctly in order to exhibit the characteristic of technical accuracy. We assessed this characteristic by comparing the characteristics of the simulated output to the inputs used in the AAA ESG.

We first analyzed the results to ensure they were non-negative as would be expected with the interest rate floor of 0.001%. We did not observe any negative rates in the ten sets of scenarios we generated with the AAA ESG.

We also compared the maximum and minimum rates to the soft limits documented for the AAA ESG. Charts 8.1 and 8.2 show a scatter plot of the maximum and minimum 20 Year Treasury rate in each time period for each set of 10,000 scenarios. We note that scatter plots generally center around the soft minimum (1.15%) and maximum (18%) applied in the model. These are 'soft' minimums and maximums since they are enforced prior to applying a random shock to the treasury rates.

Chart 8.1 – Maximum 20-Year Treasury Rate for Each Scenario Set by Month

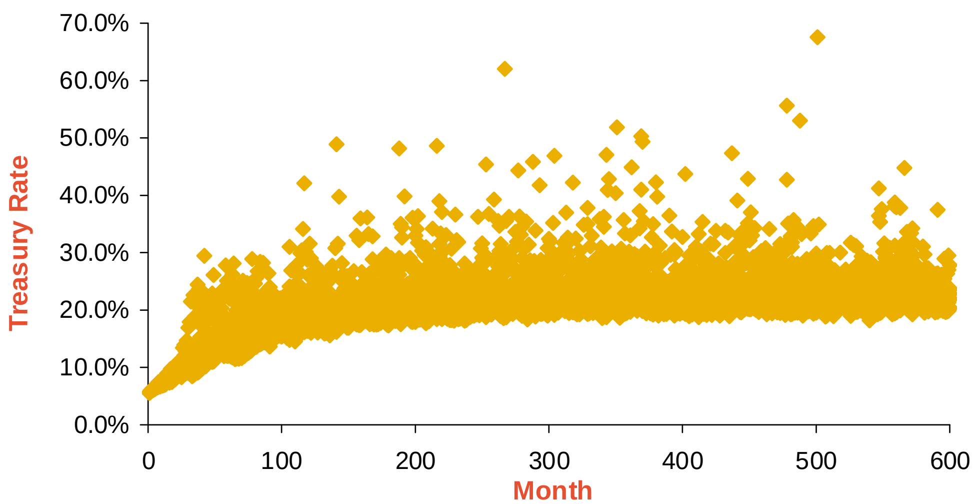


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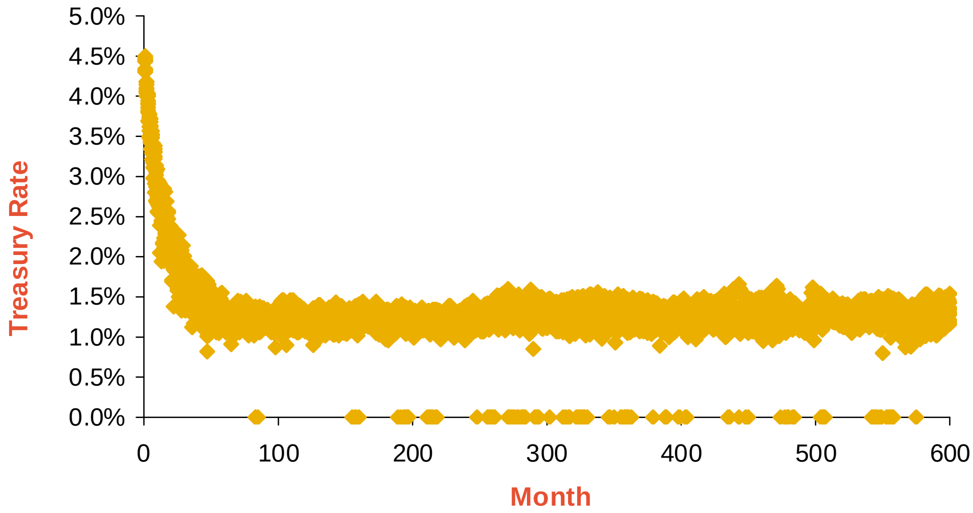
Chart 8.2 – Minimum 20-Year Treasury Rate for Each Scenario Set by Month



We reviewed the geometric average 20-year Treasury rate in the simulated interest rate scenarios to compare it to the mean reversion target of 5.25%. The average for each of the 10 sets of 10,000 scenarios is shown in Table 8.9 below. The average for each set of interest rate scenarios is reasonably close to the mean reversion target. We also simulated the total S&P 500 equity return for 10 sets of 10,000 scenarios and calculated the average annual equity return which is also shown in Table 8.9. The average total equity return is approximately 7.55%.

TABLE 8.9 – Geometric Average Rate for Each Set of Scenarios

Target 20-Year Rate = 5.25%

Scenario Set	20-Year Rate	S&P 500 Return
1	5.22%	7.55%
2	5.20	7.57
3	5.21	7.53
4	5.22	7.55
5	5.21	7.55
6	5.24	7.54
7	5.21	7.54
8	5.22	7.57
9	5.23	7.55

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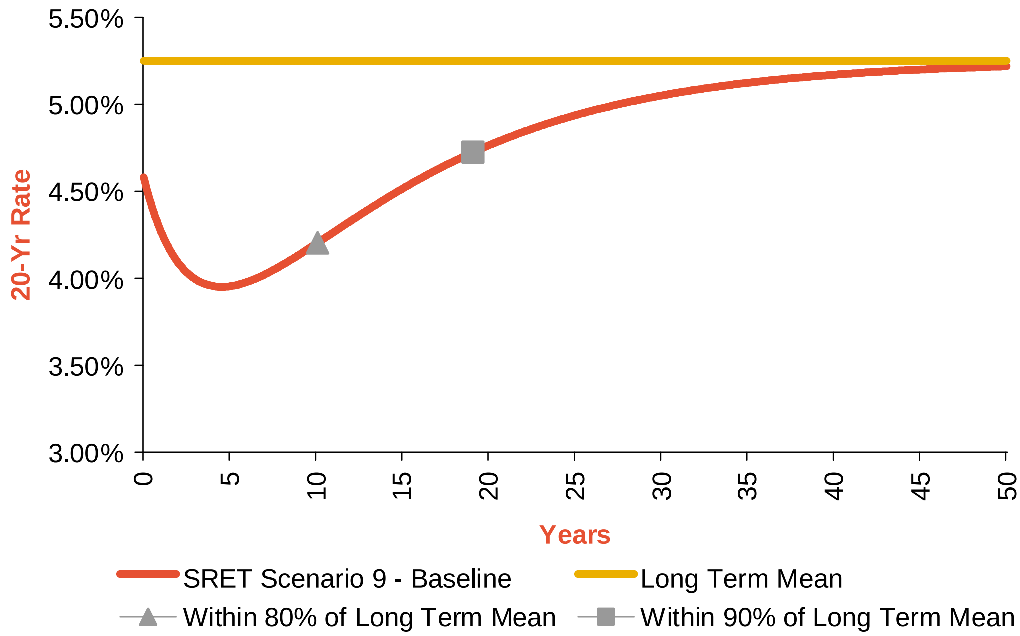
TABLE 8.9 – Geometric Average Rate for Each Set of Scenarios Target 20-Year Rate = 5.25%		
Scenario Set	**20-Year Rate**	**S&P 500 Return**
10	5.20	7.51

Chart 8.3 shows how the 20 Year Treasury rate approaches the mean reversion rate using SRET Scenario 9, which was developed using the ESG, but without the presence of random shocks.

Chart 8.3 – Expected Reversion to Mean



Finally, we checked that implied volatility in the resulting scenarios was consistent with the input. Tables 8.10 and 8.11 below show the average volatility for each of the sets of 10,000 scenarios that were run for the 20-year Treasury rate and the S&P 500. The resulting volatility is relatively consistent across the variety of interest rate scenario sets.

TABLE 8.10 – Treasury Rate Volatility Implied in Each Set of Scenario

Scenario Set	20-Year Volatility
1	0.70%
2	0.69
3	0.70
4	0.69
5	0.85
6	0.76
7	0.70
8	0.70
9	0.69
10	0.69

TABLE 8.11 – Equity Rate Volatility Implied in Each Set of Scenario

Scenario Set	S&P 500 Volatility
1	15.02%
2	15.02
3	15.03
4	15.02
5	15.03
6	15.02
7	15.02
8	15.03
9	15.01
10	15.05

Robustness

The model must produce consistent results under a wide range of initial conditions in order to exhibit the characteristic of robustness. In order to test the robustness of the model, we attempted to introduce extreme inputs that could cause errors in the scenario generation process.

We first varied each input that we were able to modify:

- Mean reversion point for the long term rate
- Mean reversion point for the long term volatility
- Volatility of the slope
- Volatility of the stochastic volatility process

We were able to vary each of the inputs easily without causing errors in the model.

We also varied the random seed to ensure that the generator still produced reasonable results with a different random seed. Table 8.12 below shows the distribution of results under the ten random seeds for a select number of points on the Treasury curve. Table 8.13 shows the results for the generated total equity returns. The model produces consistent results regardless of initial random seed.

TABLE 8.12 – Distribution of Treasury Rates Under Different Scenario Sets

Maturity	Scenario Set	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile
3 Month	1	0.01%	2.12%	3.33%	4.90%	12.81%
	2	0.01	2.12	3.31	4.86	12.67
	3	0.01	2.12	3.32	4.87	12.80
	4	0.01	2.12	3.32	4.89	12.82
	5	0.01	2.12	3.31	4.87	12.87
	6	0.01	2.13	3.33	4.89	12.75
	7	0.01	2.11	3.30	4.86	12.59
	8	0.01	2.13	3.32	4.88	12.81
	9	0.01	2.14	3.33	4.89	12.73
	10	0.01	2.12	3.31	4.87	12.78

TABLE 8.12 – Distribution of Treasury Rates Under Different Scenario Sets

Maturity	Scenario Set	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile
10 Year	1	2.10	3.65	4.51	5.79	12.52
	2	2.10	3.65	4.50	5.78	12.38
	3	2.09	3.65	4.50	5.77	12.51
	4	2.09	3.65	4.50	5.79	12.52
	5	2.09	3.65	4.50	5.76	12.74
	6	2.09	3.66	4.52	5.80	12.70
	7	2.11	3.64	4.49	5.76	12.40
	8	2.10	3.65	4.51	5.79	12.53
	9	2.11	3.67	4.52	5.79	12.37
	10	2.08	3.65	4.51	5.77	12.43

TABLE 8.13 – Distribution of S&P 500 Total Returns Under Different Scenario Sets

Monthly Returns

Scenario Set	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile
1	-11.68%	-1.55%	0.88%	3.14%	11.55%
2	-11.68	-1.55	0.88	3.14	11.57
3	-11.69	-1.55	0.88	3.14	11.57
4	-11.66	-1.55	0.88	3.14	11.55
5	-11.67	-1.55	0.88	3.14	11.58
6	-11.68	-1.55	0.88	3.14	11.56
7	-11.68	-1.55	0.88	3.14	11.56
8	-11.67	-1.55	0.88	3.14	11.57
9	-11.66	-1.55	0.88	3.14	11.53
10	-11.72	-1.55	0.88	3.14	11.58

We also ran the model under various initial starting curves to determine whether or not consistent results were produced. Table 8.14 below shows the initial starting curves that were used.

TABLE 8.14 – Initial Yield Curve for Stress Tests

Maturity	Base	Inverted	Flat	Steep	+100bp	-100bp[1]
3 Month	0.06%	4.82%	4.96%	0.16%	1.06%	0.03%
6 Month	0.20	4.58	4.99	0.19	1.20	0.10
1 Year	0.47	4.10	4.85	0.27	1.47	0.24
2 Year	1.14	3.57	4.56	0.42	2.14	0.57
3 Year	1.70	3.47	4.55	0.64	2.70	0.85
5 Year	2.69	3.29	4.60	1.27	3.69	1.69
7 Year	3.39	3.29	4.67	1.91	4.39	2.39
10 Year	3.85	2.82	4.78	2.53	4.85	2.85
20 Year	4.58	2.66	5.00	3.38	5.58	3.58
30 Year	4.63	2.58	4.92	3.69	5.63	3.63

[1]Floored at 50% of the initial value.

We analyzed the sets of scenarios that were produced using each of the starting curves. Table 8.15a below shows the geometric average Treasury rate for several of the points on the yield curve for each set of scenarios produced using each of the initial starting yield curves. The average rates are reasonably consistent regardless of the starting curve, indicating that the model is robust but does indicate some variability in the generated average Treasury rates due to the starting yield curve. Table 8.15b shows the arithmetic average rate in the last simulated month (600). This shows that by the end of 50 years, the mean reversion brings the rates to about the same level due to mean reversion.

TABLE 8.15a – Geometric Average Simulated of Rates Under Each Stress

Maturity	Base	Inverted	Flat	Steep	+100bp	-100bp
3 Month	3.72%	4.12%	4.45%	3.62%	3.90%	3.63%
6 Month	3.78	4.17	4.51	3.68	3.97	3.69
1 Year	3.91	4.25	4.62	3.80	4.10	3.81
2 Year	4.13	4.40	4.81	3.99	4.32	4.01

TABLE 8.15a – Geometric Average Simulated of Rates Under Each Stress

Maturity	Base	Inverted	Flat	Steep	+100bp	-100bp
3 Year	4.29	4.52	4.95	4.14	4.50	4.16
5 Year	4.53	4.69	5.16	4.36	4.74	4.39
7 Year	4.69	4.80	5.29	4.50	4.90	4.53
10 Year	4.83	4.89	5.41	4.64	5.05	4.67
20 Year	5.02	5.03	5.58	4.81	5.25	4.85
30 Year	5.09	5.07	5.64	4.88	5.31	4.91

TABLE 8.15b –Arithmetic Average of Simulated Rates for Month 600 Under Each Stress

Maturity	Base	Inverted	Flat	Steep	+100bp	-100bp
3 Month	4.40%	4.41%	4.43%	4.39%	4.41%	4.40%
6 Month	4.47	4.48	4.50	4.46	4.48	4.46
1 Year	4.59	4.60	4.62	4.58	4.60	4.58
2 Year	4.78	4.79	4.81	4.77	4.79	4.77
3 Year	4.93	4.94	4.97	4.92	4.94	4.93
5 Year	5.15	5.16	5.18	5.14	5.16	5.14
7 Year	5.29	5.30	5.33	5.28	5.30	5.28
10 Year	5.42	5.43	5.46	5.41	5.43	5.41
20 Year	5.59	5.60	5.63	5.58	5.60	5.58
30 Year	5.65	5.66	5.69	5.64	5.66	5.64

Usability

An ESG exhibits the characteristic of usability if specific expertise is not necessary to use the model. We reviewed the documentation along with the input and output and found the AAA ESG to be intuitive. As a test, we had an actuarial student with technical computer and modeling knowledge, but without specific scenario generation knowledge follow the documentation in order to generate a set of scenarios. The student was able to generate the scenarios without assistance, which leads us to conclude that the documentation and usability of the model are sufficient.

ESG Sensitivity Tests

ESG Starting Yield Curve

This sensitivity instructed participants to revise the initial yield curve based on three alternatives to produce three different sets of stochastic scenarios:

a. Plus 100 basis points.
b. Minus 100 basis points.
c. Inverted.

The change from the baseline for the minimum reserve (MR), deterministic reserve (DR) and stochastic reserve (SR) due to changing the initial yield curve is presented in Table 8.16 for the ULSG and term products. The impact on the minimum reserve is fairly significant and shows the VM-20 reserve for these products is very sensitive to the current economic conditions.

TABLE 8.16 – ESG Starting Yield Curve Sensitivity

All Business (Averages)

Product	No. of Participants	% Chg from Baseline		
		+100bp	-100bp	Inverted
Term – MR	13	-9%	8%	-1%
Term – DR	13	-15	12	-2
Term – SR	13	-15	13	4
ULSG – MR	4	-5	10	6
ULSG – DR	4	-8	9	7
ULSG – SR	4	-5	10	6

Results for business other than term and ULSG products are provided in Appendix E. There is virtually no change in the minimum reserve for these other products because the NPR (equal to the CRVM) is the maximum reserve (or the products pass the exclusion tests) in all but one case.

Overall, the initial yield curve had a significant impact on the VM-20 results submitted for the Impact Study. This implies the VM-20 reserves will fluctuate based on the current economic conditions and may create significant volatility on financial results, especially given the fact that the majority of assets held by life insurance companies are reported on a book value basis.

ESG Parameters

In another sensitivity test, the ESG parameters were revised based on four alternatives to produce four different sets of stochastic scenarios:

a. Long rate mean reversion point plus 100 basis points.
b. Long rate mean reversion point minus 100 basis points.
c. 150% long rate volatility.
d. 150% volatility of stochastic volatility.

Tables 8.17a and 8.17b present the results of the ESG parameter sensitivity for the minimum reserve and other VM-20 reserve components, respectively. In general, the reserves are only slightly sensitive to these parameters for the products that were analyzed.

TABLE 8.17a – ESG Parameters Sensitivity

All Business – Minimum Reserve

Product	Participant	% Chg in VM-20 Reserve			
		LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
Term 10	22	0%	0%	0%	0%
Term 15	22	0	0	0	0
Term 20	22	-3	5	-1	1
ULSG	9	-4	2	3	1
ULSG	3	-4	6	3	1
ULSG	4	-2	2	2	1
ULwo	18	0	0	0	0
ULwo	19	0	0	0	0

TABLE 8.17b – ESG Parameters Sensitivity

All Business –Reserve Components

Product	Participant	% Chg in Det. Reserve				% Chg in Stoch. Reserve			
		LT MRP +100bp	LT MRP - 100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP - 100bp	150% Long Rate Vol	150% Stoch Vol
Term 10	22	0%	0%	0%	0%	0%	-2%	1%	-1%
Term 15	22	-2	2	0	0	-2	1	1	-1
Term 20	22	-4	6	3	0	-3	5	-1	1
Term Agg	10	-4	4	2	0	Not submitted			
ULSG	9	-4	4	2	0	-4	2	3	1
ULSG	3	-6	7	3	0	-4	6	3	1
ULSG	4	-4	5	2	0	-2	2	2	1
ULwo	18	0	1	0	0	0	0	2	1
ULwo	19	-4	7	5	1	0	0	0	0

Note that the Term Agg (Participant 10) results were submitted for the deterministic reserve, but not for the stochastic reserve, which was the maximum reserve component.

Section 9: Reinsurance

Summary of Results and Towers Watson's Observations

One of the objectives of the Impact Study was to understand the impact that reinsurance has on VM-20 reserve levels and the resulting reserve credits. LATF was also interested in whether the VM-20 reinsurance requirements were relatively easy for participants to interpret, as well as the relative effort required to model reinsurance under VM-20. In order to get a clear picture on the reinsurance impact of VM-20, participants were instructed to exclude any XXX or AXXX (AG38) financing treaties in place, but to include all other reinsurance.

LATF was also interested in evaluating mirror reserving under VM-20, but with no reinsurers participating in the study, quantification of the potential impact has not been addressed. We note that since assumptions for the deterministic and stochastic reserves may be based on company experience, the VM-20 reserves assumed by the reinsurer may be different than the reserves ceded by the direct writing company. The level of aggregation and model compression may also contribute to differences between the ceding and assuming company's level of reserves.

This section presents the gross and net results as provided by the direct writing companies. Later sections will address the level of ease participants had in interpreting the areas of VM-20 relating to reinsurance and in modeling reinsurance for VM-20. The reinsurance results provided by the participants and presented in this report assume the reinsurance premiums and terms will be the same under VM-20 as they are under current regulations. It is possible that reinsurers will adjust reinsurance rates and terms on business that falls under the scope of VM-20, which would change the impact of reinsurance on reserve levels.

The results in this section are presented similar to Section 5, except that results are shown on both gross and net bases to highlight the impact of reinsurance. As in Section 5, VM-20 reserves are compared to CRVM reserves and the average per 1,000 values are presented by giving equal weight to each participating company. Results are shown both for 1 year and 5 years of issues using both Alternative 1 and Alternative 2. Only participants that modeled significant reinsurance are included in the aggregate results in this section. Table 9.1 summarizes the various forms of reinsurance that were modeled for the study and whether or not the reinsurance was considered to be significant. No participants modeled significant reinsurance for Simplified Issue WL, UL without SG or 15-year Term.

The column labeled "YRT Premium Margin" indicates whether or not participants increased non-guaranteed YRT premium rates in the calculation of the deterministic and stochastic reserve. Practice varied widely and we recommend clarification on this issue as a future revision to VM-20. The relationship between the VM-20 mortality assumption and the projected YRT premium rates (current plus any margin) is a key driver of the impact VM-20 has on the net cost of reinsurance.

TABLE 9.1 – Summary of Reinsurance Information

Individual Participants

Modeled Reinsurance	Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	Participant Count	YRT Premium Margin
YRT	Whole Policy	> 10%	First Dollar	Yes	10	6 Yes, 4 No
YRT	Whole Policy	< 10%	First Dollar	No	1	None
YRT	Whole Policy	Any	Excess of ≥ $1M	No	14	None
YRT	ADB Only	100%	First Dollar	No	5	None
Quota Share	Whole Policy	90%	First Dollar	Yes	1	None
Not Provided				No	2	

The results for 1 year of business compared to CRVM under Alternative 1 and Alternative 2 are shown in Tables 9.2a and 9.2b respectively. Table 9.2c compares the net-to-gross ratios on average for each of the product lines.

TABLE 9.2a – Impact of Reinsurance on Relative Level of VM-20 vs CRVM

Aggregate Impact – 1 Year of New business, Alternative 1

Product	Gross of Reinsurance Per $1,000 Amount			Net of Reinsurance Per $1,000 Amount			Impact of Reinsurance on Relative Level of VM-20 vs CRVM
	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	
Traditional WL	4.5	4.5	0%	3.6	3.6	0%	+0%
ULSG	68.7	88.1	28	67.9	77.4	14	-14
VUL	11.3	11.3	0	10.4	10.4	0	+0
Term 10	1.5	2.7	84	-0.7	0.3	-138	-222
Term 20	4.4	3.1	-29	3.4	0.1	-96	-67
Term 30	6.9	3.8	-46	6.5	1.8	-73	-27
Aggregate Term	3.5	2.9	-18	2.3	1.9	-14	+4

TABLE 9.2b – Impact of Reinsurance on Relative Level of VM-20 vs CRVM

Aggregate Impact – 1 Year of New business, Alternative 2

Product	Gross of Reinsurance Per $1,000 Amount			Net of Reinsurance Per $1,000 Amount			Impact of Reinsurance on Relative Level of VM-20 vs CRVM
	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	
Traditional WL	4.5	4.5	0%	3.6	3.6	0%	+0%
ULSG	68.7	73.1	6	67.9	65.4	-4	-10
VUL	11.3	11.3	0	10.4	10.4	0	0
Term 10	1.5	2.7	84	-0.7	0.3	-138	-222
Term 20	4.4	2.5	-43	3.4	0.1	-96	-54
Term 30	6.9	2.7	-61	6.5	0.9	-86	-25
Aggregate Term	3.5	2.7	-25	2.3	1.8	-21	+4

TABLE 9.2c – Comparison of VM-20 to CRVM Net/Gross Ratios

Aggregate Impact – 1 Year of New Business

Product	CRVM	VM-20 Alt 1	Change from CRVM	VM-20 Alt 2	Change from CRVM
Traditional WL	79%	79%	0%	79%	0%
ULSG	99	88	-11	90	-9
VUL	92	92	0	92	0
Term 10	-49	10	59	10	59
Term 20	77	4	-73	5	-72
Term 30	94	46	-47	33	-61
Aggregate Term	64	67	3	67	3

Tables 9.3a, 9.3b and 9.3c show the results for 5 years of business.

TABLE 9.3a – Impact of Reinsurance on Relative Level of VM-20 vs CRVM

Aggregate Impact – 5 Years of New business, Alternative 1

Product	Gross of Reinsurance Per $1,000 Amount			Net of Reinsurance Per $1,000 Amount			Impact of Reinsurance on Relative Level of VM-20 vs CRVM
	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	
Traditional WL	35.1	35.1	0%	34.1	34.1	0%	+0%
ULSG	103.5	141.7	37	102.7	124.0	21	-16
VUL	17.1	24.1	41	15.5	17.3	11	-30
Term 10	5.6	4.8	-13	2.9	1.9	-35	-22
Term 20	8.4	7.2	-14	7.2	3.5	-52	-37
Term 30	9.9	7.0	-30	9.4	4.6	-52	-22
Aggregate Term	7.1	5.0	-30	4.8	3.3	-31	-1

TABLE 9.3b – Impact of Reinsurance on Relative Level of VM-20 vs CRVM

Aggregate Impact – 5 Years of New business, Alternative 2

Product	Gross of Reinsurance Per $1,000 Amount			Net of Reinsurance Per $1,000 Amount			Impact of Reinsurance on Relative Level of VM-20 vs CRVM
	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	Average CRVM Reserve	Average VM-20 Reserve	Change from CRVM	
Traditional WL	35.1	35.1	0%	34.1	34.1	0%	+0%
ULSG	103.5	123.6	19	102.7	108.0	5	-14
VUL	17.1	20.4	19	15.5	15.5	0	-19
Term 10	5.6	4.8	-13	2.9	1.9	-35	-22
Term 20	8.4	6.6	-21	7.2	3.1	-57	-36
Term 30	9.9	5.7	-42	9.4	3.6	-62	-20
Aggregate Term	7.1	4.6	-35	4.8	3.1	-36	-1

TABLE 9.3c – Comparison of VM-20 to CRVM Net/Gross Ratios Aggregate Impact – 5 Years of New Business					
Product	**CRVM**	**VM-20 Alt 1**	**Change from CRVM**	**VM-20 Alt 2**	**Change from CRVM**
Traditional WL	97%	97%	0%	97%	0%
ULSG	99	88	-12	87	-12
VUL	91	72	-19	76	-15
Term 10	52	39	-13	39	-13
Term 20	86	48	-37	47	-39
Term 30	95	66	-29	62	-33
Aggregate Term	67	67	-1	66	-1

Table 9.3d compares the net-to-gross ratios by participant for each of the product lines.

TABLE 9.3d – Net to Gross Ratios by Participants 5 years of New Business									
Product	**Participant**	**CRVM**	**NPR**	**DR Alt 1**	**DR Alt 2**	**SR Alt 1**	**SR Alt 2**	**MR Alt 1**	**MR Alt 2**
Term 10	16	52%	39%	-46%	-35%	53%	53%	39%	39%
Term 20	16	86	62	48	47	71	71	48	47
Term 30	16	95	71	66	62	78	78	66	62
Term Agg	9	90	67	89	89	90	90	89	89
Term Agg	16	81	53	46	44	64	64	46	44
Term Agg	17	5	0	205	205	100	100	0	0
TWL	13	97	97	97	97	97	97	97	97
ULSG	1	99	100	95	95	95	94	95	95
ULSG	5	98	99	76	58	68	34	99	99
ULSG	9	100	0	77	77	80	79	79	79
VUL	24	91	91	72	76	46	50	72	76

The following are Towers Watson's observations on the net results:

- Overall, the inclusion of reinsurance does not change the direction of the VM-20 reserve when compared to the CRVM reserve. If the VM-20 gross reserve is greater than the CRVM gross reserve, then the VM-20 net reserve is generally greater than CRVM net reserve. However, the relative magnitude of the difference differs from product to product and participant to participant.

- None of the UL without SG participants modeled reinsurance, and none of the participants that modeled Simplified Issue WL or 15-year Term modeled significant amounts of reinsurance.

- Traditional WL and VUL show virtually no change in the reinsurance credit under VM-20. This is due to the fact the VM-20 reserve is equal to the CRVM reserve for the majority of these cases. That is, the NPR is the dominant VM-20 reserve component in most cases and the NPR is defined as current CRVM for these products.

- Reinsurance for ULSG appears to have a greater impact under VM-20 than it does under CRVM as the reserve credit reported was a higher percentage of the gross reserve. However, the results varied significantly by participant. Two of the six companies that provided reinsurance results showed reserve credits that were significantly higher under VM-20 than under CRVM; however, the VM-20 reserve was much larger than CRVM for these two companies.

- The Term results are mixed, but generally produce higher reserve credits under VM-20 compared to CRVM.

- In general, reinsurance has a larger impact on the NPR than on the CRVM reserve. The impact of reinsurance on the DR and SR varies significantly on a company by company basis.

- We note that there is a potential incentive to reinsure life insurance business under VM-20 for certain companies. Companies that do not have highly credible mortality experience data will be required to blend more with the industry table in their VM-20 reserve calculations than reinsurers with more credible experience data.

- Participants varied on their approach to YRT reinsurance premium margins; some applied a margin to the non-guaranteed YRT reinsurance premiums in a consistent manner with the margin applied to the mortality rates while others applied no margin. Clarification should be provided with respect to whether margins should be applied to YRT reinsurance premium rates.

- The VM-20 reinsurance reserve credit was largely unaffected by which investment alternative was used.

VM-20 Reserve Components Net of Reinsurance

Tables 9.4a and 9.4b show the percentage of participants that had the NPR, DR or SR as the maximum reserve component in the minimum VM-20 reserve. The tables only include participants that modeled reinsurance and are for five years of business.

TABLE 9.4a – VM-20 Maximum Reserve Component for 5 Years of Business Alternative 1 – Only includes participants that modeled Reinsurance							
Product	**No. of Participants**	**Gross**			**Net**		
		NPR	**DR**	**SR**	**NPR**	**DR**	**SR**
Traditional WL	1	100%	0%	0%	100%	0%	0%
ULSG	3	33	67	0	33	33	33
VUL	1	0	100	0	0	100	0
Term 10	1	100	0	0	100	0	0
Term 20	1	0	100	0	0	100	0
Term 30	1	0	100	0	0	100	0
Aggregate Term	3	33	67	0	33	67	0

TABLE 9.4b – VM-20 Maximum Reserve Component for 5 Years of Business Alternative 2 – Only includes participants that modeled Reinsurance							
Product	**No. of Participants**	**Gross**			**Net**		
		NPR	**DR**	**SR**	**NPR**	**DR**	**SR**
Traditional WL	1	100%	0%	0%	100%	0%	0%
ULSG	3	33	33	33	33	33	33
VUL	1	0	100	0	100	0	0
Term 10	1	100	0	0	100	0	0
Term 20	1	0	100	0	0	100	0
Term 30	1	0	100	0	0	100	0
Aggregate Term	3	33	67	0	33	67	0

Tables 9.5 and 9.6 show the reserve components on a net basis when the stochastic reserve is the maximum of the calculated reserve components for 1 year and 5 years of business.

TABLE 9.5 – VM-20 Reserve Components when Stochastic Reserve is Dominant

Net – 1 Year of Business

Product	Participant	CRVM per $1,000	NPR per $1,000	Det. Reserve		Stoch. Reserve		Min. Reserve	
				Alt 1	Alt 2	Alt 1	Alt 2	Alt 1	Alt 2
ULSG	3	73.78	69.98	122.38	93.04	122.28	93.51	122.38	93.51
ULSG	4	72.88	38.45	45.79	34.61	66.02	56.88	66.02	56.88
ULSG	8	67.21	69.55	72.52	53.14	87.79	74.45	87.79	74.45
ULSG	9	47.00	56.08	73.73	49.73	74.80	53.85	74.80	56.08
Term 30	10	3.07	1.25	4.89	3.46	4.98	4.52	4.98	4.52
Term 30	22	1.99	0.36	0.36	0.36	0.43	0.37	0.43	0.37
Term Agg	10	2.75	2.08	3.70	2.79	3.71	2.72	3.71	2.79

TABLE 9.6 – VM-20 Reserve Components when Stochastic Reserve is Dominant

Net – 5 Years of Business

Product	Participant	CRVM per $1,000	NPR per $1,000	Det. Reserve		Stoch. Reserve		Min. Reserve	
				Alt 1	Alt 2	Alt 1	Alt 2	Alt 1	Alt 2
ULSG	3	90.32	96.46	151.23	120.70	151.87	122.01	151.87	122.01
ULSG	4	96.76	62.72	62.79	52.75	79.52	71.42	79.52	71.42
ULSG	8	49.42	0.00	49.25	40.85	52.26	43.79	52.26	43.79
ULSG	9	148.06	0.00	108.38	86.10	135.79	119.19	135.79	119.19
Term 20	22	12.77	2.49	5.36	2.72	8.87	5.26	8.87	5.26
Term 30	10	8.77	2.64	8.07	6.57	10.14	10.11	10.14	10.11
Term 30	22	8.47	0.94	3.30	0.93	4.55	1.21	4.55	1.21
Term Agg	10	8.27	3.53	7.08	6.18	9.02	8.99	9.02	8.99

Company Results: VM-20 Results Compared to CRVM for One Year of Issues

The tables in this section show the company-specific results by product under both Alternative 1 and Alternative 2 for one year of issues, and on both a gross and net of reinsurance basis. The VM-20 reserve as a percent of CRVM is shown for each company. As was the case on a direct basis, these charts show that there is significant variability of the net VM-20 reserve as a percent of CRVM on a company-by-company basis for ULSG and Term.

Simplified Issue Whole Life Insurance

Three companies submitted results for Simplified Issue Whole Life. Of those, only one company modeled reinsurance, using YRT to reinsure 100% of the ADB rider. This reduced CRVM, and therefore NPR, from $0.48 to $0.39 per $1,000 of inforce. This company passed both exclusion tests and held the NPR (i.e. CRVM) as its Minimum Reserve for Simplified Issue Whole Life Insurance.

Traditional Whole Life Insurance

Of the five companies that modeled Traditional WL for the Impact Study, two had reinsurance. For both of these participants, as was the case with direct VM-20 reserves, net VM-20 reserves also were equal to CRVM. One ceded roughly 85% on a first dollar YRT basis and had a CRVM reserve that dropped from 4.52 to 3.57 per $1,000 on a net basis. Both exclusion tests were passed and neither the DR nor SR was provided. The other ceded roughly 9% on a first dollar YRT basis causing the CRVM reserve to drop from 2.32 to 2.19 per $1,000 on a net basis. Both exclusion tests were passed, but the DR and SR were also provided, with reinsurance causing the deterministic reserve to drop by an immaterial amount, while the stochastic reserve remained at zero.

Universal Life with Secondary Guarantees

Tables 9.7a and 9.7b show the results for those companies that provided ULSG results and modeled reinsurance. The direction of the impact of VM-20 compared to CRVM is same as on a direct basis.

Note that participant 9 included a margin on YRT premiums, and their VM-20 reserves relative to CRVM decreased significantly. Had they not used a margin on YRT premiums their net VM-20 reserves relative to CRVM would have been even lower.

Participant 5 modeled a significant amount of reinsurance, but although this reinsurance had a significant impact on the deterministic and stochastic reserve, it had a relatively minor impact on the NPR, which ended up being the dominant reserve for this company and is the reason reinsurance had only a minor impact on this company's VM-20 reserve.

Participant 3 modeled reinsurance as 90% YRT on the excess above $1 million of face amount. The impact was relatively large, due in part to not including margins on the YRT premiums. For this participant, best estimate projections would result in reinsurance being a net cost; however, under VM-20, the YRT premiums with no margins are much lower than the conservative valuation mortality rates, which likely produced projected gains on reinsurance.

TABLE 9.7a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual ULSG – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
1	94.51	123%	DR	106%	DR	93.20	117%	DR	100%	DR	-6%	-5%
3	75.15	204	DR	157	DR	73.78	166	DR	127	SR	-38	-30
4	72.93	91	SR	78	SR	72.88	91	SR	78	SR	0	0
5	65.66	58	NPR	58	NPR	64.21	59	NPR	59	NPR	1	1
8	67.33	140	SR	120	SR	67.21	131	SR	111	SR	-9	-9
9	47.25	219	DR	156	DR	47.00	159	SR	119	NPR	-60	-37

TABLE 9.7b – Summary of Reinsurance Information

Individual ULSG

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
1	YRT	Whole Policy	63%	First Dollar	Yes	No
3	YRT	Whole Policy	90	Excess of $1M	No	No
4	YRT	Whole Policy	100	Excess of $1M	No	No
5	YRT	Whole Policy	90	First Dollar	Yes	No
8	Not Provided				No	
9	YRT	Whole Policy	45	First Dollar	Yes	Yes

Universal Life without Secondary Guarantees

Two companies participated in the Impact Study with Universal Life without Secondary Guarantees product types. Neither of these companies included reinsurance in their models.

Variable Universal Life Insurance

Two of the four VUL companies modeled reinsurance for the Impact Study. One of these companies modeled 100% YRT on the excess over $2M and passed both exclusion tests and so held the NPR, which equals CRVM for VUL and, therefore, the VM-20 reserve equals 100% of CRVM on both a direct and net basis. The other company modeled 90% first dollar YRT on the whole policy and failed the exclusion tests, but still had NPR as the maximum reserve component, so the VM-20 reserve equals 100% of CRVM on both a direct and net basis.

Traditional Term Insurance

Twelve companies provided Term Insurance results for the Impact Study. Companies modeled various level premium periods of 10 years, 15 years, 20 years and 30 years (not every company provided results for all level premium periods). Most companies also provided results for the entire term model (all level premium periods modeled together in one model segment) which is called Aggregate Term in this report.

The results varied significantly by level premium period and by company for the most part. The table shows reinsurance had a negligible effect on participants that did not model significant reinsurance. The one company with significant reinsurance modeled had a VM-20 reserve that changed from 184% of CRVM on a direct basis to -38% on a net basis. This is because the 90% YRT ceded reserve credit is 1/2 c_x regardless of premium mode, resulting in CRVM net reserves that are -0.72 per thousand on a net basis but 1.49 on direct basis, whereas the VM-20 NPR is 0.27 per thousand on a net basis and 2.73 on a direct basis.

TABLE 9.8a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 10-Year Term – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	1.98	209%	NPR	209%	NPR	1.73	223%	NPR	223%	NPR	15%	15%
12	0.58	83	NPR	83	NPR	0.55	83	NPR	83	NPR	0	0

TABLE 9.8a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 10-Year Term – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
16	1.49	184	NPR	184	NPR	-0.72	-38	NPR	-38	NPR	-222	-222
22	2.65	97	NPR	97	NPR	2.60	97	NPR	97	NPR	0	0

TABLE 9.8b – Summary of Reinsurance Information

Individual 10-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Only two companies (one company modeled two blocks) provided 15 year level premium term. The company that modeled one block did not model reinsurance, and the other one modeled reinsurance on both blocks equal to 100% YRT on the excess over $3.5M. This insignificant amount of modeled reinsurance had a negligible impact on results.

Seven companies (eight blocks) provided 20 year level premium term results. Table 9.9a shows that reinsurance only had a significant impact on one company's results which was the only Term 20 company that modeled a significant amount of reinsurance. This participant had significantly lower reserves as a percentage of CRVM. On a net basis the VM-20 reserve is essentially zero and the NPR is dominant, whereas on a direct basis the DR was dominant and the VM-20 reserve was approximately 60% of CRVM.

TABLE 9.9a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 20-Year Term – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	3.12	142%	DR	115%	DR	3.03	138%	DR	111%	DR	-4%	-4%
12	0.84	55	NPR	55	NPR	0.79	53	NPR	53	NPR	-2	-2
16	4.38	71	DR	57	DR	3.37	4	NPR	4	NPR	-67	-54
22	1.79	46	NPR	46	NPR	1.77	45	NPR	45	NPR	-1	-1
22	1.07	82	NPR	82	NPR	1.05	82	NPR	82	NPR	0	0

TABLE 9.9b – Summary of Reinsurance Information

Individual 20-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Five companies (six blocks) reported 30 year level premium term. Table 9.10a shows that reinsurance only had a material impact on one company, which again was the only company that modeled a significant amount of reinsurance. This company had significantly lower reserves as a percentage of CRVM, dropping from approximately 40% of CRVM on a direct basis to approximately 15% of CRVM on a net basis for Alternative 2.

TABLE 9.10a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 30-Year Term – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	3.14	168%	SR	146%	SR	3.07	162%	SR	147%	SR	-6%	1%
12	2.27	14	NPR	14	NPR	2.20	12	NPR	12	NPR	-2	-2
16	6.95	54	DR	39	DR	6.50	27	DR	14	DR	-27	-25
22	1.99	22	SR	19	SR	1.99	21	SR	19	SR	0	0
22	2.95	15	NPR	15	NPR	2.95	15	NPR	15	NPR	0	0

TABLE 9.10b – Summary of Reinsurance Information

Individual 30-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Seven companies reported results for aggregate term with all but one company modeling reinsurance but only three modeling significant levels of reinsurance. Table 9.11a shows that reinsurance only had a material impact for one company, participant 16, which showed significantly lower reserves as a percentage of CRVM. On a net basis the VM-20 reserve is essentially zero and the NPR is dominant, whereas on a direct basis the DR was dominant and the VM-20 reserve was approximately 40% of CRVM. This company included margins on YRT premiums without which the VM-20 reserve would have been even lower. Participant 17 also modeled a significant amount of reinsurance and saw a 13 percentage point increase in the relative level of VM-20 as a percent of CRVM. Participant 9 also modeled a relatively significant amount of reinsurance, 33% first dollar YRT ceded, but the impact of reinsurance was still not significant.

TABLE 9.11a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Aggregate Term – 1 Year of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
8	3.14	225%	DR	193%	DR	3.13	218%	DR	187%	DR	-7%	-6%
9	4.44	144	DR	133	DR	3.75	150	DR	138	DR	6	5
10	2.87	137	SR	104	DR	2.75	135	SR	101	DR	-2	-3
15	1.24	5	NPR	5	NPR	0.41	2	NPR	2	NPR	-3	-3
16	4.12	41	DR	37	NPR	2.87	5	NPR	5	NPR	-36	-32
17	2.08	28	NPR	28	NPR	0.16	40	NPR	40	NPR	13	13

TABLE 9.11b – Summary of Reinsurance Information

Individual Aggregate Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
8	Not Provided				No	
9	YRT	Whole Policy	33%	First Dollar	Yes	Yes
10	YRT	Whole Policy	50	Excess of $1M	No	No
15	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
17	Quota Share	Whole Policy	90	First Dollar	Yes	No

Company Results: VM-20 Results Compared to CRVM for Five Years of Issues

The tables in this section show the company-specific results by product under both Alternative 1 and Alternative 2 for five years of issue, and on both a gross and net basis. The VM-20 reserve as a percent of CRVM is shown for each company. As was the case on a direct basis, these charts show that there is significant variability of the net VM-20 reserve as a percent of CRVM on a company-by-company basis for ULSG and Term.

Simplified Issue Whole Life Insurance

Three companies submitted results for Simplified Issue Whole Life. Of those, only one company had modeled reinsurance, using YRT to reinsure 100% of the ADB rider. This reduced CRVM, and therefore NPR, from 13.49 per $1,000 on a direct basis to 13.35 per $1,000 on a net basis. This company passed both exclusion tests and held the NPR as its Minimum Reserve.

Traditional Whole Life Insurance

Of the five companies that modeled Traditional WL for the Impact Study, two had reinsurance. For both of these participants, as was the case with direct VM-20 reserves, net VM-20 reserves were equal to CRVM. One ceded roughly 85% on a first dollar YRT basis and had a CRVM reserve that dropped from 35.11 per $1,000 on a direct basis to 34.06 per $1,000 on a net basis. Both exclusion tests were passed and neither the DR nor SR was provided. The other ceded roughly 9% on a first dollar YRT basis causing the CRVM reserve to drop from 28.16 per $1,000 on a direct basis to 28.01 per $1,000 on a net basis. Both exclusion tests were passed, but the DR and SR were also provided, with reinsurance causing the deterministic reserve to drop from 15.72 to 15.02 under Alternative 1 and from 21.35 to 20.64 under Alternative 2, and the stochastic reserve to drop from 16.94 to 16.33 under Alternative 1 and from 22.41 to 21.66 under Alternative 2.

Universal Life with Secondary Guarantees

Tables 9.12a and 9.12b show the reported results for those companies that modeled reinsurance for ULSG. The direction of the impact of VM-20 is the same on a net basis as it is on a direct basis in all cases. Reinsurance can be seen to move the net VM-20 reserve closer to CRVM for all companies that modeled it.

Note that participant 9 included a margin on YRT premiums, and their VM-20 reserves relative to CRVM decreased significantly. Had they not used a margin on YRT premiums their net VM-20 reserves relative to CRVM would have been even lower.

Participant 5 modeled a significant amount of reinsurance, but although this reinsurance had a significant impact on the deterministic and stochastic reserve, it had a relatively minor impact on the

NPR, which ended up being the dominant reserve for this company and is the reason reinsurance was reported to have a minor impact on this company's VM-20 reserve.

Participant 3 modeled reinsurance equal to 90% YRT on the excess above $1M. The impact of the reinsurance was relatively large due in part to not including margins on the YRT premiums.

TABLE 9.12a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual ULSG – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
1	121.10	122%	DR	111%	DR	119.73	117%	DR	106%	DR	-5%	-5%
3	91.92	201	DR	163	SR	90.32	168	SR	135	SR	-33	-27
4	96.82	83	SR	74	SR	96.76	82	SR	74	SR	0	0
5	118.30	56	NPR	56	NPR	115.70	57	NPR	57	NPR	1	1
8	148.31	97	SR	86	SR	148.06	92	SR	81	SR	-5	-6
9	85.89	158	DR	131	SR	85.60	126	SR	104	SR	-32	-27

TABLE 9.12b – Summary of Reinsurance Information

Individual ULSG

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
1	YRT	Whole Policy	63%	First Dollar	Yes	No
3	YRT	Whole Policy	90	Excess of $1M	No	No
4	YRT	Whole Policy	100	Excess of $1M	No	No
5	YRT	Whole Policy	90	First Dollar	Yes	No
8	Not Provided				No	
9	YRT	Whole Policy	45	First Dollar	Yes	Yes

Universal Life without Secondary Guarantees

Two companies participated in the Impact Study with Universal Life without Secondary Guarantees product types. Neither of these companies had reinsurance in their models.

Variable Universal Life Insurance

Two of the four VUL companies modeled reinsurance for the Impact Study. One of these companies modeled 90% first dollar YRT on the whole policy. This company failed the exclusion tests, but still had NPR as the maximum reserve component for one year of business so VM-20 was equal to CRVM. For five years of business the deterministic reserve was the maximum reserve component, except for Alternative 2 on a net basis where NPR was dominant. The VM-20 gross reserve was 141% of CRVM under Alternative 1 and 119% under Alternative 2. On a net basis those amounts drop to 111% and 100% respectively. The other VUL company with reinsurance modeled 100% YRT on the excess over $2M and passed both exclusion tests, causing it to hold the NPR, which equals CRVM for VUL, on both a direct and net basis.

Traditional Term Insurance

Twelve companies provided Term Insurance results for the Impact Study. Companies modeled various level premium periods of 10 years, 15 years, 20 years and 30 years (not every company provided results for all level premium periods). Most companies also provided results for the entire term model (all level premium periods modeled together in one model segment) which is called Aggregate Term in this report.

The results varied significantly by level premium period and by company for the most part. Table 9.13a shows the reinsurance results reported by the companies. One company with significant reinsurance modeled had a VM-20 reserve that changed from 87% of CRVM on a direct basis to 65% on a net basis.

TABLE 9.13a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 10-Year Term – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	6.09	71%	NPR	71%	NPR	5.79	69%	NPR	69%	NPR	-2%	-2%
12	2.03	97	NPR	97	NPR	1.99	97	NPR	97	NPR	0	0

TABLE 9.13a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 10-Year Term – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
16	5.56	87	NPR	87	NPR	2.88	65	NPR	65	NPR	-22	-22
22	7.75	40	NPR	40	NPR	7.71	40	NPR	40	NPR	0	0

TABLE 9.13b – Summary of Reinsurance Information

Individual 10-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Only two companies (one company modeled two blocks) provided 15 year level premium term. The company that modeled one block did not model reinsurance, and the other one modeled reinsurance on both blocks equal to 100% YRT on the excess over $3.5M. This insignificant amount of modeled reinsurance had a negligible impact on results.

Seven companies (eight blocks) provided 20 year level premium term results. Tables 9.14a and 9.14b shows that reinsurance only had a significant impact on one company, which showed significantly lower reserves as a percentage of CRVM on a net basis compared to the direct basis. On a net basis the VM-20 reserve is approximately 45% of CRVM, whereas on a direct basis the VM-20 reserve was approximately 80% of CRVM.

TABLE 9.14a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 20-Year Term – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	9.30	90%	DR	81%	DR	9.19	88%	DR	79%	DR	-2%	-2%
12	5.00	63	NPR	63	NPR	4.91	62	NPR	62	NPR	0	0
16	8.40	86	DR	79	DR	7.19	48	DR	43	DR	-37	-36
22	12.79	71	SR	43	SR	12.77	69	SR	41	SR	-1	-2
22	6.16	31	NPR	31	NPR	6.14	31	NPR	31	NPR	0	0

TABLE 9.14b – Summary of Reinsurance Information

Individual 20-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Five companies (six blocks) reported 30 year level premium term. Tables 9.15a and 9.15b shows that reinsurance only had a material impact for one company, again, the only company that modeled a significant amount of reinsurance. The company had significantly lower reserves as a percentage of CRVM on a net basis compared to the direct basis, dropping from approximately 60% of CRVM on a direct basis to approximately 40% of CRVM on a net basis for Alternative 2.

TABLE 9.15a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Individual 30-Year Term – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
10	8.85	116%	SR	114%	SR	8.77	116%	SR	115%	SR	0%	2%
12	6.25	38	NPR	38	NPR	6.17	38	NPR	38	NPR	-1	-1
16	9.94	70	DR	58	DR	9.43	48	DR	38	DR	-22	-20
22	8.47	54	SR	15	SR	8.47	54	SR	14	SR	0	0
22	7.17	19	NPR	19	NPR	7.17	19	NPR	19	NPR	0	0

TABLE 9.15b – Summary of Reinsurance Information

Individual 30-Year Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
10	YRT	Whole Policy	50%	Excess of $1M	No	No
12	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
22	YRT	Whole Policy	100	Excess of $3.5M	No	No
22	YRT	Whole Policy	100	Excess of $3.5M	No	No

Seven companies reported results for Aggregate Term with all but one company modeling reinsurance, but only three modeling significant levels of reinsurance. Tables 9.16a and 9.16b show that reinsurance only had a material impact for two companies, Participants 16 and 17, both of which had significantly lower VM-20 reserves as a percentage of CRVM. Under Alternative 2, Participant 16's VM-20 reserve fell from 61% of CRVM on a direct basis to 33%, whereas Participant 17's VM-20 reserve fell from 22% of CRVM to 0%, an opposite direction to the 13 percentage point increase in the relative level of VM-20 as a percentage of CRVM seen for one year of business. Participant 9 also modeled a relatively significant amount of reinsurance, 33% of first dollar YRT ceded, but the impact of reinsurance was still not significant.

TABLE 9.16a – Impact of Reinsurance on Relative Level of VM-20 vs. CRVM

Aggregate Term – 5 Years of New Business

Participant	Gross of Reinsurance					Net of Reinsurance					Reins Impact on VM-20/ CRVM	
	CRVM per 1,000	Alt 1		Alt 2		CRVM per 1,000	Alt 1		Alt 2			
		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR		VM-20/ CRVM	MCR	VM-20/ CRVM	MCR	Al t1	Alt 2
8	6.26	145%	DR	129%	DR	6.25	137%	DR	121%	DR	-8%	-7%
9	8.63	98	DR	94	DR	7.78	96	DR	92	DR	-2	-2
10	8.41	108	SR	108	DR	8.27	109	SR	109	SR	1	1
15	3.56	13	NPR	13	NPR	2.60	15	NPR	15	DR	2	2
16	7.89	69	DR	61	DR	6.39	39	DR	33	DR	-30	-28
17	4.91	22	NPR	22	NPR	0.25	0	NPR	0	NPR	-22	-22

TABLE 9.16b – Summary of Reinsurance Information

Individual Aggregate Term

Participant	Modeled Reinsurance	Whole Policy/ Rider Only	Percent Ceded	First Dollar/ Excess	Significant	YRT Premium Margin
8	Not Provided				No	
9	YRT	Whole Policy	33%	First Dollar	Yes	Yes
10	YRT	Whole Policy	50	Excess of $1M	No	No
15	YRT	ADB Only	100	First Dollar	No	No
16	YRT	Whole Policy	90	First Dollar	Yes	Yes
17	Quota Share	Whole Policy	90	First Dollar	Yes	No

Section 10:Assumption and Margin Setting

Background

Phase II asked companies to perform several sensitivities to show the impact on the VM-20 reserves if they modified the assumptions and margins used in the calculation. Also, Towers Watson received feedback from the companies participating in the Impact Study on assumption and margin setting as part of the survey conducted after Phase II was complete. This section provides the results of the Phase II sensitivities and survey relating to assumption and margin setting.

Mortality

Sensitivity Results – Mortality Margin Component Analysis

This sensitivity was a series of runs designed to help understand the components of change as the mortality assumption is changed stepwise from best estimate mortality to VM-20 mortality. These sensitivities only applied to the calculation of the deterministic and stochastic reserves. The steps were performed in the following order:

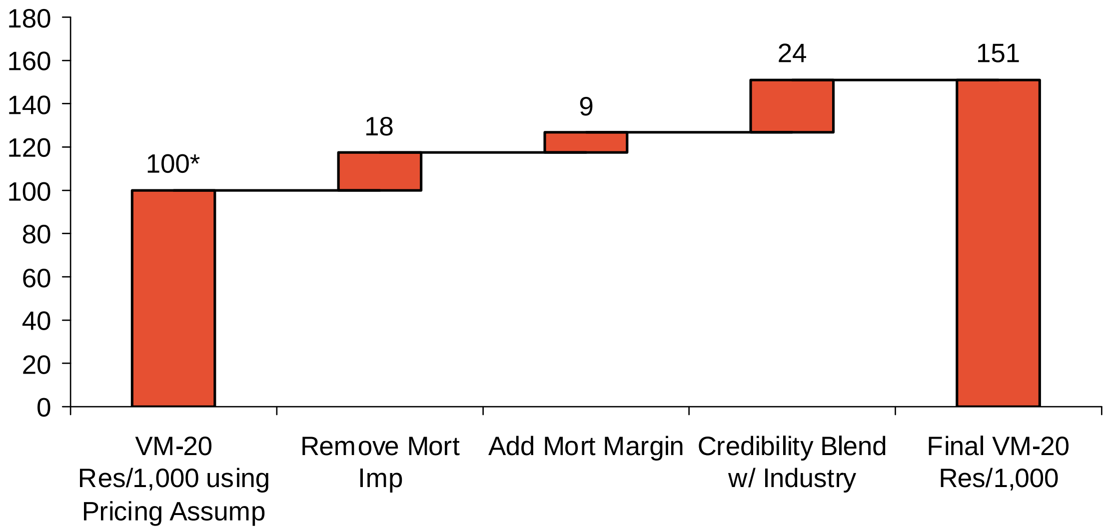
- Best estimate – Set the mortality assumption to company best estimate. Include mortality improvement if it is part of the best estimate.
- Best estimate, no improvement – Remove the mortality improvement from the company best estimate (this step may be skipped if the company best estimate does not include mortality improvement).
- Best estimate, no improvement, with margin – Add the explicit margin per VM-20.
- VM-20 with “LRWG” credibility – Credibility-blend mortality using a “total company” view of credibility. That is, use an entire block of policies with similar underwriting methods to define a credibility segment used for determining a credibility factor. (This may have been the where the company stopped for purposes of calculating the Phase I baseline, in which case this step was skipped as would be equal the Phase I baseline).
- Full VM-20 credibility – Credibility-blend mortality using VM-20’s more granular basis for credibility.

Some participants provided results only up to the mortality margin step, while others were able to fully complete the analysis.

The charts below show the progression through each step in the sensitivity. The VM-20 reserve in the first step was calibrated to 100 and then changed based on the average increase reported by participants. For presentation purposes the two credibility blending steps described above were combined into one step due to lack of data points at each step.

Chart 10.1 shows the results for the term products. The final VM-20 reserve is 51% higher than what the reserve would be using best-estimate mortality. The use of the valuation mortality instead of the best-estimate mortality appears to add a significant margin to the term product reserves.

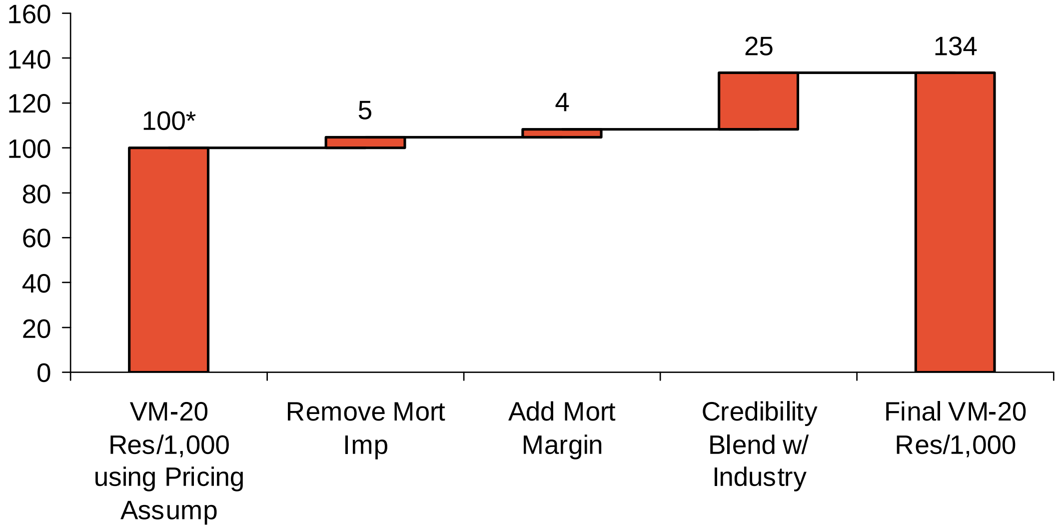
Chart 10.1 – Mortality Margin Component Analysis for Term Business, 5 Years of Business, Alternative 2, Net of Reinsurance



* Hypothetical starting reserves set to 100

Chart 10.2 shows the results for the ULSG products. The final VM-20 reserve is about 34% higher than what the reserve would be using best-estimate mortality, with most of this margin coming from the credibility blending step.

Chart 10.2 – Mortality Margin Component Analysis for ULSG Business, 5 Years of Business, Alternative 2, Net of Reinsurance



* Hypothetical starting reserves set to 100

The mortality margins have less of an effect on ULSG than term as a consequence of the difference in the risk profiles of the two products. UL products include a significant interest rate risk whereas the primary risk is mortality for term products.

Results were also submitted for the mortality margin analysis for SIWL, TWL, ULwo and VUL products. The NPR is the maximum component for many of these products and, therefore, the sensitivity has little or no impact since this sensitivity applies only to the deterministic and stochastic reserve calculations. Thus, there was little change to the minimum reserve. However, the mortality margins had a significant impact on the deterministic and stochastic reserve components, although still not causing them to be higher than the NPR in most cases. Complete results of the Phase II sensitivity tests are provided in Appendix E.

Survey Results

Several questions in the survey asked about how companies developed the prudent estimate mortality assumption used in the calculation of the deterministic and stochastic reserve. The survey asked what the companies used for anticipated experience mortality assumptions, how many deaths they used to determine credibility and their thoughts on the overall level of mortality assumed in the calculation. The responses received are summarized below.

Anticipated Experience Assumption

Question 17 asked companies to describe the steps they took to develop their anticipated experience assumption for mortality.

- 8 companies based the anticipated mortality on company experience as described below
  - Based on company experience with some modifications for credibility of the results (5 companies)
  - Best estimate mortality was based on internal experience studies, credibility weighted with Relative Risk Ratios (RRR's) for the 2008 VBT developed using the UCS tool (1 company)
  - CFT Assumptions - based on actual company experience with a 5% PAD (1 company).
  - Pricing Assumptions reflecting a combination of internal studies, industry-wide studies, or information provided by reinsurers (1 company).
- One company reported that it developed factors that varied by risk class. We also looked at the UCS process, but were not comfortable with the relative values it produced.
- We developed credibility at a high-level based on our currently defined mortality segments (underwriting eras and by class). Initial assessment indicated low credibility so we completed with the testing using 100% of the 2008 VBT.
- VM-20 with LRWG credibility
- 2 companies used Canadian methods
  - C-GAAP mortality
  - We followed the Normalized Method to develop the best-estimate assumption (i.e. credibility adjusted experience rates.) This method is outlined in the July 2002 CIA Educational Note on Expected Mortality.

Question 18 asked companies what experience they used in setting their best estimate mortality assumption.

- 8 companies used company experience
  - We used company experience from 2005-2009.
  - Company experience from 2001 through 2006, although some blocks started in 2002.
  - Company experience from 2000-2009
  - 2005-2009 calendar year experience
  - Exposure years 2004-2010

  - Policies issued between 2001 and 2005. The reason why this block was chosen was because the experience for this block needed to be examined for a reinsurance agreement for this block.
  - Most recent 5-year mortality experience study data.
  - Best-estimate based on company experience - issue age, gender, and underwriting class

- Experience provided by a consulting firm that works with a number of companies on final expense business.
- Input from reinsurers
- Blended company data with industry rates for the first thirty durations.

Question 21 asked companies roughly what percentage of the 2008 VBT was their overall expectation of mortality and how the slope of mortality compared to 2008 VBT.

- For ULSG we are coming in at roughly 65% of the 2008VBT RR Table 4. For Term, the experience was roughly 80% of 2008 VBT Table 4.
- 75%
- Overall non-tobacco was 81.7%. Overall tobacco was 101.9%. Slope was generally steeper than 2008 VBT, with much lower ratios in early durations and higher in later durations
- Approximately 88% Durations 1-20, slopes broadly similar. One difference is that VBT never reaches a qx of 1, which our assumptions do.
- Our overall expectation of mortality was roughly 88% of the 2008 VBT. The slope is steeper than 2008 VBT because of the requirement that we blend into 2008 VBT in the cells that have no exposures. For us, this happens at older ages. The steep slope results in a significant margin in the reserves.
- 99.5%, early durations were >100% later durations <100%
- The most noticeable difference in slope is that our experience was worse than otherwise for durations 3 and 4
- We have found that the ratios have an extreme variation that goes as high as 300% (VBT/internal) in later durations.
- Not calculated / do not know (5 companies)

Credibility and Use of the Industry Table

Question 19 asked companies to describe their credibility segments and the granularity of their mortality segments. A summary of the responses are contained below.

- Mortality Segments:
  - based on gender and risk classes consistent with underwriting
  - Some all durations, some key durations
  - Gender and smoking status but condensed risk classes (combined smokers and preferred smokers together and also non-smoker preferred and preferred plus)
  - By gender and issue age grouping
  - Quinquennial policy years by smoking status
- Credibility Segment
  - all fully underwritten, single-life, individual life insurance policies by gender, smoking status, and risk class
  - risk class level for Phase I, Risk Class, gender, and issue ages for Phase II
  - all fully underwritten by gender and issue age grouping
  - all fully underwritten life business varying by smoking status
  - underwritten business with experience in the 10 year study period window
  - counts from entire ULSG and Term blocks for exposure period
- Two companies provided one response addressing both Mortality and Credibility segments combined
  - Not using the exact structure of credibility segments and mortality segments, but conceptually look at credibility at an aggregate level
  - Only one overall for all of our permanent individual life insurance block of business because this block uses the same underwriting practice.

Question 20 asked participants how many deaths they deemed to be fully credible.

- By number of deaths
  - 30
  - 1,082 - 1,083 (3 companies)
  - 3,007 (4 companies)
  - varied by segment, calculated credibility with severity (ranged between 4,000 – 6,000)
- Other / comments
  - We used the limited fluctuations credibility method outlined in the Society of Actuaries' Research Paper ""Credibility Theory Practices"" to determine the credibility of our experience. This method takes into account the variance in the face amount when assigning credibility to the experience. This is appropriate when there is significant variation in the face amount by policy. Full credibility was assigned at the 90% confidence that the true mean will be within 3% of the approximation. This requirement does not equate to a number of deaths because this method also takes into account the variation in the face amount. As a comparison, if we assume no variation in the face amount, then the required number of deaths for full credibility would have been 3,007 for 90% confidence and 3% error. The number of deaths in our credibility segment is almost 5 times this amount but was not deemed fully credible because of the significant variation in the face amount. Please understand that using number of deaths to determine credibility makes a simplifying assumption that there is no variation in the face amount by policy. Other companies may have overlooked this assumption. When this assumption is not true, you cannot use a number of deaths as the criteria for full credibility.
  - The square root of the deaths in a segment divided by 1500. This gave us credibility blending percentages that were similar to the Bahna-Nolan illustration.

Question 22 asked companies if the used the UCS tool to choose the Relative Risk (RR) table, or some other method.

- 9 companies indicated they used the UCS Tool
- 1 company estimated the mapping that would be used in the UCS tool
- 2 companies provided details about their underwriting criteria not fitting well into the UCS scoring tool, and sent emails to Jack Luff

Question 23 asked participants if they used the option to move the mapped table up or down two tables.

- 2 companies used the option to move two tables
- 1 company used the option to move one table
- 10 companies did not use the option. Several companies provided the reason why:
  - couldn't identify factors that were not recognized in the scoring
  - best class could not decrease further
  - were not comfortable doing so because of issues we encountered.
  - weren't sure we could justify it right away and did not have the time to research it. We do feel that the UCS does not account for differences in ULSG vs Term vs other types of insurance. ULSG should have better ultimate mortality experience than term business. If VM20 uses UCS when it is adopted we feel that we would probably be able to drop it down a table or two.
  - took a conservative stance, and decided to use the approach that could not be questioned.
  - did not have enough information to support or justify the adjustment

Question 24 asked participants how long on average was the period where their data was credible.

  - 2 companies had credibility periods less than 10 years (8 years, 3 years)
  - 1 company indicated their credibility varied by face, with low face having credibility of 7 durations, high face having low credibility in the first 3 durations and for durations 21+
  - 4 companies indicated 10 years
  - 1 company indicated 15 years
  - 3 companies had credibility periods longer than 20 years (about 25 years, 25 years, 27-30 depending on product)
  - 1 company did not break it down by duration

Question 25 asked companies at what point they determined their experience was no longer credible, and what they did when they had no credibility.

- 4 companies used their experience as credible throughout the study period

- Grading
  - 10 years (3 companies)
  - 25 years (3 companies)
  - 30 years (1 company)
- Other answers
  - Credibility by duration was reflected in the factors described above (and therefore our unsmoothed mortality rates) using limited fluctuation credibility. Ultimately, we graded to a mortality rate at Omega of approximately 0.45 (as done in the development of the 2008 VBT tables). We did Whitakker-Henderson smoothing using exposed policies by age/duration group for all face amounts combined as weights. So the weight at Omega was fairly significant.
  - We developed an algorithm that reduces the credibility factor to zero by attained age 95 and by attained age 10. The credibility factor goes to zero over a 5-year period. The factor does not go down linearly over the 5-year period. Instead, the speed at which it goes to zero depends on the number of cells with no exposures in the neighborhood of the 5-year period. This means, if we have very little exposures in the very old and the very young ages, then the factor will go down to zero quickly. If we have high amount of exposures in those ages, then the factor goes down to zero slowly.
  - For our testing, we calculated a credibility score for each of 8 UW classes (sex-distinct) for the first 10-year duration and then a separate score for the remaining term. However, at age 85 we substituted a fixed score of 30%. In effect, a) our grading was stepped and b) never fully reflected 100 of a VBT. We believe fully reflecting 100% VBT would yield an even higher reserve.

Question 26 asked companies to list the credibility procedure they used for the field test.

The instructions for the Impact Study did not give specific instructions on the credibility procedure to use in blending company experience with the industry. Participants were simply referred to VM-20, which states that (1) a credibility procedure shall be based on a statistical method consistent with accepted actuarial practice, and (2) as the credibility in the experience data set for a mortality segment or for a cell or group of call included in a mortality segment increases, the credibility adjusted experience rates produced by the credibility procedure shall approach the actual experience rates.

- 5 companies used the limited fluctuation credibility procedure once generally described by the Life Reserve Working Group and having broader mortality segments such as “all preferred term policies”.

- 3 companies also used the limited fluctuation credibility, but with a more granular “full credibility” procedure where a mortality segment may be as narrow as “super preferred male term policies with issue ages 35-45, in durations 5-10”.
- 5 companies used other credibility procedures which included
  - some participants that used limited fluctuation credibility based on amounts, with the potential of moving to the Bühlmann approach if external data is available
  - some participants that used limited fluctuation credibility noted they were unsure of the difference between “LRWG” and “Full” credibility.

Observations on Setting of the Mortality Assumption

Question 27 asked companies for their observations on the VM-20 mortality assumption setting process and whether or not it was in line with their expectations.

- Too complicated – some contradictions in language and example would help (2 companies)
- Too conservative – more credibility to company experience needed (observed by multiple companies)
- Not enough gradations of VBT Table. VBT Table is too steep for company experience
- Other:
  - Our adjustments are most often based on studies we do internally (which may be published internally, but not externally) or on input we've received from outside vendors or reinsurers (which is not published). So I think the requirement that adjustments be supported by published studies is too strict. The requirement in 3.d.ii. that rationale and support be disclosed in the PBR Actuarial Report should be good enough.
  - It seems like VM-20 is either allowing for a mortality improvement adjustment to be made only to the company experience and not to the industry table the company experience is being weighted with, or they're expecting a mortality improvement adjustment that is made to the weighted average of company experience and the industry table to be based on the average date underlying the company experience. [But] the company experience and the industry table may be centered on two different dates. The company experience should be improved based on the average date underlying the company experience, and the industry table should be improved based on the date on which the industry rates are centered. Then the improved company experience should be credibility-weighted with the improved industry table.
  - After attempting the first round, it seemed like the experience mortality should not have to be mixed with other outside information and then mixed again with an industry table. The best

approach seems to be to acquire enough data to be credible, (probably by purchasing it), to avoid having to use the extremely conservative 2008 VBT. The UCS needs to be revised or enhanced to accommodate mixed underwriting systems better. The results for our company came out more conservative than expected, and not representative of best estimate mortality on the block studied (plus a valuation margin on the end).

– We encountered a problem in using the industry mortality table suggested by the study. Pre-Need mortality was much too high. We used 80 VBT and we still thought that was too high. An industry final expense mortality table is needed.

Assumptions other than mortality

Question 28 asked companies to describe the steps they took to develop all non-prescribed, non-mortality, best-estimate assumptions.

- 8 companies used cash flow testing assumptions with some comments below
  - some modifications for margins and updates to incorporate recent experience studies for lapses, premiums, and expenses
  - Embedded Value, Budget and IFRS used in combination with cash flow testing assumptions.
- 2 companies reported using company experience
- 2 companies reported using assumptions similar to GAAP or unlocked assumptions

Question 29 asked companies to describe their general approach to setting margins on assumptions other than mortality.

- No company reported reducing margins for correlations between assumptions.
- 2 companies used cash flow testing margins
- 1 company reported basing margins on PADs in GAAP and one referencing Canadian papers
- 6 companies reported basing margins on sensitivity testing
- 3 companies reported using actuarial judgment

  1 company reported that: Our general approach to setting the margins was to look at the standard deviation in the past company experience. Then, set the margin to be one standard deviation higher than the mean. This I supplemented with sensitivity testing to see if the level and direction of the margin makes sense. Actuarial judgment was required in some cases.

Towers Watson's Observations

Mortality

- The mortality margin analysis provided by participants indicates there are significant margins related to mortality included in VM-20. In particular, related to the credibility blending.
- In general, participants have found the mortality credibility-blending and margin setting process difficult to follow and implement
- Some participants were concerned about the inability to include future mortality improvement
- Purpose and use of mortality segment vs. and credibility segment was reported as being unclear by some participants

Credibility methodology

- As of the time of this report, the AAA has told the RTS that are developing a proposal to modify the assumption setting and credibility methodology for mortality. This proposal was not available at the time the report was being drafted.

Defaults

- Several participants have had difficulty modeling default margins as prescribed in VM-20

Assets

- Several participants have had difficulty modeling asset values under credit spread alternative 1

Section 11: Number of Scenarios

Impact of Number of Scenarios

This section contains the reported information on the number of scenarios used in determining VM-20 results and the survey responses covering the scenario reduction techniques.

We received information on stochastic reserves for 35 different product segments. Of those, companies were directed to choose the amount of scenarios that would lead to convergence in their results while working within their resources and capabilities.

None of the participants who calculated stochastic reserves did so using the full set of 10,000 scenarios. However many participants used 1000 scenarios.

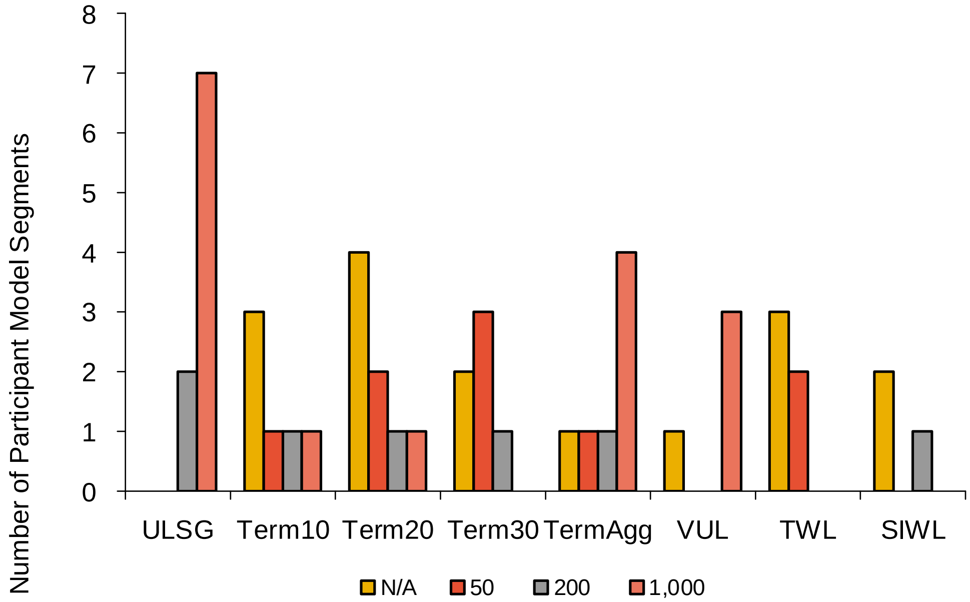
Table 11.1: Number of Participants with a Total of "X" Scenarios Modeled

Product	N/A*	50 scenarios	200 scenarios	1000 scenarios	Total
ULSG	0	0	2	7	9
Term 10	3	1	1	1	6
Term 15	1	2	0	0	3
Term 20	4	2	1	1	8
Term 30	2	3	1	0	6
Agg. Term	1	1	1	4	7
VUL	1	0	0	3	4
TWL	3	2	0	0	5
SIWL	2	0	1	0	3
ULwo	1	0	0	1	2
Total	18	11	7	17	53

*These participants were not required to calculate a stochastic reserve

The distribution of the number of scenarios by product is shown in Chart 11.1.

Chart 11.1 – Number of Scenarios by Product



Towers Watson attempted to calculate the impact of the reduction in the number of the scenarios on stochastic reserve from the information provided by the participants. We only received the information required from a small number of participants who modeled term and ULSG products. For those that we able to calculate, decreasing the number of scenarios from 1,000 to 200 or 50 did not have a material impact on the stochastic reserve amount.

Scenarios and Scenario Reduction Techniques

Question 31 asked companies to describe how they determined the number of scenarios to use for the stochastic reserve calculation.

- The biggest driver of how many scenarios to run was the availability of time and resources.
- Companies using smallest number of scenarios (50):
  - the smallest number of scenarios due to lack of robust system
  - ability to replicate results with small number of scenarios
  - Only needed a few scenarios to prove stochastic reserves were not needed (2 companies)

- Companies using 200 scenarios
  - Largest number that could be run with existing resources
  - Seemed reasonable for term
- Companies 1000 scenarios
  - Maximum number that could be run with resources in time allowed. (2 companies)
  - felt 1000 scenarios was appropriate for this calculation (4 companies)
  - This is the standard number of stochastic scenarios used for C-GAAP.

Question 32 asked companies if they used any scenario reduction techniques in the field test, other than the representative scenario picker included with the ESG. The Impact Study instructions did not tell companies whether or not to employ scenario reduction techniques in addition to simply using subsets of the full 10,000 scenarios chosen using the ESG's built-in representative scenario picking tool.

Only one of the study participants reported using additional scenario reduction techniques other than the ESG's built in representative scenario picking tool. No further information was given on the scenario reduction technique this participant used.

Section 12:Results of Sensitivity Testing

One of the objectives of the Impact Study was to understand how companies would use sensitivity testing in the VM-20 calculation. Although the study participants were not asked to develop their own sensitivity tests, companies were asked about expected sensitivity testing as part of the survey and Phase II consisted of various sensitivities related to VM-20 assumptions. This section provides first the results of the survey and then Phase II sensitivity tests that are not included in other parts of the report.

The complete instructions for Phase II are included in Appendix D and the results shown in Appendix E. In general, participants were instructed to use the same assumed in force policies, assumptions and methodologies as they used in Phase I, unless otherwise indicated by the sensitivity test. Due to time constraints, the results of the sensitivity tests were requested for 5 years of issues, credit spread Alternative 2, and net of reinsurance only.

Table 12.1 provides a brief description of the sensitivities that are presented in this section.

TABLE 12.1 – Sensitivity Description

Sensitivity Number	Sensitivity Description
1	Mortality Rates +10%
2	Margins (Zero and Double)
3	Lapse Rates +/- 20%
4	Dynamic Lapses
5	Expenses +10%
6	ULSG Funding Patterns
7	Lower Spreads
8	Double Defaults
9	Negative Cash Flow Strategy
10	Eliminate Post-Level Term Amounts

Survey Results: Use of Sensitivity Tests

Question 39 asked companies to describe how they used sensitivity tests to aid in determining margins. The responses are shown below:

- We used 4% mortality margin, consistent with what we have used for other purposes. For lapse, we used 5%. We did test to see if that meant increasing or decreasing the lapse rates.
- Our approach for setting margins for the Impact Study was not very scientific or exact in nature. We used sensitivity tests to determine which direction a margin should go in order to increase the reserve and then got a consensus from various individuals as to what the margin should be. The margins were as follows. Lapses reduced 25%, expenses increased 10%, premium increased 10%, reinsurance premium increased 5%.
- For non-mortality margins, we ran sensitivities with different levels of margins and looked at the results. We used this to determine whether we were seeing reasonable increases in reserves.
- Determined which direction, increase or decrease, was conservative. Considered assumptions individually.
- We performed sensitivity testing with large margins that weren't always well developed (e.g., increase mortality by 20%). The NPR was still the winner.
- For the Net Premium Reserve, we ran the following sensitivities:
  - Set shock lapse = 100%
  - Set shock lapse = 100% and level term lapse = 0%
  - Set shock lapse = 100%, level term lapse = 0%, and interest = 4%
- For the Deterministic Reserve, we ran a sensitivity setting shock lapse = 100%

Question 40 asked companies to describe how they used sensitivity tests to aid in gaining insight into the drivers of their VM-20 reserve. The responses are listed below.

- Premium persistency
- Lapse persistency
- Shock Lapses
- Mortality margins
- Reinvestment assumptions

- ESG parameters
- Asset spreads/defaults
- High and low interest scenarios
- Initial Assets
- Reserve pattern

Question 41 asked companies to describe how they used sensitivity tests to aid in identifying major risk components on their balance sheet.

- We perform sensitivity tests on all major assumptions, but not necessarily for the purpose of determining margins
- As part of all of our pricing exercises and we stress test all significant assumptions to determine which assumptions/items can make the largest impact to our results.
- The sensitivities that have the largest impact on economic reserve, profits or surplus are some of the ways that we identify major risk components.
- We run sensitivity tests with respect to mortality, lapses, interest yields, and equity (or separate account) yields.

Results of Phase II Sensitivity Tests

The remainder of this section presents a summary of the results for each sensitivity test. Detailed results of the Phase II submissions are provided in Appendix E.

Sensitivity 1 – Mortality Rates +10%

Description of Sensitivity Test: Mortality rates used for the deterministic and stochastic reserves are permanently increased by 10% (i.e., mortality rates multiplied by 1.10 in all projection years and durations) with no adjustment to non-guaranteed cost of insurance charges or premium rates.

Results of Sensitivity Test:

Table 12.2 shows the results of the +10% mortality sensitivity.

TABLE 12.2 – Mortality Rates + 10%

All Business

Product	No. of Participants	% Change from Baseline		
		DR	SR	Minimum
Term (Average)	12	83%	59%	33%
ULSG (Average)	4	7	6	6
SIWL	1	68	31	8
TWL	1	13	12	0
ULwo	1	47	n/a	0
VUL	1	-1	2	0

As expected, increasing the mortality rates by 10% caused significant increases to the deterministic and stochastic reserve amounts reported by participants. In particular, the results for term products, where mortality is the primary risk, show very large increases and demonstrates the importance of this assumption; both in terms of the underlying best-estimate assumption and the level of margins.

Note that since this sensitivity did not apply to the NPR mortality rates, the NPR did not change and is the reason for no change for TW, ULwo and VUL. A sensitivity of decreasing the mortality rates by 10% would not necessarily produce symmetrical results since the NPR floor may be in effect for more cases.

Sensitivity 2 – Margins (Zero and Double)

Description of sensitivity: Margins are either removed (zero margin) or doubled. The margins refer to explicit margins on the best-estimate assumptions. The mortality credibility blending is not considered to be an explicit margin for the purposes of this test. This sensitivity does not apply to the NPR.

Results of Sensitivity Test:

Table 12.3 shows the results of the margin sensitivity for term and ULSG products.

TABLE 12.3 – Margins (Zero and Double) Percentage Change from Base							
Product	**No. of Participants**	**No Margins**			**Double Margins**		
		DR	**SR**	**Min**	**DR**	**SR**	**Min**
Term (Average)	11	-38%	-33%	-13%	50%	37%	22%
ULSG (Average)	4	-22	-20	-19	13	12	12

Using no explicit margins causes term product reserves to decrease by an average of 13% while doubling the margins causes reserves to increase by an average of 22%. These averages are dampened by that fact that the NPR was the dominant reserve component in 4 of the 11 submissions and, therefore, produced zero change. Without including the NPR, the reported impact on the deterministic and stochastic reserve components in this sensitivity was much more significant.

On average, the ULSG minimum reserve decreases by 19% with no explicit margins and increases by 12% with double margins. The deterministic and stochastic reserves changes are similar.

Sensitivity 3 – Lapse Rates +/- 20%

Description of Sensitivity Test: Lapse rates are multiplied by either 1.20 (+20%) or .80 (-20%). For term business, the lapse increase/decrease only applies during the level term period. For other business, the lapse increase/decrease applies in all policy durations.

Results of Sensitivity Test:

The results related to the lapse sensitivity are presented in Table 12.4.

TABLE 12.4 – Lapse Rates +/- 20% Sensitivity All Business – Percentage Change from Base							
Product	**No. of Participants**	**Lapse +20%**			**Lapse -20%**		
		DR	**SR**	**Min**	**DR**	**SR**	**Min**
Term (Average)	12	6%	11%	7%	-8%	-10%	-4%
ULSG (Average)	4	-5	-5	-5	5	6	6

The results of this sensitivity show that the VM-20 reserves are moderately sensitive to the lapse assumption.

For some of the term products, an increase in lapse rates increased the reserves and a decrease in lapse rates decreased reserves. Also, the impact is greater for the longer level premium period plans (T20 and T30) than the shorter plans (T10 and T15). Thus, there was a wide range of results for term. In addition, the impact on the minimum VM-20 reserve for term products is impacted by the fact that the NPR is the maximum reserve component in many cases for term and this sensitivity does not apply to the NPR calculation.

For ULSG, the results were widely consistent for all 4 submissions and are symmetrical.

Sensitivity 4 – Dynamic Lapses

Description of Sensitivity Test: The dynamic lapses rates are doubled and halved. This sensitivity applies to UL products only.

Results of Sensitivity Test:

Only two participants provided results for this sensitivity. The dynamic lapse rates had minimal affect on the VM-20 reserves for the two UL products.

TABLE 12.5 – Dynamic Lapse Sensitivity

All Business – Percentage Change from Base

Product	Participant	Double			Half		
		DR	SR	Min	DR	SR	Min
ULSG	3	-2%	-3%	-3%	1%	0%	0%
ULwo	19	1	n/a	0	1	n/a	0

Sensitivity 5 – Expenses +10%

Description of Sensitivity Test: Expenses included in the model are increased by 10%.

Results of Sensitivity Test:

Table 12.6 shows the impact of increasing expenses. The impact on the minimum reserve is negligible.

TABLE 12.6 – Expenses + 10% Sensitivity All Business				
Product	**Participant**	**% Change from Baseline**		
		DR	**SR**	**Minimum**
Term 20	19	26%	n/a	0%
Term Agg	9	1	n/a	1
Term Agg	17	12	n/a	0
ULSG	3	1	1	1
ULSG	4	2	1	1
ULSG	9	0	3	3
SIWL	21	16	8	0
TWL	23	6	6	0
ULwo	19	10	n/a	0
VUL	24	2	8	1

Sensitivity 6 – ULSG Funding Patterns

Description of Sensitivity Test:

In addition to the baseline level funding pattern tested as part of Phase I, participants were instructed to test the following three funding patterns (a, b, and c below). For all funding patterns, premiums were assumed to cease when the secondary guarantee is fully funded.

a. Premium acceleration – Increase each policy's premium 25% (i.e. 125% multiple applied to premium in all years).

b. Premium deceleration – Decrease each policy's premium 25% (i.e. 75% multiple applied to premium in all years)

c. Premium to maintain the guarantee – Assume the baseline premium pattern, until a premium is necessary to prevent the policy from lapsing without value. To prevent the policy from lapsing without value, the minimum required premium is assumed to be paid to persist the policy from one policy year to the next. If the ULSG product utilizes a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level, the minimum required premium is calculated assuming the lowest set of charges.

Results of Sensitivity Test:

Table 12.7 shows the dominant VM-20 reserve component and the change in the minimum reserve for each sensitivity related to the ULSG funding assumption.

TABLE 12.7 – ULSG Funding Patterns Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.
ULSG	1	DR	DR	DR	n/a	-14%	-1%	n/a
ULSG	3	SR	SR	SR	n/a	-1	-8	n/a
ULSG	4	SR	NPR	NPR	SR	-12	-12	0
ULSG	9	SR	SR	SR	SR	7	-38	13

The reserve decreased in all but 1 case for both the premium acceleration and deceleration tests. It is likely that increasing the funding level reduces the reserve due to lower utilization of the secondary guarantee. It is also likely that lowering the expected premiums reduces the reserve due to an increase in policy lapsation (i.e. the no-lapse guarantee has inadequate premiums to keep the guarantee in force).

The results indicate the level of premiums included in the VM-20 reserve projection can have a significant impact on the overall level of reserves.

Sensitivity 7 – Lower Spreads

Description of Sensitivity Test: Initial and ultimate spreads were assumed to be lower than the baseline assumption.

Results of Sensitivity Test:

Results for this sensitivity were provided for four products. The changes in the minimum reserve are shown in Table 12.8. Although this is a very small sample, the results show that the level of the ultimate spreads appears to have a greater impact on results than the initial spreads.

TABLE 12.8 – Spreads +/- 100bp Sensitivity

All Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Lower Initial Spread	Lower Ultimate Spread	Lower Initial Spread	Lower Ultimate Spread
Term 20	19	NPR	NPR	NPR	0%	0%
ULSG	4	SR	SR	SR	1	10
ULwo	19	NPR	NPR	NPR	0	0
VUL	24	NPR	NPR	DR	0	11

Sensitivity 8 – Double Defaults

Description of Sensitivity Test: Default rates are doubled compared to the baseline assumption.

Results of Sensitivity Test:

Table 12.9 shows the results for the default sensitivity. The results are largely consistent for the term and ULSG products and shows the reserves would increase moderately using double the level of baseline defaults.

TABLE 12.9 – Double Defaults Sensitivity

All Business

Product	Participant	% Chg from Baseline		
		DR	SR	Minimum
Term 20	19	9%	n/a	0%
Term Agg	9	2	n/a	2

TABLE 12.9 – Double Defaults Sensitivity

All Business

Product	Participant	% Chg from Baseline		
		DR	SR	Minimum
ULSG	3	7	6%	6
ULSG	4	8	5	5
ULSG	9	7	9	9
SIWL	21	0	2	0
TWL	23	4	3	0
ULwo	19	0	n/a	0
VUL	24	3	-3	2

Sensitivity 9 – Negative Cash Flow Strategy

Description of Sensitivity Test:

Participants were instructed to run the DR and SR reserves using three different disinvestment strategies:

a. Sell assets.
b. Borrow assets.
c. Use negative assets.

Results of Sensitivity Test:

Results for this sensitivity are shown on a per $1,000 of face amount basis since the baseline isn't necessarily to sell assets. Participants could choose the negative cash flow strategy for the baseline result.

The sensitivity results are shown in Tables 12.10a for the minimum reserve and 12.10b for the deterministic and stochastic reserves. The reserves do not appear to be very sensitive to the negative cash flow strategy that is employed.

TABLE 12.10a – Negative Cash Flow Strategy Sensitivity

All Business – Minimum Reserve

Product	Participant	Minimum Reserve Per $1,000		
		Base	Borrow	Negative Assets
Term 20	19	2.3	2.3	2.3
Term Agg	9	1.7	7.2	1.7
Term Agg	10	7.3	7.1	9.0
ULSG	3	120.8	120.8	122.0
ULSG	4	71.4	66.1	n/a
ULSG	9	n/a	91.0	n/a
SIWL	21	54.5	54.5	54.5
TWL	23	28.0	28.0	28.0
ULwo	19	30.7	30.7	30.7

TABLE 12.10b – Negative Cash Flow Strategy Sensitivity

All Business – Deterministic and Stochastic Reserves

Product	Participant	Deterministic Reserve per $1,000			Stochastic Reserve per $1,000		
		Base	Borrow	Negative Assets	Base	Borrow	Negative Assets
Term 20	19	-0.8	-0.8	-0.8	n/a	n/a	n/a
Term Agg	9	n/a	7.2	n/a	n/a	n/a	n/a
Term Agg	10	6.1	6.2	6.2	7.3	7.1	9.0
ULSG	3	120.8	120.8	120.7	120.8	120.5	122.0
ULSG	4	52.7	52.0	n/a	71.4	66.1	n/a
ULSG	9	n/a	n/a	n/a	n/a	n/a	n/a
SIWL	21	25.5	25.5	25.6	38.0	38.0	37.4
TWL	23	20.6	n/a	n/a	21.8	n/a	n/a
ULwo	19	20.1	20.1	20.1	n/a	n/a	n/a

Sensitivity 10 – Eliminate Post-Level Term Amounts

Description of Sensitivity Test: This test applies to term products only. The shock lapse rate at the end of the level premium period is set to 100%, thus eliminating the impact of post-level premium period cash flows.

Results of Sensitivity Test:

The VM-20 reserve increased for all of the term products when eliminating the post-level term period cash flows. This is an intuitive result since most post-level term period premiums are priced to be sufficient to cover the mortality anti-selection that is expected to occur and eliminating this profit increases the reserve.

TABLE 12.11 – Eliminate Post-Level term Sensitivity

Term Business

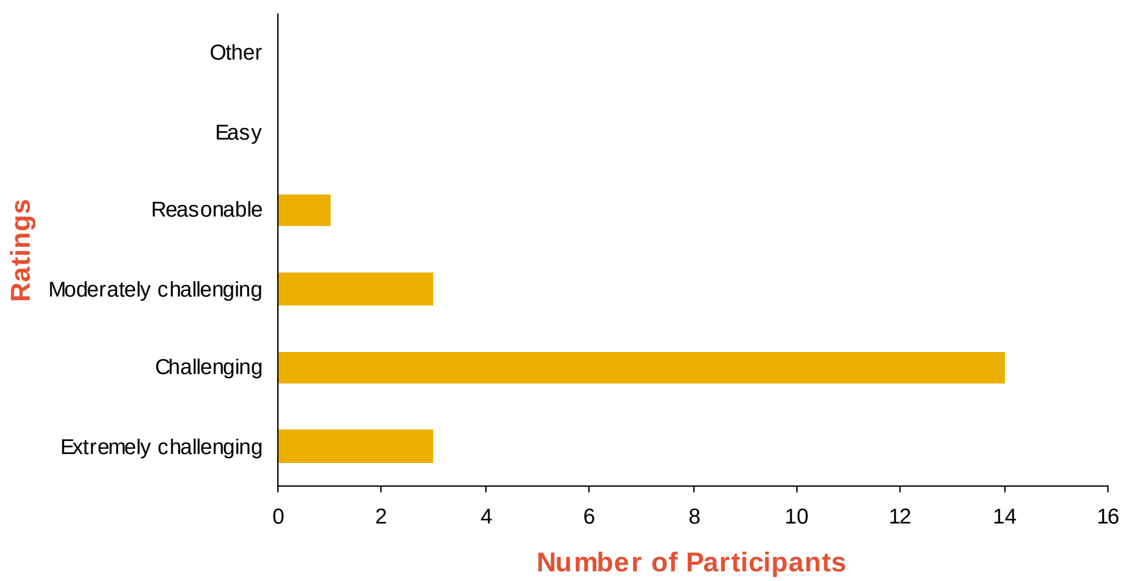
Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
Term 20	5	SR	n/a	22%	n/a	n/a
Term Agg	9	DR	DR	1	n/a	1
Term Agg	10	SR	SR	8	5	5
Term Agg	17	NPR	n/a	n/a	n/a	n/a

Section 13: Ease of Implementation

This section summarizes and comments on the results of the survey regarding how the companies found the level of difficulty when implementing VM-20 for the Impact Study.

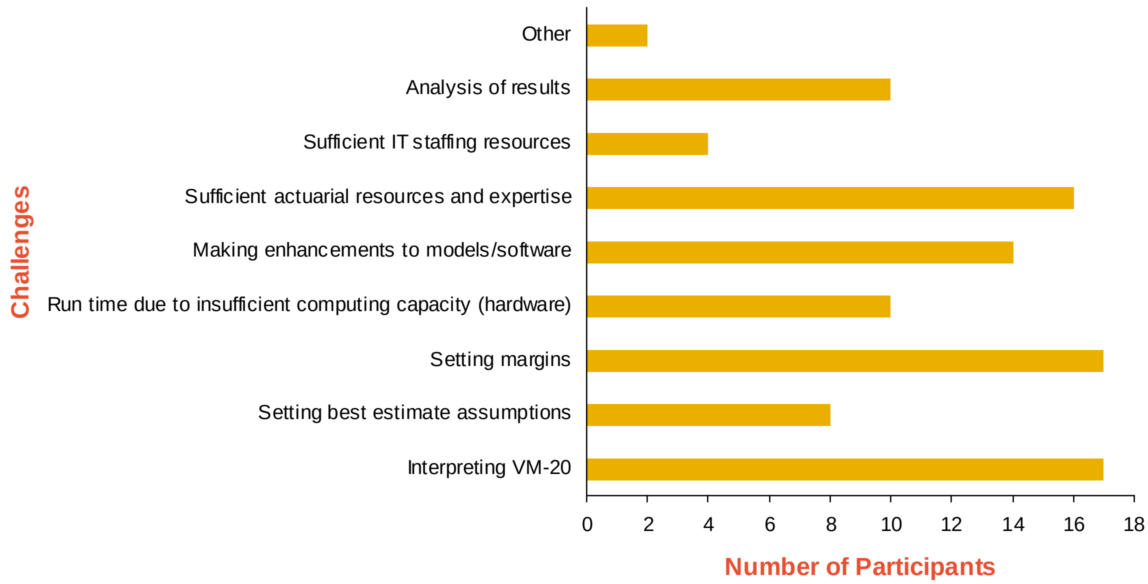
Question 36 queried participants on the general level difficulty they had implementing VM-20 as part of the impact study. Not surprisingly, no participants found the process easy and only one participant found the process reasonable. The most common response was that 14 participants said it was challenging, with three each saying it was moderately challenging or extremely challenging.

Chart 13.1 – Rating of Overall Experience with VM-20 Implementation



Question 34 asked participants to choose from a list the current/potential challenges they are having with VM-20 implementation. Although dozens of different challenges were listed, some were much more prevalent than others. A total of 17 participants listed interpreting VM-20 and setting margins as challenges, making them the most prevalent. Sufficient actuarial resources and expertise came in third and making enhancements to models/software was fourth, with 16 and 14 participants listing them as a challenge respectively. Chart 13.2 summarizes other common challenges and how prevalent they were.

Chart 13.2 – Current/Potential Challenges with VM-20 Implementation



Also as part of question 34, the following challenges were noted by at least one participant, but were not as prevalent as those in the chart above.

- Resource intensive calculations
- Initial setup of valuation system and internal controls and process
- Infrastructure
- PIMR tracking
- Asset allocation and integration
- Aggregation
- Reserve volatility
- Documentation
- Justification to regulators for changes to models (including asset portfolios) in future years
- Realistic reflection of management optionality in the model
- Integration of RBC with this framework

Question 35 asked companies to identify areas of VM-20 where they had trouble interpreting the language. The responses are listed below:

- Assumption margins
- Shock lapses for term and lapse rates for ULSG
- The deterministic reserve exclusion test
- The stochastic reserve exclusion test should clarify that best estimate mortality is to be used instead of prudent estimate mortality that has been blended with industry
- The mortality assumption
- Starting assets
- Asset spreads and defaults
- What to do when stochastic or deterministic reserves are negative
- Deterministic reserve period to use for products with non-guaranteed future premiums
- The net premium reserve language (2 companies)
- Reinsurance
- Hedging

Starting Assets

Survey Responses

Many companies reported that a large number of iterations were required to meet the VM-20 requirement of the starting assets being within two percent of the final reserve. This section summarizes the results shown in Phase II and in the survey about the starting assets amount and the iterations required to meet the requirement that starting assets are within 2% of the modeled reserve.

Question 44 asked companies to list the average number of iteration required for starting assets to be within two percent of the modeled reserve. This question was asked for both deterministic and stochastic reserves and for all products tested. The number of companies is greater since some responses varied by product

- 1 iteration (2 companies)

- For 10/15 year term and Whole Life, only one iteration was needed since the Net Premium Reserve was always the greatest
- 1 iteration for the Deterministic Reserve.

- 2 - 3 iterations (12 companies)
  - For 20/30 year term, it took about 3 iterations on average
  - One company said deterministic was 2 iterations with more than 3 for stochastic
- 4 – 6 iterations (6 companies)
  - Stochastic – started averaging 4-6 iterations, but I took a few shortcuts toward the end of Phase II and usually got it within 3 iterations. Rerunning for a new iteration took a more effort for the Stochastic runs than the Deterministic runs, so every iteration we can keep from doing will decrease our time. The stochastic runs ultimately calculate the reserve so that it is within 2% of the starting assets but we have found that there is quite a range of reserves that will fit in that 2% collar.
- Greater than 6 iterations (2 companies)
  - 9 iterations
  - I do not have the exact number, but our modeler spent a lot of time getting within the 2% tolerance.

Question 45 asked participants how they thought the numbers above would change if the starting asset collar was relaxed to 5% or 10%. Note that many companies responded to this question with a single response which is shown below.

- 1 iteration (6 companies)
- 2 - 3 iterations (7 companies)
- More than 3 iterations (1 company)
  - 8 and 6, respectively.
- Other responses:
  - Significantly. In our tests, the stochastic GPVAD calculation is disconnected from "reality". Using spot rates to discount instead of a net asset earned rate can result in a very poor "guess" of the right solution. We found that the "guess" created from the GPVAD was not a good guide to the correct asset values. Widening the collar would create highly volatile results pending on your initial guess. We think a better method to decrease the required

iterations would be to use scenario specific net asset earned rates for discounting instead of 1-year spot rates

  - Per our results of Phase II #11, for deterministic, there wasn't much effect of increasing/decreasing the starting assets by 10% - no more than 0.75%. But for stochastic, there was more of an effect – as much as 8.6% change for increasing starting assets by 10%, and as much as 7.1% for decreasing the starting assets by 10%. Increasing the collar to 5-10% would reduce the time needed, but there would be quite an effect on the calculated stochastic reserves.

  - Probably would have some impact, but not be a major driver. However, in some situations, the range of starting assets linked to plus/minus 10% might be substantial.

Question 46 asked companies how much improvement was usually seen after the second iteration for the deterministic and stochastic reserves.

- Less than 20% (1 company)
- 20%-40% (2 companies)
- About half (6 companies)
- Greater than a half (5 companies)
- Depended on starting assets (2 companies)
- No convergence (1 company)

Question 47 asked companies if they thought it took too long to converge and why they thought this was so. The responses are listed below:

- Yes (6 responses)
  - The guidance for how to perform iterations isn't clear. It could take long depending on how the iterations are performed. Using our original method, we realized it would have taken too long for the iterations to converge. We realized there was no guidance on how to perform the iterations so we modified our method.
  - In cases where the starting asset amount was within 10% of the final stochastic reserve, the iterations converged relatively quickly to within a collar of 2% - 5%. However, on cases where the starting asset amount was outside of 10% of the final stochastic reserve, the investment activity the excess or deficient asset amounts overtook the insurance cash flow activity, substantially increasing the number of iterations required.
  - Using a rate to discount that is inconsistent with what you expect to earn causing internal inconsistencies in the model. To make it efficient the assumptions used to project cash flows

and discount cash flows need to be consistent. The discount rate used to discount the deficiencies in the stochastic reserve is too different from the asset net earned rate. Discounting at the one year treasury makes the target (zero deficiency) move around too much in the tail scenarios. It doesn't make sense that the choice of discount rate should materially impact the reserve since you are trying to solve for the starting assets to cover the liabilities.

  - Because each iteration takes computing resources and requires wait time.
  - In general, the number of iterations should not be a major issue to PBR . In the future, software vendors can easily build algorithms that can converge efficiently on the appropriate asset level. For this testing, however, our starting points were determined by trial and error.
  - CTE calculation is nonlinear, so estimation is difficult. With experience, we (and the industry) should be able to develop estimation rules

- No (1 response)
  - Once you have a better understanding of your block of business and the structure of the calculation you will have a much easier time estimating what starting assets should be.

Question 48 asked companies what they used for the original starting assets for the deterministic and stochastic reserves and how far off it was from the final starting assets. The responses are listed below:

- Source of number used for original starting assets:
  - Deterministic Reserve (3 companies)
  - NPR Reserve (3 companies)
  - Statutory reserves (2 companies)
  - NPR if deterministic reserve was negative
  - Actual assets
  - Subset of actual assets
  - Trial and error to get to 2% collar (2 companies)
  - Ran SET
  - Cash Value
- Difference or original starting assets from final starting assets:

- Less than 20% (1 company)
- 20%-30% (2 companies)
- 50%-70% (2 companies)
- 0-200% (1 company)

Phase II Sensitivity Results

Sensitivity 9 applied to the calculation of deterministic and stochastic reserves and was designed to test the impact of starting assets falling outside of the targeted range of 98-102% of the final aggregate modeled reserve. Participants were instructed to increase/decrease the starting assets by 10%.

Table 13.1 shows the impact of increasing and decreasing the starting assets by 10% on the VM-20 minimum reserve, deterministic reserve and stochastic reserve. The most significant impacts are on the stochastic reserve component and only a minimal impact on the deterministic reserve component. This may suggest the tolerance for the deterministic reserve starting assets could be widened.

TABLE 13.1 – Starting Assets+/- 10% Sensitivity

All Business – Percentage Change from Base

Product	Participant	Assets +10%			Assets -10%		
		DR	SR	Min	DR	SR	Min
Term 20	5	n/a	-7%	-4%	n/a	11%	11%
Term 20	19	-2%	n/a	0	2%	n/a	0
Term Agg	9	0	n/a	0	0	n/a	0
Term Agg	10	0	8	8	0	-6	-6
ULSG	3	0	-15	-1	1	19	19
ULSG	4	0	0	0	1	2	2
ULSG	9	0	-12	-4	0	16	16
TWL	23	0	-15	0	0	28	0
ULwo	19	1	n/a	0	1	n/a	0
VUL	24	n/a	-3	0	n/a	2	0

Towers Watson's Observations on Implementation

It is clear that implementing VM-20 for the first time is a significant exercise. The participants found that it was challenging in multiple ways: interpreting VM-20, developing assumptions and margins, modifying their financial modeling software and finding resources to perform the calculation. However, it seems likely that after the calculation is performed for the first time, future calculations will be significantly easier. Clarifications to the VM-20 language will be made or industry practice on how to interpret the language will exist and the software changes should not be as extensive. This should also be the case with the setting of assumptions and margins with future iterations of the calculation requiring less work than the first.

Of course as we have seen with other principle-based methods (AG-43 for example), there is still quite a bit of work to validate and understand the calculation results. The results can be impacted greatly by company experience, policyholder behavior and changes in the economic environment. Companies will need to develop the ability to gather the output of the calculation in a workable format to make the review of the large amounts of data produced (in particular for the stochastic reserve) feasible in the time frames required.

Towers Watson's Recommendations

Overall, the level of starting assets appears to have only a small effect on the deterministic reserve for all participants. This may indicate that the tolerance for the starting assets under the deterministic reserve could be widened from the +/- 2% in the current VM-20 draft.

The stochastic reserve is much more sensitive to the level of starting assets than the deterministic reserve. Towers Watson recommends that LATF consider decreasing the implementation difficulty for VM-20 by increasing the requirement that the starting assets in the stochastic reserve be within 5% instead of requiring at most a 2% difference. Based on the results of the survey, this would significantly decrease the required iterations to meet this requirement. The Phase II results showed that there would be some change to the level of the stochastic reserve however, (assuming the results are linear – i.e., half of the 10% sensitivity), the change would be in the range of plus/minus 5 – 10% if the corridor is widened. Also, a number of companies didn't calculate separate starting assets for the deterministic and stochastic reserves. LATF should consider clarifying some of the language surrounding which modeled reserves need starting assets within the collar.

Section 14: Impact of Model Granularity

This section addresses the objective of understanding how companies determine the level of granularity used in combining or grouping assets and liabilities into model cells so that all major risk characteristics are reflected or captured.

One of the sensitivity tests was designed to quantify the impact of reducing the number of model cells used to calculate the deterministic and stochastic reserves. Companies were asked to provide a sensitivity assuming the liability model was created with half as many model cells as was used in the baseline calculation. The results showed very little change to the term and ULSG minimum reserves and no change to the minimum reserves for any of the other product lines (the NPR reserve dominated for all of the other product lines which was equal to CRVM). However, there were significant changes to some of the deterministic and stochastic reserve components but since the NPR was the minimum reserve for both the baseline and sensitivity, there was no change to the minimum reserve. Additional details on this sensitivity are provided below.

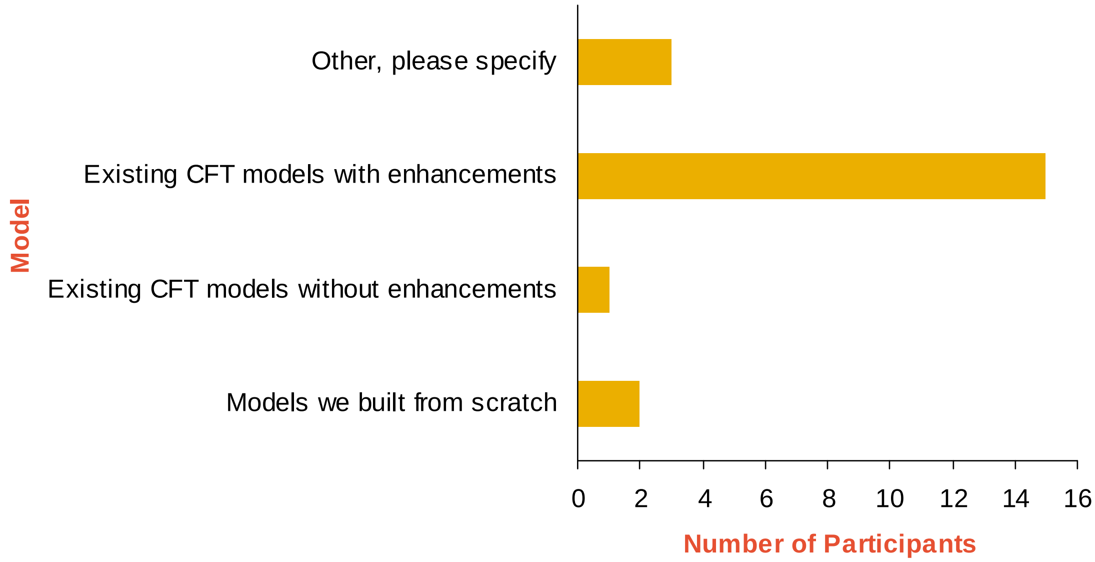
Another concept related to granularity that was analyzed was product aggregation. Companies were instructed to perform the VM-20 calculation for a specific product type (e.g., ULSG or term) with a few companies providing results for more than one product type. This led every company to use product type as a liability group (called model segment in VM-20). However, VM-20 requires cash flow “model segments consistent with the company’s asset segmentation plan, investment strategies, or approach used to allocate investment income for statutory purposes.” It is very likely that some companies will create VM-20 model segments that include more than one product type. The only product where the Impact Study had data showing the impact of combining products was for term business the analysis of the impact of aggregation is discussed below.

Models used for the Impact Study

Understanding which models were used by participants to determine the VM-20 reserves can provide some insight on the model granularity.

Question 4 on the survey asked companies what models they used for the impact study. Chart 14.1 indicates that the vast majority of participants used existing cash flow testing models for the VM-20 Impact Study, with almost all of them making enhancements to the models to accommodate VM-20. Other models used included embedded value models and relying on consultants to do the modeling.

Chart 14.1 – Models Used for the Impact Study



It appears likely that companies will leverage existing cash flow testing models when building their VM-20 models and, as a consequence, have similar model cell granularity.

Model Compression Sensitivity Test

As part of the sensitivity tests, participants were instructed to compress the in force liability model points to 50-75% of the baseline model. For example, use broader groupings in terms of issue age, underwriting classes, issue months or funding patterns.

Although the VM-20 minimum reserve did not change significantly for the cases that were submitted, there were some material changes to the deterministic and stochastic reserve components. Generally, a less granular model decreased these reserve components.

Table 14.1 provides the results of the term products. There were significant reductions to the deterministic reserve for two of the term product results provided (56% and 20%), although the NPR floor caused no change to the minimum reserve. On average, the minimum reserve decreased by only 1%.

TABLE 14.1 – Double Compression of Model Points Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
Term 20	19	NPR	NPR	-56%	n/a	0%
Term Agg	9	DR	DR	0	n/a	0
Term Agg	10	SR	SR	-4	-3	-3
Term Agg	17	NPR	NPR	-20	n/a	0

Table 14.2 shows the results of the model compression for ULSG products. There was only a very small impact on the level of reserves reported by the two participants that submitted results for this sensitivity.

TABLE 14.2 – Double Compression of Model Points Sensitivity

ULSG Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
ULSG	4	SR	SR	0%	0%	0%
ULSG	9	SR	SR	1	2	2

Table 14.3 provides results for products other than term and ULSG.

TABLE 14.3 – Double Compression of Model Points Sensitivity

Other Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
SIWL	21	NPR	NPR	-25%	-13%	0%
TWL	23	NPR	NPR	-2	-2	0
ULwo	19	NPR	NPR	-7	n/a	0
VUL	24	NPR	NPR	-60	-93	0

Aggregation

Another concept related to granularity that was analyzed was product aggregation. Section 7 of VM-20 requires cash flow "model segments consistent with the company's asset segmentation plan, investment strategies, or approach used to allocate investment income for statutory purposes." It is very likely that some companies will create VM-20 model segments that include more than one product type.

The only product in which results were submitted for the Impact Study that showed the impact of combining products was for the term products. We requested companies to provide results for term products both separately for 10, 15, 20 and 30 year level premium periods and in aggregate with all of the term periods combined in one calculation ("aggregate term"). Three companies provided results both separately and in aggregate.

Table 14.4 shows the results for these participants for 1 year of business. There was no impact for Participant 5 under Alternative 2 because the NPR was the maximum reserve for the individual products as well as the aggregate term. There is no impact on aggregation on the NPR because it is a seriatim calculation.

TABLE 14.4 – Aggregation Impact on Mimum Reserves per $1,000 1 Year of Business				
Participant	**Alternative**	**Simple Sum**	**Aggregate Term**	**Effect of Aggregation**
5	1	0.55	0.47	-14.9%
5	2	0.47	0.47	0.0
10	1	4.69	3.94	-15.9
10	2	4.09	2.99	-26.9
16	1	3.16	1.70	-46.2
16	2	2.64	1.53	-42.0

Table 14.15 shows the impact of aggregation for the term products for 5 years of business.

TABLE 14.15 – Aggregation Impact on Mimum Reserves per $1,000 5 Years of Business				
Participant	**Alternative**	**Simple Sum**	**Aggregate Term**	**Effect of Aggregation**
5	1	2.25	1.84	-18.3%
5	2	1.84	1.84	0.0
10	1	8.19	9.12	11.4
10	2	7.81	9.10	16.5
16	1	6.37	5.45	-14.5
16	2	5.80	4.77	-17.8

The aggregation impact dropped significantly for Participant 16 for 5 years of business compared to 1 year of business (from over 40% to less than 20%). For Participant 10, aggregating the term products actually increased the minimum reserve. This occurred because 2 of the 3 products included in this company's results passed the SRET on an individual basis even though the stochastic reserve was actually higher than the minimum reserve reported (i.e. false positives). When all 3 products were aggregated, the SRET failed and the stochastic reserve was the maximum reserve component.

Table 14.16 provides the details of the sensitivity for Participant 10, 5 years of business under Alternative 2. The reserve component that was reported as the VM-20 reserve is bolded in each case.

TABLE 14.16 Aggregation Impact for Participant 10

5 years of Business, Alternative 2, Per $1,000 Amounts

	NPR	DR	SR	Max	Pass SRET?	Min Res
Term 10	**4.33**	3.78	7.07	7.07	Yes	4.33
Term 20	4.29	**7.55**	10.43	10.43	Yes	7.55
Term 30	2.72	6.89	**10.07**	10.07	No	10.07
Simple Sum	3.69	6.45	9.54	9.54		7.81
Agg Term	3.69	6.44	**9.10**	9.10	No	9.10
Aggregation Impact	0.0%	0.0%	-4.6%	-4.6%		16.5%

Note that for Term 10 and Term 20, the stochastic reserve was the maximum reserve component, but because the SRET was passed, the minimum reserve was another reserve component. For aggregate term, the SRET was not passed and the stochastic reserve was reported as the VM-20 minimum reserve, which produced a higher reserve than the simple sum of the individual products.

Observations on Aggregation

The fact that the aggregate term reserve is less than the sum of the individual reserves in many cases is not a flaw in VM-20 but the result of the combination of different risk profiles in the calculation. Aggregating risks leading to lower overall risk is a standard concept in risk management (also called diversification). In this case, the diversification does not come from combining different product risks, but from the length of the premium guarantee period leading to different levels of exposure to long term market risks. We would expect companies to include multiple product lines in their models when implementing VM-20 if the product lines meet the criteria of a model segment in VM-20. Having multiple product lines combined may lead to lower required reserves under VM-20 for product lines where the minimum reserve is the stochastic or deterministic reserve than if the calculations were performed separately and added together. However, we do not have enough data from the Impact Study to estimate this impact.

There was one instance in which the aggregate reserve was greater than the simple sum due to passing the stochastic exclusion test for some of the individual products while failing the test in aggregate.

Section 15: Reporting, Documentation and Metrics

One of the objectives of the Impact Study was to obtain information about participants' perceptions regarding the most effective way they could report and document reserve results, modeling assumptions, experience assumptions, margins and sensitivity testing.

Another objective was to gain insight on the most effective regulatory benchmarks and/or metrics that could be used in determining a company's compliance with the principle-based valuation provisions of the standard valuation law and valuation manual.

Reporting and Documentation

During the initial planning of the Impact Study, it was anticipated that participants would be requested to provide detailed documentation of their calculation methods, assumptions and sensitivity testing. However, as the study progressed it became clear that participants would be unable to produce this documentation given the timeframes and lack of resources. Feedback from the participants suggests that the proposed documentation requirements are large and somewhat redundant with current actuarial opinion and memorandum documentation requirements.

Below is a summary of the responses to the survey related to reporting and documentation.

Question 49 of the survey asked participants what they thought was the most effective way they could report and document reserve results, assumptions, margins and sensitivity tests.

- Utilize an actuarial memorandum (5 companies)
- Reporting and documentation tools built into Excel (4 companies)
- An actuarial report to management, available to regulators (3 companies)
- Not yet determined (2 companies)
- VM-31 (1 company)

Question 50 asked participants for comments on the proposed VM-31 reporting requirements. The few comments received included the following:

- The reporting requirements seem reasonable.
- Concern about how regulators will get comfortable with assumptions and reserve levels

- Concern about how much time it will take to do initially and each quarter
- We need to minimize the redundancy with asset adequacy requirements

Metrics

Given the complex nature and principle-based approach of VM-20, it is difficult to establish benchmarks or metrics that can be applied widely to all companies to determine compliance with the provisions of the standard valuation law and valuation manual.

Given the wide range of results produced by participants during the Impact Study, even within the same product groups, it appears common patterns or relationships between companies will be almost impossible to identify.

Over time, as more data is gathered and companies converge to more consistent methodologies and approaches, it may be possible to establish useful benchmarks and metrics. Surely, certain analytics, such as trend reports, will develop and aid in the analysis of one company's results from one period to the next.

Towers Watson's Observations

LATF should consider allowing documentation requirements for VM-20 to use the format of asset adequacy reports and actuarial memoranda, if possible, to minimize the same information having to be reported multiple times.

Section 16: Participant Recommended Changes

This section shows a summary of the changes already made to VM-20 based on comments from the participants of the Impact Study and other comments that were submitted as part of the survey.

VM-20 revisions that were adopted based on comments from companies participating in the field test:

- Clarified that there are 3 approaches to pass the stochastic exclusion test: ratio test, demonstration, and certification.
- Clarified the treatment of policyholder dividends that are included in the statutory dividend liability when modeling non-guaranteed elements.
- Clarified the risks being addressed by the stochastic exclusion test are only interest rate risk and equity return risk.
- Numerous changes to clarify intent and eliminate inconsistent wording.

Survey Responses – Suggested Changes

The last question of the survey asked companies for any other comments, concerns or suggested refinements they have related to VM-20. The responses are listed below.

- Margins
  - More clarity on margins as they were difficult to set
  - Combination of explicit and implicit margins seems excessive
- Mortality
  - More clarity on credibility / how to combine segments
  - Concern on not allowing mortality improvement
  - Concern regarding the prescribed mortality margin
  - There is excess conservatism in the assumption that should be removed
  - Overall mortality is higher than reinsurers expect

- Underwriting Criteria Scoring (UCS) Calculator – Possible Errors
  - Alcohol/Drug Abuse – If one specifies this as a DC item in row 51 of the Input sheet, the cells in row 147 do turn blue. However, it is not possible to actually type in the DC points in this row.
  - Cholesterol – A problem arises if this is specified as a DC item and Total Cholesterol is used. According to the UCT report, the final (Cumulative) UCS is supposed to equal .75*Preliminary UCS + .25 * 188. This formula is in fact used for the 1st DC category (cell O21 in the "Cholesterol" sheet), but not for any DC category beyond this. Also, the ".25*188" in the above formula appears to be replaced by 25.
  - Family History – (1) "Diagnosis Included" – According to the UCT Report, the UCS value is supposed to be 100 if the answer to this question in "N" ("No"). If selected as a KO criterion, this does in fact happen. However, if DC is selected, the UCS values (beginning in cell O33) always appear as zero.
  - Family History – (2) "Number of Incidents" and "Maximum Age" – The UTC report only refers to a single number for each of these items. As best as I can determine, the UCSC treats these items as follows:
    - (a) If both Cardiovascular (CV) Disease and Cancer are taken into account, the average of the 'Number of incidents" is used, as is the average of the "Maximum Ages". (If the average "Number of Incidents" is not an integer, it appears to be rounded down to the lower integer before determining the UCS).
    - (b) If exactly one of these diseases is taken into account, the final numbers differ depending on whether Family History is specified as a KO or DC criterion.

      (b1) If KO, for the disease that is not taken into account, the "Number of incidents" is set equal to the max value of 2, and the "Maximum Age" is set equal to 0 and the averages are then taken as in (a).

      (b2) If DC, the final "Number of Incidents" and "Maximum Age" are set equal to the values for the disease that is taken into account.

      Given that there is a separate Family History question regarding the number of Primary Diseases (i.e., CV and cancer) that are taken into account, approach (b2) makes more sense to me. In any event, the same approach should be used for KO & DC.
    - (c) If neither disease is taken into account, the final "Maximum age" is 0, which serves to maximize the UCS for this item. However, for "Number of Incidents", the KO approach is to set the number for each disease equal to 2 (resulting in a final number of .5*(2+2)=2), while the DC approach apparently treats each number as 0, resulting in a final number of zero. I'm not sure which approach makes more sense, but in any event the same approach should be used for both.

  - Family History – (3) Weighting of the Family History components – for both KO & DC the weights actually applied are 1 for "Number of Incidents" and 2 for "Siblings", when according to the UTC report (and the "Weights" section of the Family History sheet) these 2 weights should be reversed. I believe that the cause of the error is that the order in which "Number of Incidents" and "Siblings" are listed in the "Value Calculation" section (Rows 40 & 41) is the reverse of the order in which they are listed in the "Weights" section (Rows 70 & 71). I think that if you flip flop one of these pairs, the error will be corrected.

  - Miscellaneous – If this is selected as a DC criterion, and the answer to all of the questions (rows 203-235 in the Input sheet) is "N", then this criterion is not included in the "DC Calcs" sheet. Apparently the intention was to override "DC" with "Excl". This makes sense to me. However, if this WAS the intent, then the value associated with zero "Y" answers (133) should have been carried directly into the Miscellaneous row (Row 14) in the "Input" sheet. Instead, "Miscellaneous" is treated as a DC item in the "UCS to RRR" sheet (you'll see the Miscellaneous weight of 1 appearing in cell L3 of that sheet), and also in the final derivation of the Miscellaneous UCS values.

- Reinvestment;

  - The alternative one reinvestment assumption is too conservative

- Net premium reserve

  - Difficult to calculate

  - More analysis needed for lapse and premium persistency

  - Not comfortable with results

  - Need to specify what secondary guarantee period is exempt; i.e. is 5 years okay?

  - NPR may not be in sync with stochastic and deterministic reserve

  - Don't like having to redevelop level premium each year for NPR calculation

  - Section 3.C.3.c.i specifies the calculation of an R ratio in order to calculate the lapse rates on ULSG products. In the unusual instance where such a policy has paid in so much premium that it is funded over the FFSG, a literal reading of VM-20 would result in a negative value of R and therefore negative lapse rates. Since this is absurd, R should be bounded below by zero (it's already bounded above by 1). Additionally, in an instance where product design specifies that no further premiums are required after a certain duration, I think the FFSG and LSG are equal and the ratio R becomes infinity.

- Exclusion tests

  - Need more clarity

- Stochastic reserve
  - Concern on number of iterations
  - Concern on discount rate used
- Reinsurance
  - Need more guidance
- Hedges
  - Concern over getting hedges coded in the model and still being able to perform calculations in a reasonable amount of time
- Reserves levels
  - VM-20 reserves for ULSG are higher than AXXX
- IMR
  - Remove IMR from statutory requirements if principles based reserves are used, since the reserve calculation will perform the same task
- Aggregation
  - The field test only tested the impact by type of business. But VM20 will give us incentive to aggregate as much as possible across the types of business. This impact hasn't been tested.
- Run time
  - Concern about the typical run time and man hours needed for a quarter-end to complete this process. Technology and process improvements will be needed. What about using prior data as is done with CFT? For example, could month-old assets or even month-old assets and liabilities be used? For CFT, third quarter data is allowed as long as there are no significant changes by year-end.
- General guidance
  - Hope that some "rules of thumb" will emerge that can help guide companies. For example, do most 10, 20 and 30-year term blocks hold the NPR, the deterministic reserve or the stochastic reserve? What can companies do to determine if they are way off track?

- Would be helpful to be in touch with other companies who are working on the same product as us. Would like to know if other companies in the study were seeing the same things we were or if we were just doing something wrong.

- Clarification could be used on exactly what the floor for each reserve component is: None (allowed to go negative), Zero, ½ Cx and/or Cash Surrender Value?

One participant provided an Excel spreadsheet capturing their views of areas of VM-20 that require clarification. Note that some of these were submitted to Towers Watson as questions (and would be included in the Q&A section). The company's submission is shown in the table below.

VM-20 Section	**Description of Question or Clarification Needed**
3	Reinsurance treatment incomplete Net Premium Reserve.
3.B.8.b	What does "x1 = the gross premium for the first policy year" mean?
3.B.8.b	What does "y2-5 = 10% of the gross premium for each year from the second through fifth policy year" mean?
3.B.8.b	What does "z = an amount of $2.50 per $1,000 of insurance for the first policy year only" mean?
3.B.9	Does section 3.B.8.e apply to ULSG products (3.B.9), as well? If not, what basis should be used in projecting future benefits (guaranteed, shadow?).
3.B.9.c.ii	What does "x1 = the gross premium for the first policy year" mean?
3.B.9.c.ii	What does "y2-5 = 10% of the gross premium for each year from the second through fifth policy year" mean?
3.B.9.c.ii	What does "z = an amount of $2.50 per $1,000 of insurance for the first policy year only" mean?
3.B.9.c.iii	What lapse rate should be used for at-issue present value calculations?
3.C.3.c	Either the lapse rate or the ratio R_{x+t} used to calculate it should be floored at zero.

VM-20 Section	Description of Question or Clarification Needed
3.C.3.c	Is Lx+t calculated only once (using valuation date values for FFSGx+t, ASGx+t, and LSGx+t), then kept constant for all future policy years?
4	Reinsurance treatment incomplete Deterministic Reserve.
5	Reinsurance treatment incomplete for Stochastic Reserve.
5.B.2	References to Subparagraph a and Subparagraph b should be Subparagraph 1 and Subparagraph 2, respectively.
5.B.3	Reference to Subparagraph b should be Subparagraph 2.
6.B.2.b	"Shall use the most current available baseline economic scenario". Not entirely clear which scenario this is referring to.
9.F.1.b.i	The spread related factor simplistically assumes 25% of the increase/decrease in current versus historic spread for the Benchmark translated to additional/reduction of default cost. However, spread compensates for generally 2 major factors – credit risk and liquidity risk... [so] the '25%' should vary depending on the assessment of proportion of credit risk versus liquidity risk in the current spread versus the historic average spread.
9.F.1.c	The maximum net spread adjustment factor simplistically assumes 100% of the difference between the Weighted Average Net Current Spread of Company's Model Segment versus the Net Current Spread of the Regulatory Asset translates to additional default cost. However, this difference, to varying degrees, can be attributed to liquidity risk rather than credit risk in different market environments.
9.C.3.d.i	The requirement that mortality experience adjustments be supported by published studies is too strict.

VM-20 Section	Description of Question or Clarification Needed
9.C.4.d	It sounds like VM-20 is either allowing for a mortality improvement adjustment to be made only to the company experience and not to the industry table the company experience is being weighted with, or it's expecting a mortality improvement adjustment that is made to the weighted average of company experience and the industry table to be based on the average date underlying the company experience. [But] the company experience and the industry table may be centered on two different dates.
9.F.6	Defines a rate cap but does not define the actual reinvestment rate to use.
9.F.6	Unclear what is meant by "historical U.S. Treasury yield rate most closely coinciding with the dates of purchase" when referring to reinvestment assets.
9.F.6 for Alt. 2	Reference to nonexistent Subsection 9.F.c
9.F.8	This section addressed setting of gross asset spreads for public non-callable bonds purchased as a result of reinvestment in the model.... It is not clear if the intention is for gross asset spreads for public non-callable bonds published by the NAIC to apply to agency MBS, Agricultural Mortgages, and Commercial Mortgages, as well. I believe that would be inappropriate as the spreads that are available in these asset sectors are unique and distinct from the public non-callable corporate bond sector.
9.F.8.c	Spreads "shall grade linearly between year one and year four in yearly steps." This could be argued to mean that the ultimate rate begins in year 4 (3 year grading) or in year 5 (4 year grading).
N/A	Phase II Sensitivity 4 files are in an unreadable "zipx" format. Sensitivity 5 files are in the zip format and are not a problem.
Appendix 2	The data in Tables F, G, H, & I have no units specified.
	No definition of "Working Reserve".

VM-20 Section	Description of Question or Clarification Needed
	Note that in the NAIC Q&A (https://oneplace.ehr.com/sites/NAIC/QandA/default.aspx) there are pages and pages of questions and attempts at clarification. Very few of these have made it into VM-20 revisions.

Appendices

A: Invitation to Participate in Impact Study

The following request was sent by the NAIC on October 13, 2010 to selected insurance companies:

FOR IMMEDIATE RESPONSE

Your company has been invited to participate in a study to test the results of principles-based reserve requirements for life insurance. A revised Standard Valuation Law was adopted by the NAIC in 2009 and the associated Valuation Manual, as it relates to life insurance reserving, is near completion. The new life reserve standard, "VM-20", will apply to all individual life insurance business, except pre-need and credit life business, written after the adoption of the valuation manual. The results of the study will be released March 31, 2011, and will be used by regulators and legislators to gauge the impact the new standard would have on the regulatory process and on the level of industry reserves.

The National Association of Insurance Commissioners' (NAIC's) Principles-based Reserving Testing Subgroup is overseeing the testing project. As a first step, the following survey is being sent to selected life insurers. Please submit a response to this survey via e-mail to JEngelha@naic.org by October 22, 2010.

Your participation in this survey is very important. Immediate attention is appreciated. Should you have any questions about the survey questions, please feel free to contact Jason Kehrberg at 312-201-5724 or jason.kehrberg@towerswatson.com.

1. Is your company willing to participate in this testing?

   – This will involve calculating reserves for selected blocks of new business under both the old and new standards.

   – To assist participants with interpreting VM-20 and performing the calculations, support will be provided via written guidance, an online share forum, group Q&A sessions, webinars, in-person seminars, and/or one-on-one support from the consultants leading the study.

2. Are there other companies within your company's group that would be willing to participate in the testing? If so, please specify the company name and NAIC Company Code.

3. For your company and for each company noted in item 2 above, please prepare a chart showing 2009 first-year premiums (in millions, direct & ceded) for the following blocks of life business. Also, for blocks with significant 2009 first-year premiums, please indicate whether your models are VM-20 ready, close to being VM-20 ready, far from being VM-20 ready, or not sure.

Company Product Details and VM-20 Status

Product	2009 Direct Premiums	2009 Ceded Premiums	VM-20 Readiness? (Ready / Close to Ready / Far from Ready)
ULSG with AG38			
Other ULSG			
Fixed premium UL without secondary guarantee			
Flexible premium UL without secondary guarantee			
Competitive term life (at least one premium in top quartile)			
Non-competitive term life			
Traditional large-face whole life			
Simplified issue term or whole life			
Variable Life			
Variable Universal Life			
Other Life with over $1Million in first year premiums in 2009			

B: VM-20 Overview

The version of VM-20 used as the basis for the Impact Study was the February 28, 2011 working draft (included in Appendix I of this report), which in turn was based on the October 16, 2010 exposure draft. This appendix gives a high level overview of the sections in VM-20, listing key points only.

Section 1 – Purpose and Definitions

This section lists the purpose of VM-20 which is to establish new minimum CRVM reserves for future individual life insurance policies subject to principle-based reserves. The section also defines key terms used within the VM-20 Document.

Section 2 – Minimum Reserve

The VM-20 Minimum Reserve (MR) is defined to equal to the greatest of three separate components: the Net Premium Reserve (NPR), the Deterministic Reserve (DR), and the Stochastic Reserve (SR)

A Deferred Premium Asset is to be added to the DR and SR if applicable. An as of date no earlier than 3 months before the valuation date is allowed, provided an appropriate method is used to adjust those reserves to the valuation date. Requirements are given on how to allocate the minimum reserve between general and separate accounts. Simplifications and approximations are allowed if the company can demonstrate that the impact of such simplifications and approximations does not materially understate the resulting minimum reserve.

Section 3 – Net Premium Reserve

This section describes the calculation of the Net Premium Reserve (NPR) for Term and ULSG only. Other products are referred to appendices A and C of the proposed valuation manual which instructs the use of current CRVM for NPR. This will change in future versions of VM-20 as Section 3 is updated to include new NPR instructions for more than just Term and ULSG products.

The NPR defined in section 3 is a formulaic reserve equal to the present value of future benefits less the present value of future premiums, where premiums now include an expense and lapse component in addition to mortality and interest. The section defines different NPR calculations for fund and non-fund products. The NPR serves as a minimum “floor” for the VM-20 reserves since it is always calculated, whereas the DR and SR may not be due to the exclusion tests. NPR itself is floored by CSV or ½ Cx.

Section 4 – Deterministic Reserve

The Deterministic Reserve is a Gross Premium Reserve defined as the present value of modeled benefits, expenses, premium and other inflows. It uses company investment strategy under a prescribed economic scenario. Present values use discount rates based on category specific projected earned rates. Prudent estimate assumptions are to be used; i.e. including margins. Reinsurance discrete cash flows are to be determined in compliance with the VM-20 reinsurance section. Instructions are given on how to allocate net of reinsurance aggregate cash flows.

Section 5 – Stochastic Reserve

As with the deterministic reserve, cash flows are modeled using prudent estimate assumptions with margins, but multiple, i.e. stochastic, prescribed economic scenarios are to be used. The Greatest Present Value Accumulated Deficiency (GPVAD) is calculated for each scenario, where the Accumulated Deficiency is defined as the negative of the projected accumulated value of assets. Present values are calculated using the prescribed discount rate equal to 105% of the scenario specific one-year Treasury rate. The Stochastic Reserve is defined to equal the CTE (70) of the GPVADs, i.e. the average of 30% worst GPVADs plus an additional amount to capture any material risk included in the scope of these requirements but not already reflected in the cash flow models using an appropriate and supportable method and supporting rationale. There is also guidance on how to aggregate if the company uses subgroups for aggregation purposes.

Section 6 – Exclusion Tests for the Deterministic and Stochastic Reserve

If certain criteria are met, then the DR and/or SR may not be required to be calculated.

- Deterministic Reserve Exclusion Test (DRET)
  - Compares the sum of the gross premiums to the sum of valuation net premiums
  - If the sum of gross premiums is greater than the sum of valuation net premiums, then the DRET is passed
- Stochastic Reserve Exclusion Test (SRET)
  - In order to exclude a group of policies from the stochastic reserve requirements, the ratio of (b-a)/c must be less than 4.5% where:

    a = the adjusted deterministic reserve using the baseline economic scenario

    b = the largest adjusted deterministic reserve under any of the 15 economic scenarios prescribed by VM-20 for SRET purposes

c = an amount calculated from the baseline economic scenario that represents the present value of benefits for the policies, adjusted for reinsurance by subtracting ceded benefits

– The adjusted deterministic reserve in each scenario is determined using anticipated experience assumptions with no margins

If a group of policies fails the SRET, it must calculate the deterministic reserve even if it passes the DRET.

Section 7 – Cash Flow Models

This section outlines the requirements for cash flow models that are used in calculating the deterministic and stochastic reserves and exclusion tests. Elements that are addressed include model structure, general description of cash flow projections, the treatment of non-guaranteed elements, starting assets, reinvestment and disinvestment, cash flows from invested assets, economic scenarios, determination of net asset earned rates and discount rates, pretax IMR amounts, grouping of equity investments in the general account, grouping of variable funds and subaccounts for separate accounts, modeling of derivative programs and clearly defined hedging strategies.

Section 8 – Reinsurance

This section outlines how reinsurance is to be handled, including general considerations, reinsurance ceded, reinsurance assumed, and reinsurance assumptions, including margins on YRT premiums.

Section 9 – Assumptions

This section describes the concept of prudent estimate assumptions and how actuaries are to go about setting prudent estimate assumptions and the margins they contain. Specific instructions on setting the mortality assumption are given, including how actuaries are to blend their best estimate assumption with industry experience using an accepted credibility blending procedure. Additional guidance is also given on policyholder behavior assumptions, expense assumptions, asset assumptions and revenue sharing assumptions.

VM-20 Appendices

Appendix 1 – Stochastic Exclusion Test Scenarios

Appendix 2 – Tables for Calculating Asset Default Costs and Asset Spreads, Including Basis of Tables

Appendix 3 – Mortality Margin Table

C: Phase I Instructions

These instructions were sent to participants on January 14, 2011:

The following document outlines the details for the Phase I Data Request submission. There are two types of information being requested: (1) a spreadsheet called “Phase I Data Request Reporting Template.xls”, and (2) “Additional Information”, in whatever format is easiest to provide.

This document and the data request spreadsheet build on the Instructions for the VM-20 Field Test, “NAIC VM-20 Field Test - Project Overview and Participant Instructions REVISED 2010-12-02.pdf”, and available at https://oneplace.ehr.com/sites/NAIC/Instructions/default.aspx.

Phase I Data Request Reporting Template.xls

A spreadsheet template was created to provide a consistent format for participants in the study to submit the Phase I data request. This template is not intended to be overwhelming, but if you have difficulty in providing the data in the format requested, please provide us with the data in the format you are able to. Submissions should be sent to vm20.impactstudy@towerswatson.com.

Each company should complete the spreadsheet template one time for each Product they are testing.

If you are modeling more than one segment for your Product, please provide a description of each model segment in the space provided. For example, if you are testing Term, you may have the following model segments:

- Model segment 1 – Aggregate term (i.e. all other segments modeled together)
- Model segment 2 – 10 year term
- Model segment 3 – 20 year term
- Model segment 4 – 30 year term
- Model segment 5 – 10 year return of premium term
- Model segment 6 – 20 year return of premium term
- Model segment 7 – 30 year return of premium term
- Model segment 8 – Annually renewable term

Other model segments could include, but are not limited to the following:

- Term Insurance - 10 year term

- Term Insurance - 20 year term
- Term Insurance - 30 year term
- Term Insurance - 10 year return of premium term
- Term Insurance - 20 year return of premium term
- Term Insurance - 30 year return of premium term
- Term Insurance - Annually renewable term
- Term Insurance - Aggregate
- Traditional Whole Life - Participating whole life
- Traditional Whole Life - Variable whole life
- Traditional Whole Life - Indexed whole life
- Traditional Whole Life - Aggregate
- Simplified Issue - Term
- Simplified Issue - Whole life
- Simplified Issue - Aggregate
- Current Assumption UL without SG - Minimally funded
- Current Assumption UL without SG - Accumulation
- Current Assumption UL without SG - Fixed premium
- Current Assumption UL without SG - Aggregate
- ULSG - Shadow account
- ULSG - Double shadow account
- ULSG - Minimum premium
- ULSG - Short term guarantee
- ULSG - Lifetime guarantee
- ULSG - Aggregate

- Indexed Universal Life
- Variable Universal Life
- Reinsurance - Assumed coinsurance
- Reinsurance - Modified Coinsurance
- Reinsurance - Assumed YRT on permanent products
- Reinsurance - Assumed YRT on term products
- Reinsurance - Aggregate YRT
- Reinsurance - Aggregate

For each model segment run, the spreadsheet contains sections for results from each of the four runs necessary to complete the field study:

- Run 1) 1 year of business and credit spread alternative 1
- Run 2) 5 years of business and credit spread alternative 1
- Run 3) 1 year of business and credit spread alternative 2
- Run 4) 5 years of business and credit spread alternative 2

WHICH TABS DO I FILL OUT?

If you pass one or both exclusion tests, you only need to fill out the Summary tab, Deterministic Exclusion Test tab and Stochastic Exclusion Test tab. But if you have the capability, we strongly encourage you to calculate the deterministic reserve and stochastic reserve, and fill out the Stochastic Reserve tab.

If you don't pass the stochastic exclusion test, you only need to fill out the Summary tab, Stochastic Reserve tab and Stochastic Exclusion Test tab, but if you have the capability, we strongly encourage you to calculate the deterministic exclusion test and fill out that tab.

If your plan for VM-20 is to skip the exclusion tests and to calculate all required reserves, that is fine. You would only have to fill out the Summary tab and Stochastic Reserve tab. But for this field test, if you have the capability, we strongly encourage you to calculate the deterministic and stochastic exclusion tests and fill out those tabs.

TEMPLATE TAB 1: "SUMMARY"

Company Information:

For tracking purposes, please list your company name and contact information.

Product Information:

This section is intended to give us information about the product, product grouping, and model segment being modeled.

The following information is being requested:

- Product
- Number of model segments the product grouping contains
- Description of model segments

Assets

In most cases we expect participants to fill out this section. Although there may be some circumstances where participants do not have to run any asset models, for example, participants that pass the deterministic exclusion test, and elect to pass the stochastic exclusion test by provided certification by a qualified actuary that the group of policies is not subject to material interest rate risk or tail risk, or asset risk (this option is not available for VUL and ULSG)

This section requests your starting assets subject to a principles-based valuation for each model segment. It goes on to request the following information on fixed income investments included in the initial asset amounts (please do not include assets that don't have a NAIC designation and aren't subject to the VM-20 default framework; information on these assets is requested in the Additional Information section below):

- Market Value
- Statutory Value

- Gross Level Option Adjusted Spread (OAS) over Treasury (in basis points) implied in MV (i.e. embedded spread disclosure)
- Projected estimated annual default costs as a percentage of approximate average annual MV
- Net Level OAS over treasury
- Aggregate Weighted Average Life

In-Force Amounts

This section requests details on the Face Amount, Account Value (for fund value products), Cash Value (for fund value products only), and Net Amount at Risk (for fund value products only). To the extent possible, please provide these details on a direct, assumed, ceded and net basis.

Reserves

This section requests a breakdown of your current formulaic reserves into basic and deficiency, with and without reinsurance.

The aggregate minimum reserve is also requested, along with its components, the deferred premium asset, the net premium reserve, deterministic reserve (if calculated), and stochastic reserve (if calculated). In addition, we request you break down the minimum reserve into its general account and separate account components; i.e. the liability due to contractual guarantees provided by the GA (must be greater than or equal to zero), and the liability due to the variable portion of contracts (must be greater than or equal to the cash surrender value and less than or equal to the account value).

GAAP Benefit reserves are also requested, if available, for comparison purposes.

To the extent possible, please provide these details on a direct, assumed, ceded and net basis.

TEMPLATE TAB 2: "Stochastic Reserve"

Companies that calculate a stochastic reserve are requested to provide the following information:

- CTE70 Reserve
- Additional Reserves for risks not captured
- Stochastic Reserve
- A vector of the Greatest Present Value of Accumulated Deficiencies for the number of scenarios modeled

- Please run and provide data for as many scenarios as possible
- It is important you provide the original AAA ESG scenario numbers
- You will need to modify the spreadsheet slightly if you ran a different number of scenarios for different model segments. Please feel free to contact us if you would like assistance with this.
- We don't expect companies will compute assumed or ceded amounts by scenario, so if you do supply this information, please define how it was computed.

TEMPLATE TAB 3: "Deterministic Exclusion Test"

Companies that calculate the deterministic exclusion test are asked to provide:

- Sum of Valuation Net Premiums for the Group (using designated scenario 12)
- Sum of Guaranteed Gross Premiums for the Group (using designated scenario 12)

Please provide this information for all model segments for which you calculated the deterministic exclusion test. Also, please provide for both the one year of business, and five year of business runs.

The Deterministic Exclusion test is passed when the Valuation Net Premiums are less than the Guaranteed Gross Premiums. The worksheet does the comparison automatically once the premium amounts have been entered.

TEMPLATE TAB 4: "Stochastic Exclusion Test"

Companies that calculate the stochastic exclusion test are asked to provide:

- For the 16 NAIC Scenarios, the Adjusted Deterministic Reserve.
- For scenario 9, the Baseline Scenario, the Present Value of Benefits less Reinsurance

Please provide this information for all model segments for which you calculated the deterministic exclusion test. Also, please provide for all four types of runs.

The spreadsheet then calculates the maximum of the 16 NAIC scenarios as well as the test ratio as defined in VM-20. The Stochastic Exclusion Test is passed when the Test Ratio is less than 4.5%.

Additional Information

In addition to the reporting template, we are also requesting additional information in the format you are best able to complete. Companies are encouraged to refer to VM-31 - PBR Report Requirements for Business Subject to a Principle-Based Reserve Valuation when possible. Submissions should be sent to vm20.impactstudy@towerswatson.com. The following Additional Information is being requested:

- Existing assets used in the models (in the format most easy to provide), including information on spreads and default costs
- Information on the cash flow model(s) used by the company in determining principles based reserves
- Information on how assets were selected and apportioned between those policies subject to principles based reserving and those not subject to principles based reserves
- Assumptions, including anticipated experience, margin amount and rationale for selecting those margins
- Reinsurance details
- Details on non-guaranteed elements in the model
- Description of any material risks
- Other additional information you think is relevant and material to your reserve calculations
- Rationale for model segments and aggregation subgroups
- Separate information on non-NAIC assets that aren't subject to the NAIC default framework, including information on prudent estimate default assumption developed.

D: Phase II Instructions and Data Template

These instructions were sent to participants on June 23, 2011

Background and Purpose of Phase II of the Field Test

Phase I of the field test had two main objectives: (1) to measure the baseline impact of switching to a principle-based approach to reserves on the life insurance industry and life insurance products, and (2) to have participating companies work through the process of building robust and accurate VM-20 models in order to produce reasonable and valid baseline results.

In addition, other NAIC field test objectives will be able to be addressed, at least partially, with data from Phase I. These include:

- The effectiveness of the Exclusion Tests (deterministic and stochastic) as a risk measurement tool in determining the ultimate level of minimum reserves that ought to be established based upon the underlying risks assumed.
- The effectiveness of the Net Premium Reserve Component as a floor for the minimum reserve.
- The effectiveness of the American Academy of Actuaries' Economic Scenario Generator in exposing asset and liability risks embedded in a life insurance company's balance sheet, given different future economic environments.
- The method of recognizing different forms of reinsurance, both proportional and non-proportional agreements, and the determination of pre- and post-reinsurance amounts and reinsurance reserve credits.
- Understanding company variation in how companies determine anticipated experience assumptions, including the use of credibility theory and sensitivity testing in establishing prudent estimate assumption margins.
- The most effective reporting and documentation of reserve results, modeling assumptions, experience assumptions, margins, and sensitivity testing.
- The most effective regulatory benchmarks and/or metrics to be used in determining a company's compliance with the principle-based valuation provisions of the standard valuation law and valuation manual.

- Areas where further refinements or changes, if any, to the methodology are needed or suggested based in the results of the modeling or analysis. The primary goal of such changes would be to improve the risk measurement functionality of the methodology.

It is likely that not all of the above objectives will be able to be met based solely on analysis of Phase I results and documentation. As Phase I data is analyzed over the next few weeks (and late data is received and analyzed over the next couple months) we will be able to ascertain whether additional data and information is necessary to meet the above objectives. If so, we will request additional data from the participating companies in the form of an addendum(s) to these Phase II instructions.

NAIC objectives for the field test that will be addressed in Phase II include:

- Understanding how companies determine the level of granularity used in combining or grouping assets and liabilities into model cells so that all major risk characteristics are reflected or captured. In addition, understanding the sensitivity of results to the level of granularity.

- Understanding how companies determine the number of economic scenarios that should be modeled so results have statistical confidence. Such processes may take into account scenario reduction or stratified sampling techniques. Changes to the starting (at the valuation date) economic environment will be investigated (including its impact on defaults), as will changes to economic scenario generator parameters.

- Understanding how companies use sensitivity testing in identifying the major risk components of a company's balance sheet, including the results of various sensitivity tests on items such as: key asset and liability assumptions, older blocks of business, and changes to starting asset allocations.

The NAIC objective related to measuring the cost of implementation will be addressed via a survey at the end of Phase II. Specifically, this objective reads as follows:

- The ease of implementation of the proposed methodology, taking into account human resources, information technology resources, computer modeling run times, and the required sensitivity analysis. The ease of implementation should consider available scenario reduction techniques or processes that may be implemented.

The NAIC objective related to clarifying VM-20 language will be addressed via the communication we have with participants throughout the process, particularly the question and answer section of the bulletin board. Specifically, this objective reads as follows:

- List areas where further clarification of the proposed methodology or processes is needed in order to facilitate a smooth implementation.

Phase II Approach

Phase II consists mainly of sensitivity tests of the Phase I models, assumptions, and results. Individual sensitivity tests are laid out in the Phase II Sensitivity Tests section below. Note that Phase I consisted of six valuations:

- a valuation using the current formula-based reserve standards with one calendar year of issues;
- a valuation using the current formula-based reserve standards with five calendar years of issues;
- a VM-20 valuation with one calendar year of issues, using Alternative 1 asset credit spreads;
- a VM-20 valuation with five calendar years of issues, using Alternative 1 asset credit spreads;
- a VM-20 valuation with one calendar year of issues, using Alternative 2 asset credit spreads;
- a VM-20 valuation with five calendar years of issues, using Alternative 2 asset credit spreads.

We will continue to request these six valuations for each of the sensitivity tests. Also note that VM-20 requires companies with reinsurance to calculate the minimum reserve with and without reinsurance.

As in Phase I, unless otherwise noted, the “as of” date for Phase II will continue to be December 31, 2009.

Liability In Force

In Phase II, we will continue to make use of the two liability in force files developed in Phase I: one with one calendar year of issues, and one with five calendar years of issues. Phase II also includes sensitivity tests on in force files with 10 and 15 calendar years of issues. Please develop these in force file in a manner consistent with that used to develop the other two in force files. More guidance regarding the in force files can be found in the Phase I instructions on the bulletin board.

Unless otherwise indicated, please use the same liability cell compression algorithm used to construct the liability in force files for Phase I modeling.

Product Groupings

Participants will be modeling the same product groupings they modeled in Phase I.

Reinsurance

As in Phase I, please totally exclude, for the purposes of this field test, any XXX, AXXX (AG38), or other such financing treaties you have in place. However, please do include all other reinsurance as directed in VM-20. This will likely include calculating a pre-reinsurance ceded reserve.

Aggregation Methodology

Unless otherwise indicated, aggregation methodology should be the same as in Phase I.

Liability Assumptions

Unless otherwise indicated, please use the anticipated experience assumptions and prudent estimate margins used in Phase I

Asset Models

Unless otherwise indicated, asset models should be the same as in Phase I.

Asset Credit Spreads

Unless otherwise indicated, as in Phase I, please calculate VM-20 results under both alternative 1 and 2 asset credit spreads, and assume that the December 31, 2009 credit spreads are equal to the long term credit spreads shown in Appendix 2 of VM-20 (Tables H and I).

Economic Scenarios

Unless otherwise indicated, please run your models with the same economic scenario sets used in Phase I.

Net Premium Reserve, Deterministic Reserve, Stochastic Reserve and Exclusion Tests

As in Phase I, please calculate these elements, as directed per VM-20

Additional Phase I Information

If you did not perform the exclusion tests for Phase I, please perform them (deterministic and/or stochastic) and send to us as soon as possible.

If you calculated the deterministic or stochastic reserve, please provide details on the credibility method used, the granularity used in evaluating company experience (e.g. on a segmented and duration basis or on a more aggregate basis), and the impact of credibility on the mortality assumption used.

If you calculated the stochastic reserve, please provide expand GPVAD vectors into a two dimensional array with surplus streams and discount rates used for each scenario over time. This will be used to evaluate the impact of discounting at rates 100bp above and below, to study the impact of very large positive or negative ending surplus in the tail scenarios, and to evaluate accumulating and discounting after assets or liabilities run out.

If you calculated a DR or SR for Phase I (i.e. ran an ALM model), please be sure you let us know your disinvestment strategy for phase I.

If you modeled a ULSG product that utilizes a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level, please calculate the CRVM/AG38 reserve using the lowest set of charges. Please submit results separately for ULSG products that utilize a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level

Please note there is no template for this additional Phase I information being requested. Please submit to the project inbox as soon as possible in your desired format.

Phase II Sensitivity Tests

Unless otherwise stated, please perform sensitivity tests on the 5-year block of business, under credit spread Alternative 2, and net of reinsurance. The sensitivity tests should result in the VM-20 minimum reserve amount, so at a minimum the Net Premium Reserve will have to be calculated.

If you calculated a deterministic reserve for Phase I, then please calculate a deterministic reserve for Phase II.

If you calculated a stochastic reserve for phase I, then please calculate a stochastic reserve when you run sensitivities. If possible run with the same set of scenarios. If resource constraints require you to run with less scenarios, please use one of the subsets we posted for Phase I.

Ideally we would also like to see the formulaic CRVM reserve alongside the VM-20 minimum reserve, as well as the results of the deterministic and stochastic exclusion tests, but these are not required (except for sensitivity 2).

Please focus on high priority sensitivity tests, moving on to medium and then low priority sensitivity tests.

High Priority

24. Mortality Margins and Credibility – This series of sensitivities is designed to help understand the components of change as we move stepwise from best estimate mortality to VM-20 mortality. These sensitivities only apply to the calculation of the Deterministic and Stochastic Reserves. It is important they be done in the order specified.

    a. Best estimate – Set the mortality assumption to company best estimate. Include mortality improvement if it is part of the company best estimate.

    b. Best estimate, no improvement – Remove the mortality improvement from the company best estimate (skip this step if your company best estimate does not include mortality improvement).

    c. Best estimate, no improvement, with margin – Add the explicit margin per VM-20.

    d. VM-20 with “LRWG” credibility – Credibility-blend mortality using a “total company” view of credibility. That is, use an entire block of policies with similar underwriting methods to define a credibility segment used for determining a credibility factor. (This may have been where you stopped for purposes of calculating the Phase I baseline, in which case you can skip this step as it will equal your Phase I baseline).

    e. Full VM-20 credibility – Credibility-blend mortality using VM-20’s more granular basis for credibility (as in the example provided in the training session in Kansas City). You may skip this sensitivity as it will equal your Phase I baseline.

1.5. Margins – For this sensitivity, do not consider credibility blending mortality to constitute a margin, but do consider the explicit VM-20 mortality margin to be a margin. This sensitivity on applies to the calculation of the Deterministic and Stochastic Reserves.

    a. No margins –Margins should be removed from all prudent-estimate assumptions that contain margins.

    b. Double margins – Margins should be doubled for all prudent estimate assumptions that contain margins.

25. Reserve Pattern – Redo Phase I; i.e. both credit spread Alternatives 1 and 2, with and without reinsurance, and please don’t forget to run exclusion tests, deterministic reserve, and stochastic reserve if you can. This sensitivity applies to exclusion tests, NPR, DR and SR. This sensitivity can be reported using the reporting template, but reporting 10 calendar years of issues under “1 year of business” and 15 calendar years of issues under “5 years of business”.

    a. 10 calendar years of issues

    b. 15 calendar years of issues

    c. If your modeling system has the capability to calculate future VM-20 reserves, then instead of (a) and (b) above, you could run this sensitivity on a single year of issue and calculate reserves at time 1, 5, 10 and 15. Please assume the initial yield curve remains flat until those times.

26. Compression – Granularity in liability in force files

    a. More compression – e.g. group together more issue ages, smoking classes, rate classes, funding patters, issue months until your liability inforce file has 50-75% of the number of model points. Please be sure to report this compression factor as well as the characteristics that had additional grouping performed. This sensitivity only applies to the calculation of deterministic and stochastic reserves.

27. Initial Treasury Rates – The scenario sets for this sensitivity are located at https://oneplace.ehr.com/sites/NAIC/ScenarioGenerator/sens_phaseII/Shared%20Documents/Forms/AllItems.aspx.

    a. Plus 100 basis points

    b. Minus 100 basis points

    c. Inverted

28. ESG parameters – The scenario sets for this sensitivity are located at https://oneplace.ehr.com/sites/NAIC/ScenarioGenerator/sens_phaseII/Shared%20Documents/Forms/AllItems.aspx.

    a. Long rate mean reversion point plus 100 basis points

    b. Long rate mean reversion point minus 100 basis points

    c. 150% long rate volatility

    d. 150% volatility of stochastic volatility

Medium Priority

29. NPR

    a. For ULSG, change formula in 3.C.3.c.ii to $L_{x+t} = R_{x+t} \cdot 0.03 + (1 – R_{x+t}) \cdot 0.015 \cdot r_{x+t}$

    b. Please conduct a sensitivity to the NPR calculation by changing the valuation rate from 5% to 4% for the no-CSV benefit streams. And from 4% to 3% for the with-CSV benefit streams.

    c. For those testing Whole Life and UL without secondary guarantees, use section 3 of VM-20 to calculate the Net Premium Reserve instead of using CRVM

30. Mortality – 10% permanent increase in mortality (i.e., mortality rates multiplied by 1.10 in all projection years and durations). For products with NGE, please don't model management behavior, e.g. the increasing of COIs.

31. Lapse Rates – For term business, the lapse increase/decrease only applies during the level term period. For other business, the lapse increase/decrease applies in all policy durations.

    a. Decrease lapse rates by 20%, i.e. multiply by 0.80.

    b. Increase lapse rates by 20%, i.e. multiply by 1.20.

32. ULSG Funding Patterns – In addition to the baseline level funding pattern tested as part of Phase I, test the following three funding patterns (a, b, and c below). Note, for all funding patterns, premiums should be assumed to cease when the secondary guarantee is fully funded.

    a. Premium acceleration – Increase each policy's premium 25% (i.e. 125% multiple applied to premium in all years).

    b. Premium deceleration – Decrease each policy's premium 25% (i.e. 75% multiple applied to premium in all years)

    c. Premium to maintain the guarantee – Assume the baseline premium pattern, until a premium is necessary to prevent the policy from lapsing without value. To prevent the policy from lapsing without value, assume the minimum required premium is paid to persist the policy from one policy year to the next. If your ULSG product utilizes a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level, the minimum required premium should be calculated assuming the lowest set of charges. Please submit results separately for ULSG products that utilize a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level

33. No Tail Profit – 100% shock lapse at the end of the level term period. Policies already beyond the level term period as of the valuation date are assumed to lapse immediately with no value. This test only applies to term business.

34. Starting Assets – Test impact of starting assets falling outside of the targeted range of 98-102% of the final aggregate modeled reserve. This sensitivity only applies to the calculation of deterministic and stochastic reserves.

    a. Increase starting assets by 10%

    b. Decrease starting assets by 10%

35. Disinvestment – If you are calculated a DR or SR (i.e. ran an ALM model for Phase I), please run sensitivities with different disinvestment strategies if your model has the ability to:

    a. Sell assets

    b. Borrow

    c. Use negative assets

Low Priority

36. Equity Rates – For companies modeling VUL, we will contact you directly to determine the appropriate equity sensitivities to run

37. Expenses – Increase expenses by 10%

38. Asset Credit Spreads

    a. Please use the new lower *initial* asset credit spread table posted to the bulletin board (Tables F2 and G2 at https://oneplace.ehr.com/sites/NAIC/InputsandSpreads/Standardized%20Inputs%20and%20Spreads/VM-20%20Appendix%20Tables%20(additional%20tables%20for%20sensitivities%2015%20and%2017)%20rev.xls)

b. Please use the new lower *ultimate* asset credit spread table posted to the bulletin board (Tables H2 and I2 at https://oneplace.ehr.com/sites/NAIC/InputsandSpreads/Standardized%20Inputs%20and%20Spreads/VM-20%20Appendix%20Tables%20(additional%20tables%20for%20sensitivities%2015%20and%2017)%20rev.xls)

39. Dynamic Lapses – On UL products

    a. Double dynamic lapses on UL products

    b. Halve dynamic lapses on UL products

40. Defaults – Double defaults

Phase I Errors or Methodology Changes

It is likely that errors will be found, or methodology changes will be decided upon at your company that could potentially change the Phase I results you submitted. If this happens please let us know via the project inbox, and we will contact you to determine the best course of action.

Reporting of Results

Phase II results will be reported using the same reporting template used in Phase I. In general you will need to fill out a separate reporting template for each sensitivity you conduct. Please be sure to indicate the sensitivity being reported on in row 3 of the Summary tab, as well as in the filename itself. Although several files will need to be submitted (one for each sensitivity), you will be able to leverage using the same format each time.

In addition, one-on-one interviews may also be used to gather field test information for analysis and report compilation.

Reliances and Limitations

Towers Watson has performed the work assigned and has prepared this memorandum in conformity with its intended utilization by a person(s) technically competent in the areas addressed and for the stated purposes only. Members of the Towers Watson staff are available to explain and/or amplify any matters presented herein, and it is assumed that the user of this document will seek such explanation and/or amplification as to any matter in question.

E: Phase II Detailed Results

The Impact Study was completed in two phases: Phase I compared baseline VM-20 results to current valuation results while Phase II consisted mainly of various sensitivities related to VM-20 assumptions. This appendix provides the detailed results of the Phase II submissions.

The complete instructions for Phase II are included in Appendix D. In general, participants were instructed to use the same in force, assumptions and methodologies as they used in Phase I, unless otherwise indicated by the sensitivity test. The results of the sensitivity tests were requested for 5 years of issues, credit spread Alternative 2, and net of reinsurance only.

Some of the Phase II baseline results that were submitted were different from the Phase I results that were submitted due to changes in models and/or assumptions.

Table E.1 provides a brief description of the sensitivities that were requested. More detailed descriptions are provided in the subsections that follow.

TABLE E.1 – Sensitivity Description

Sensitivity Number	Sensitivity Description
1	Mortality Rates +10%
2	Mortality Margin Component Analysis
3	Margins (Zero and Double)
4	Lapse Rates +/- 20%
5	Dynamic Lapses
6	Expenses +10%
7	ULSG Funding Patterns
8	Net Premium Reserve
9	Starting Assets +/- 10%
10	Lower Spreads
11	Double Defaults
12	Negative Cash Flow Strategy
13	ESG Starting Yield Curve

TABLE E.1 – Sensitivity Description	
Sensitivity Number	**Sensitivity Description**
14	ESG Parameters
15	Eliminate Post-Level Term Amounts
16	Double Compression of Model Points
17	Expand to 10 and 15 Years of Issues

Phase II Participation

Not all companies participating in Phase I participated in Phase II. In addition, those companies performing the Phase II sensitivities did not run all sensitivities. Table E.2 provides a summary of the submissions for each product.

TABLE E.2 – Phase II Product Coverage by Sensitivity (Sensitivities 1 through 17)

Count of Product Segments

Product	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ULSG	4	6	4	4	1	3	4	2	3	1	3	3	4	0	0	2	2
ULwo	1	2	0	0	1	1	0	1	1	1	1	1	2	2	0	1	1
Term	12	13	11	12	0	3	0	3	4	1	2	3	13	4	4	4	7
TWL	1	1	0	0	0	1	0	1	1	0	1	1	1	0	0	1	1
SIWL	1	1	0	0	0	1	0	2	0	0	1	1	1	0	0	1	3
VUL	1	1	0	0	0	1	0	0	1	1	1	0	1	0	0	1	1

Detailed Results of Each Sensitivity Test

The remainder of this appendix presents the results for each sensitivity test for each participant that provided Phase II submissions. Generally, the percentage change from baseline is shown for each VM-20 component. The dominant VM-20 component under the baseline and sensitivity test is also provided in order to highlight cases in which the dominant component changed.

In certain cases, not all elements of the sensitivity test or all reserve components were provided. In these instances, the table figure is left blank.

Sensitivity 1 – Mortality Rates +10%

Description of Sensitivity Test:

Mortality rates used for the deterministic and stochastic reserves are permanently increased by 10% (i.e., mortality rates multiplied by 1.10 in all projection years and durations) with no adjustment to non-guaranteed cost of insurance charges or premium rates.

Results of Sensitivity Test:

TABLE E.3a – Mortality Rates + 10% Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component		% Change from Baseline		
		Baseline	+10% Mortality	DR	SR	Minimum
Term 10	22	NPR	SR	134%	73%	21%
Term 15	22	NPR	SR	209	134	39
Term 15R	22	SR	SR	45	25	25
Term 20	5	SR	SR	84	67	67
Term 20	19	NPR	NPR	161	n/a	0
Term 20	22	SR	SR	109	75	75
Term 20R	22	SR	SR	41	29	29
Term 30	22	SR	SR	105	83	83
Term 30R	22	SR	SR	50	43	43
Term Agg	9	DR	DR	20	n/a	20
Term Agg	10	SR	SR	35	0	0
Term Agg	17	NPR	n/a	9	n/a	0

TABLE E.3b – Mortality Rates + 10% Sensitivity

ULSG Business

Product	Participant	Dominant VM-20 Reserve Component		% Change from Baseline		
		Baseline	+10% Mortality	DR	SR	Minimum
ULSG	1	DR	DR	5%	6%	5%
ULSG	3	SR	SR	4	5	5
ULSG	4	SR	SR	15	8	8
ULSG	9	SR	SR	3	6	6

TABLE E.3c – Mortality Rates + 10% Sensitivity

Other Business

Product	Participant	Dominant VM-20 Reserve Component		% Change from Baseline		
		Baseline	+10% Mortality	DR	SR	Minimum
SIWL	21	NPR	DR	68%	31%	8%
TWL	23	NPR	NPR	13	12	0
ULwo	19	NPR	NPR	47	0	0
VUL	24	NPR	NPR	-1	2	0

Sensitivity 2 – Mortality Margin Component Analysis

Description of Sensitivity Test:

This is a series of sensitivities is designed to help understand the components of change as we move stepwise from best estimate mortality to VM-20 mortality. These sensitivities only applied to the calculation of the deterministic and stochastic reserves. The steps were performed in the following order:

- Best estimate – Set the mortality assumption to company best estimate. Include mortality improvement if it is part of the best estimate.

- Best estimate, no improvement – Remove the mortality improvement from the company best estimate (this step may be skipped if the company best estimate does not include mortality improvement).

- Best estimate, no improvement, with margin – Add the explicit margin per VM-20.

- VM-20 with "LRWG" credibility – Credibility-blend mortality using a "total company" view of credibility. That is, use an entire block of policies with similar underwriting methods to define a credibility segment used for determining a credibility factor. (This may have been the where the company stopped for purposes of calculating the Phase I baseline, in which case this step was skipped as would be equal the Phase I baseline).

- Full VM-20 credibility – Credibility-blend mortality using VM-20's more granular basis for credibility.

Results of Sensitivity Test:

Some participants provided results only up to the mortality margin step, while others were able to fully complete the analysis. The "not provided" cases are indicated by a blank in each table.

The following table shows the VM-20 maximum reserve component at each step in the sensitivity.

TABLE E.4a – Mortality Margin Component Analysis Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component				
		VM-20 Res using Pricing Assumption	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry
Term 10	22	NPR	NPR	NPR	n/a	n/a
Term 15	22	NPR	NPR	NPR	n/a	n/a
Term 15R	22	SR	SR	SR	n/a	n/a
Term 20	5	NPR	NPR	SR	n/a	n/a
Term 20	19	NPR	NPR	NPR	NPR	NPR
Term 20	22	NPR	NPR	SR	n/a	n/a
Term 20R	22	SR	SR	SR	n/a	n/a
Term 30	22	NPR	SR	SR	n/a	n/a
Term 30R	22	NPR	SR	SR	n/a	n/a

TABLE E.4a – Mortality Margin Component Analysis Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component				
		VM-20 Res using Pricing Assumption	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry
Term Agg	8	DR	DR	DR	DR	n/a
Term Agg	9	NPR	DR	DR	DR	DR
Term Agg	10	SR	SR	SR	SR	SR
Term Agg	17	DR	DR	DR	DR	DR

The table below shows the change in the VM-20 minimum reserve at each step in the sensitivity. Note that if the NPR is the minimum reserve in both the current and prior steps, then there will be no change since the NPR mortality was not changed for this sensitivity.

TABLE E.4b – Mortality Margin Component Analysis Sensitivity

Term Business – Minimum Reserve

Product	Participant	% Change in VM-20 Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final VM-20 Res/ 1,000	Total Change
Term 10	22	3.1	0%	0%	n/a	n/a	3.1	0%
Term 15	22	2.5	0	0	n/a	n/a	2.5	0
Term 15R	22	7.3	25	11	n/a	n/a	9.9	36
Term 20	5	2.0	0	10	n/a	n/a	2.2	10
Term 20	19	2.3	0	0	0%	0%	2.3	0
Term 20	22	1.9	0	10	n/a	n/a	2.1	10
Term 20R	22	3.4	52	15	n/a	n/a	5.7	67
Term 30	22	1.4	6	37	n/a	n/a	2.0	43

TABLE E.4b – Mortality Margin Component Analysis Sensitivity

Term Business – Minimum Reserve

Product	Participant	% Change in VM-20 Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final VM-20 Res/ 1,000	Total Change
Term 30R	22	0.9	189	41	n/a	n/a	3.1	230
Term Agg	8	1.7	59	28	184	n/a	6.3	271
Term Agg	9	1.7	21	46	249	73	8.4	389
Term Agg	10	9.5	-2	-4	0	4	9.3	-2

TABLE E.4c – Mortality Margin Component Analysis Sensitivity

Term Business – Deterministic Reserve

Product	Participant	% Change in Deterministic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final DR/ 1,000	Total Change
Term 10	22	-0.5	-251%	-123%	n/a	n/a	1.3	-374%
Term 15	22	-1.4	-124	-41	0%	n/a	0.9	-164
Term 15R	22	5.8	-14	16	n/a	n/a	5.9	2
Term 20	5	0.8	0	122	n/a	n/a	1.9	122
Term 20	19	-1.4	0	-39	0	-100	0.5	-138
Term 20	22	-0.9	-213	-54	n/a	n/a	1.5	-267
Term 20R	22	1.8	108	30	n/a	n/a	4.2	138
Term 30	22	-1.8	-160	-27	n/a	n/a	1.6	-188
Term 30R	22	0.0	6774	1172	n/a	n/a	2.8	7947
Term Agg	8	1.7	59	28	184	n/a	6.3	271

TABLE E.4c – Mortality Margin Component Analysis Sensitivity

Term Business – Deterministic Reserve

Product	Participant	% Change in Deterministic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final DR/ 1,000	Total Change
Term Agg	9	1.5	42	54	292	85	8.4	472
Term Agg	10	3.7	14	46	0	58	8.0	117
Term Agg	17	-1.8	-5	-5	-1	-6	-1.5	-18

TABLE E.4d – Mortality Margin Component Analysis Sensitivity

Term Business – Stochastic Reserve

Product	Participant	% Change in Stochastic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final SR/ 1,000	Total Change
Term 10	22	1.0	72%	55%	n/a	n/a	2.2	127%
Term 15	22	-0.8	-203	-89	n/a	n/a	1.5	292
Term 15R	22	7.3	25	11	n/a	n/a	9.9	36
Term 20	5	1.2	0	83	n/a	n/a	2.2	83
Term 20	22	-0.9	-274	-73	n/a	n/a	2.1	347
Term 20R	22	3.4	52	15	n/a	n/a	5.7	67
Term 30	22	-1.0	-249	-52	n/a	n/a	2.0	301
Term 30R	22	0.4	556	93	n/a	n/a	3.1	650
Term Agg	8	2.0	52	23	162%	n/a	6.9	237
Term Agg	10	9.5	-2	-4	0	4%	9.3	-2

TABLE E.4e – Mortality Margin Component Analysis Sensitivity

ULSG Business

Product	Participant	Dominant VM-20 Reserve Component				
		VM-20 Res using Pricing Assumption	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry
ULSG	1	DR	DR	DR	DR	DR
ULSG	3	NPR	DR	SR	SR	n/a
ULSG	4	NPR	NPR	NPR	SR	SR
ULSG	7	SR	SR	SR	SR	n/a
ULSG	8	SR	SR	SR	SR	SR
ULSG	9	SR	SR	SR	SR	SR

TABLE E.4f – Mortality Margin Component Analysis Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	% Change in VM-20 Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final VM-20 Res/ 1,000	Total Change
ULSG	1	98.0	6%	3%	20%	4%	130.9	34%
ULSG	3	96.5	6	5	16	n/a	122.0	26
ULSG	4	62.7	0	0	9	5	71.4	14
ULSG	7	27.7	0	11	48	n/a	43.8	58
ULSG	8	75.4	10	5	39	5	119.2	58
ULSG	9	75.4	2	2	13	8	94.5	25

TABLE E.4g – Mortality Margin Component Analysis Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	% Change in Deterministic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final DR/ 1,000	Total Change
ULSG	1	98.0	6%	3%	21%	4%	130.9	34%
ULSG	3	94.7	8	5	15	n/a	120.7	27
ULSG	4	37.6	0	10	21	9	52.7	40
ULSG	7	24.3	0	18	50	n/a	40.8	68
ULSG	8	40.6	18	10	69	16	86.1	112
ULSG	9	71.6	2	2	16	7	90.5	26

TABLE E.4h – Mortality Margin Component Analysis Sensitivity

ULSG Business – Stochastic Reserve

Product	Participant	% Change in Stochastic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final SR/ 1,000	Total Change
ULSG	1	92.6	6%	3%	24%	3%	126.4	36%
ULSG	3	94.7	7	5	16	n/a	122.0	29
ULSG	4	59.4	0	5	10	5	71.4	20
ULSG	7	27.7	0	11	48	n/a	43.8	58
ULSG	8	75.4	10	5	39	5	119.2	58
ULSG	9	75.4	2	2	13	8	94.5	25

TABLE E.4i – Mortality Margin Component Analysis Sensitivity

Other Business

Product	Participant	Dominant VM-20 Reserve Component				
		VM-20 Res using Pricing Assumption	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry
SIWL	21	NPR	NPR	DR	n/a	n/a
TWL	23	NPR	NPR	NPR	NPR	NPR
ULwo	18	NPR	NPR	DR	n/a	n/a
ULwo	19	NPR	NPR	NPR	NPR	DR
VUL	24	DR	DR	DR	NPR	n/a

TABLE E.4j – Mortality Margin Component Analysis Sensitivity

Other Business – Minimum Reserve

Product	Participant	% Change in VM-20 Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final VM-20 Res/ 1,000	Total Change
SIWL	21	54.5	0%	7%	n/a	n/a	58.4	7%
TWL	23	28.0	0	0	0%	0%	28.0	0
ULwo	18	202.7	0	7	n/a	n/a	215.9	7
ULwo	19	30.7	0	0	0	55	47.7	55
VUL	24	15.8	0	-1	-1	n/a	15.5	-2

TABLE E.4k – Mortality Margin Component Analysis Sensitivity

Other Business – Deterministic Reserve

Product	Participant	Change in Deterministic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final DR/ 1,000	Total Change
SIWL	21	5.6	0%	655%	n/a	n/a	42.2	655%
TWL	23	15.3	0	12	25%	19%	23.9	56
ULwo	18	167.1	0	29	n/a	n/a	215.9	29
ULwo	19	16.4	0	23	0	168	47.7	191
VUL	24	15.8	0	-1	n/a	n/a	15.6	-1

TABLE E.4l – Mortality Margin Component Analysis Sensitivity

Other Business – Stochastic Reserve

Product	Participant	% Change in Stochastic Reserve						
		VM-20 Res/ 1,000 using Pricing Assump	Remove Mort Imp	Add Mort Margin	LRWG Credibility Blend w/ Industry	Full Credibility Blend w/ Industry	Final SR/ 1,000	Total Change
SIWL	21	23.8	0%	110%	n/a	n/a	49.9	110%
TWL	23	16.6	0	10	20%	19%	24.7	49
ULwo	18	166.6	0	16	n/a	n/a	192.7	16
ULwo	19	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VUL	24	3.8	0	1	3	n/a	4.0	4

Sensitivity 3 – Margins (Zero and Double)

Description of sensitivity:

Margins are either removed (zero margin) or doubled. The margins refer to explicit margins on the best-estimate assumptions. The mortality credibility blending is not considered to be an explicit margin for the purposes of this test. This sensitivity does not apply to the NPR.

Results of Sensitivity Test:

TABLE E.5a – Margins (Zero and Double) Sensitivity

Term Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	No Margins	Double Margins	No Margins	Double Margins
Term 10	22	NPR	NPR	NPR	0%	0%
Term 15	22	NPR	NPR	NPR	0	0
Term 15R	22	SR	SR	SR	-18	20
Term 20	19	NPR	NPR	NPR	0	0
Term 20	22	SR	NPR	SR	-9	35
Term 20R	22	SR	SR	SR	-22	24
Term 30	22	SR	NPR	SR	-30	53
Term 30R	22	SR	SR	SR	-34	39
Term Agg	9	DR	DR	DR	-31	45
Term Agg	10	SR	SR	DR	4	28
Term Agg	17	NPR	NPR	NPR	0	0

TABLE E.5b – Margins (Zero and Double) Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Change in Det. Reserve	
		Baseline	No Margins	Double Margins	No Margins	Double Margins
Term 10	22	NPR	NPR	NPR	-45%	49%
Term 15	22	NPR	NPR	NPR	-75	81
Term 15R	22	SR	SR	SR	-30	31
Term 20	19	NPR	NPR	NPR	-60	58
Term 20	22	SR	NPR	SR	-44	49
Term 20R	22	SR	SR	SR	-28	31
Term 30	22	SR	NPR	SR	-60	68
Term 30R	22	SR	SR	SR	-38	43
Term Agg	9	DR	DR	DR	-31	45
Term Agg	10	SR	SR	DR	0	86
Term Agg	17	NPR	NPR	NPR	-6	6

TABLE E.5c – Margins (Zero and Double) Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	No Margins	Double Margins	No Margins	Double Margins
Term 10	22	NPR	NPR	NPR	-27%	31%
Term 15	22	NPR	NPR	NPR	-60	66
Term 15R	22	SR	SR	SR	-18	20
Term 20	19	NPR	NPR	NPR	n/a	n/a
Term 20	22	SR	NPR	SR	-45	35
Term 20R	22	SR	SR	SR	-22	24

TABLE E.5c – Margins (Zero and Double) Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	No Margins	Double Margins	No Margins	Double Margins
Term 30	22	SR	NPR	SR	-62	53
Term 30R	22	SR	SR	SR	-34	39
Term Agg	9	DR	DR	DR	n/a	n/a
Term Agg	10	SR	SR	DR	4	27
Term Agg	17	NPR	NPR	NPR	n/a	n/a

TABLE E.5d – Margins (Zero and Double) Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	No Margins	Double Margins	No Margins	Double Margins
ULSG	1	DR	NPR	DR	-25%	8%
ULSG	3	SR	DR	SR	-9	8
ULSG	4	SR	NPR	SR	-12	12
ULSG	9	SR	SR	SR	-30	21

TABLE E.5e – Margins (Zero and Double) Sensitivity ULSG Business – Deterministic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Change in Det. Reserve**	
		Baseline	**No Margins**	**Double Margins**	**No Margins**	**Double Margins**
ULSG	1	DR	NPR	DR	-29%	8%
ULSG	3	SR	DR	SR	-8	8
ULSG	4	SR	NPR	SR	-18	17
ULSG	9	SR	SR	SR	-32	20

TABLE E.5f – Margins (Zero and Double) Sensitivity ULSG Business – Stochastic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in Stoch. Reserve**	
		Baseline	**No Margins**	**Double Margins**	**No Margins**	**Double Margins**
ULSG	1	DR	NPR	DR	-28%	8%
ULSG	3	SR	DR	SR	-9	8
ULSG	4	SR	NPR	SR	-13	12
ULSG	9	SR	SR	SR	-30	21

Sensitivity 4 – Lapse Rates +/- 20%

Description of Sensitivity Test:

Lapse rates are multiplied by either 1.20 (+20%) or .80 (-20%). For term business, the lapse increase/decrease only applies during the level term period. For other business, the lapse increase/decrease applies in all policy durations.

Results of Sensitivity Test:

TABLE E.6a – Lapse Rates +/- 20% Sensitivity

Term Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
Term 10	22	NPR	NPR	NPR	0%	0%
Term 15	22	NPR	NPR	NPR	0	0
Term 15R	22	SR	SR	SR	12	-12
Term 20	5	SR	SR	NPR	-4	23
Term 20	19	NPR	NPR	NPR	0	0
Term 20	22	SR	SR	NPR	13	-9
Term 20R	22	SR	SR	SR	15	-15
Term 30	22	SR	SR	SR	31	-29
Term 30R	22	SR	SR	SR	24	-22
Term Agg	9	DR	DR	DR	-8	9
Term Agg	10	SR	SR	SR	1	7
Term Agg	17	NPR	NPR	NPR	0	0

TABLE E.6b – Lapse Rates +/- 20% Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Change in Det. Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
Term 10	22	NPR	NPR	NPR	3%	-10%
Term 15	22	NPR	NPR	NPR	18	-18
Term 15R	22	SR	SR	SR	17	-19
Term 20	5	SR	SR	NPR	-23	27
Term 20	19	NPR	NPR	NPR	-15	-2

TABLE E.6b – Lapse Rates +/- 20% Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Change in Det. Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
Term 20	22	SR	SR	NPR	17	-17
Term 20R	22	SR	SR	SR	19	-18
Term 30	22	SR	SR	SR	39	-35
Term 30R	22	SR	SR	SR	20	-25
Term Agg	9	DR	DR	DR	-8	9
Term Agg	10	SR	SR	SR	-13	14
Term Agg	17	NPR	NPR	NPR	3	-3

TABLE E.6c – Lapse Rates +/- 20% Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
Term 10	22	NPR	NPR	NPR	6%	-9%
Term 15	22	NPR	NPR	NPR	19	-18
Term 15R	22	SR	SR	SR	12	-12
Term 20	5	SR	SR	NPR	-24	23
Term 20	19	NPR	NPR	NPR	n/a	n/a
Term 20	22	SR	SR	NPR	13	-16
Term 20R	22	SR	SR	SR	15	-15
Term 30	22	SR	SR	SR	31	-29
Term 30R	22	SR	SR	SR	24	-22
Term Agg	9	DR	DR	DR	n/a	n/a

TABLE E.6c – Lapse Rates +/- 20% Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
Term Agg	10	SR	SR	SR	1	7
Term Agg	17	NPR	NPR	NPR	n/a	n/a

TABLE E.6d – Lapse Rates +/- 20% Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
ULSG	1	DR	DR	DR	-4%	5%
ULSG	3	SR	SR	SR	-5	4
ULSG	4	SR	SR	SR	-7	7
ULSG	9	SR	SR	SR	-4	6

TABLE E.6e – Lapse Rates +/- 20% Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Det. Reserve	
		Baseline	Lapse +20%	Lapse -20%	Lapse +20%	Lapse -20%
ULSG	1	DR	DR	DR	-4%	5%
ULSG	3	SR	SR	SR	-4	4
ULSG	4	SR	SR	SR	-7	8
ULSG	9	SR	SR	SR	-3	3

TABLE E.6f – Lapse Rates +/- 20% Sensitivity ULSG Business – Stochastic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in Stoch. Reserve**	
		Baseline	**Lapse +20%**	**Lapse -20%**	**Lapse +20%**	**Lapse -20%**
ULSG	1	DR	DR	DR	-4%	4%
ULSG	3	SR	SR	SR	-5	4
ULSG	4	SR	SR	SR	-7	7
ULSG	9	SR	SR	SR	-4	6

Sensitivity 5 – Dynamic Lapses

Description of Sensitivity Test:

The dynamic lapses rates are doubled and halved. This sensitivity applies to UL products only.

Results of Sensitivity Test:

TABLE E.7a – Dynamic Lapse Sensitivity UL Business – Minimum Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in VM-20 Reserve**	
		Baseline	**Double**	**Half**	**Double**	**Half**
ULSG	3	SR	SR	DR	-3%	0%
ULwo	19	NPR	NPR	NPR	0	0

TABLE E.7b – Dynamic Lapse Sensitivity UL Business – Deterministic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in Det. Reserve**	
		Baseline	**Double**	**Half**	**Double**	**Half**
ULSG	3	SR	SR	DR	-2%	1%
ULwo	19	NPR	NPR	NPR	1	1

TABLE E.7c – Dynamic Lapse Sensitivity UL Business – Stochastic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in Stoch. Reserve**	
		Baseline	**Double**	**Half**	**Double**	**Half**
ULSG	3	SR	SR	DR	-3%	0%
ULwo	19	NPR	NPR	NPR	n/a	n/a

Sensitivity 6 – Expenses +10%

Description of Sensitivity Test:

Expenses included in the model are increased by 10%.

Results of Sensitivity Test:

TABLE E.8a – Expenses + 10% Sensitivity Term Business						
Product	**Participant**	**Dominant VM-20 Reserve Component**		**% Chg from Baseline**		
		Baseline	**Expenses +10%**	**DR**	**SR**	**Minimum**
Term 20	19	NPR	NPR	26%	n/a	0%
Term Agg	9	DR	DR	1	n/a	1

TABLE E.8a – Expenses + 10% Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Expenses +10%	DR	SR	Minimum
Term Agg	17	NPR	NPR	12	n/a	0

TABLE E.8b – Expenses + 10% Sensitivity

ULSG Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Expenses +10%	DR	SR	Minimum
ULSG	3	SR	SR	1%	1%	1%
ULSG	4	SR	SR	2	1	1
ULSG	9	SR	SR	0	3	3

TABLE E.8c – Expenses + 10% Sensitivity

Other Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Expenses +10%	DR	SR	Minimum
SIWL	21	NPR	NPR	16%	8%	0%
TWL	23	NPR	NPR	6	6	0
ULwo	19	NPR	NPR	10	n/a	0
VUL	24	NPR	SR	2	8	1

Sensitivity 7 – ULSG Funding Patterns

Description of Sensitivity Test:

In addition to the baseline level funding pattern tested as part of Phase I, participants were instructed to test the following three funding patterns (a, b, and c below). For all funding patterns, premiums were assumed to cease when the secondary guarantee is fully funded.

a. Premium acceleration – Increase each policy's premium 25% (i.e. 125% multiple applied to premium in all years).

b. Premium deceleration – Decrease each policy's premium 25% (i.e. 75% multiple applied to premium in all years)

c. Premium to maintain the guarantee – Assume the baseline premium pattern, until a premium is necessary to prevent the policy from lapsing without value. To prevent the policy from lapsing without value, the minimum required premium is assumed to be paid to persist the policy from one policy year to the next. If the ULSG product utilizes a multi-fund design or a second set of COI rates and/or charges on the shadow fund that are a function of the funding level, the minimum required premium is calculated assuming the lowest set of charges.

Results of Sensitivity Test:

TABLE E.9a – ULSG Funding Patterns Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.
ULSG	1	DR	DR	DR	n/a	-14%	-1%	0%
ULSG	3	SR	SR	SR	n/a	-1	-8	0
ULSG	4	SR	NPR	NPR	SR	-12	-12	0
ULSG	9	SR	SR	SR	SR	7	-38	13

TABLE E.9b – ULSG Funding Patterns Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Det. Reserve		
		Base	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.
ULSG	1	DR	DR	DR	n/a	-14%	-1%	n/a
ULSG	3	SR	SR	SR	n/a	-1	-8	n/a
ULSG	4	SR	NPR	NPR	SR	-47	-95	0%
ULSG	9	SR	SR	SR	SR	7	-41	10

TABLE E.9c – ULSG Funding Patterns Sensitivity

ULSG Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Stoch. Reserve		
		Base	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.	Prem. Acc.	Prem. Dec.	Prem. to Maint. Gtee.
ULSG	1	DR	DR	DR	n/a	-15%	-1%	n/a
ULSG	3	SR	SR	SR	n/a	-1	-8	n/a
ULSG	4	SR	NPR	NPR	SR	-33	-79	0%
ULSG	9	SR	SR	SR	SR	7	-38	13

Sensitivity 8 – Net Premium Reserve

Description of Sensitivity Test:

Participants were instructed to produce results for three separate changes to the net premium reserve:

a. For ULSG, change formula in 3.C.3.c.ii from

$$L_{x+t} = R_{x+t} \cdot 0.01 + (1 - R_{x+t}) \cdot 0.005 \cdot r_{x+t}$$

to

$$L_{x+t} = R_{x+t} \cdot 0.03 + (1 - R_{x+t}) \cdot 0.015 \cdot r_{x+t}$$

b. Change the valuation rate from 5% to 4% for the no-CSV benefit streams and from 4% to 3% for the with-CSV benefit streams.

c. For those testing Whole Life and UL without secondary guarantees, use Section 3 of VM-20 to calculate the Net Premium Reserve instead of using CRVM.

Results of Sensitivity Test:

TABLE E.10a – Net Premium Reserve Sensitivity

Term Business

Product	Participant	% Chg from Baseline		
		ULSG Lapse	Val Rate	VM-20 NPR
Term 20	5	n/a	5%	n/a
Term 20	19	n/a	4	n/a
Term Agg	9	n/a	2	n/a

TABLE E.10b – Net Premium Reserve Sensitivity

ULSG Business

Product	Participant	% Chg from Baseline		
		ULSG Lapse	Val Rate	VM-20 NPR
ULSG	1	n/a	18%	n/a
ULSG	3	-16%	23	n/a

TABLE E.10c – Net Premium Reserve Sensitivity Other Business				
Product	**Participant**	**% Chg from Baseline**		
		ULSG Lapse	**Val Rate**	**VM-20 NPR**
SIWL	21	n/a	n/a	-20%
SIWL	25	n/a	n/a	-11
TWL	23	n/a	n/a	-20
ULwo	19	n/a	n/a	-21

Sensitivity 9 – Starting Assets +/- 10%

Description of Sensitivity Test:

This sensitivity only applies to the calculation of deterministic and stochastic reserves and is designed to test the impact of starting assets falling outside of the targeted range of 98-102% of the final aggregate modeled reserve. Participants were instructed to increase/decrease the starting assets by 10%.

Results of Sensitivity Test:

TABLE E.11a – Starting Assets+/- 10% Sensitivity Term Business – Minimum Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in VM-20 Reserve**	
		Baseline	**Assets +10%**	**Assets -10%**	**Assets +10%**	**Assets -10%**
Term 20	5	SR	NPR	SR	-4%	11%
Term 20	19	NPR	NPR	NPR	0	0
Term Agg	9	DR	DR	DR	0	0
Term Agg	10	SR	SR	SR	8	-6

TABLE E.11b – Starting Assets+/- 10% Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Det. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
Term 20	5	SR	NPR	SR	n/a	n/a
Term 20	19	NPR	NPR	NPR	-2%	2%
Term Agg	9	DR	DR	DR	0	0
Term Agg	10	SR	SR	SR	0	0

TABLE E.11c – Starting Assets+/- 10% Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
Term 20	5	SR	NPR	SR	-7%	11%
Term 20	19	NPR	NPR	NPR	n/a	n/a
Term Agg	9	DR	DR	DR	n/a	n/a
Term Agg	10	SR	SR	SR	8	-6

TABLE E.11d – Starting Assets+/- 10% Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
ULSG	3	SR	DR	SR	-1%	19%
ULSG	4	SR	SR	SR	0	2

TABLE E.11d – Starting Assets+/- 10% Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
ULSG	9	SR	DR	SR	-4	16

TABLE E.11e – Starting Assets+/- 10% Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Det. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
ULSG	3	SR	DR	SR	0%	1%
ULSG	4	SR	SR	SR	0	1
ULSG	9	SR	DR	SR	0	0

TABLE E.11f – Starting Assets+/- 10% Sensitivity

ULSG Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
ULSG	3	SR	DR	SR	-15%	19%
ULSG	4	SR	SR	SR	0	2
ULSG	9	SR	DR	SR	-12	16

TABLE E.11g – Starting Assets+/- 10% Sensitivity

Other Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
TWL	23	NPR	NPR	NPR	0%	0%
ULwo	19	NPR	NPR	NPR	0	0
VUL	24	NPR	NPR	NPR	0	0

TABLE E.11h – Starting Assets+/- 10% Sensitivity

Other Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Det. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
TWL	23	NPR	NPR	NPR	0%	0%
ULwo	19	NPR	NPR	NPR	1	1
VUL	24	NPR	NPR	NPR	n/a	n/a

TABLE E.11i – Starting Assets+/- 10% Sensitivity

Other Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Stoch. Reserve	
		Baseline	Assets +10%	Assets -10%	Assets +10%	Assets -10%
TWL	23	NPR	NPR	NPR	-15%	28%
ULwo	19	NPR	NPR	NPR	n/a	n/a
VUL	24	NPR	NPR	NPR	-3	2

Sensitivity 10 – Lower Spreads

Description of Sensitivity Test:

Initial and ultimate spreads were assumed to be lower than the baseline assumption.

Results of Sensitivity Test:

TABLE E.12a – Spreads +/- 100bp Sensitivity

All Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in VM-20 Reserve	
		Baseline	Lower Initial Spread	Lower Ultimate Spread	Lower Initial Spread	Lower Ultimate Spread
Term 20	19	NPR	n/a	NPR	0%	0%
ULSG	4	SR	SR	SR	1	10
ULwo	19	NPR	NPR	NPR	0	0
VUL	24	NPR	n/a	DR	0	11

TABLE E.12b – Spreads +/- 100bp Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			% Chg in Det. Reserve	
		Baseline	Lower Initial Spread	Lower Ultimate Spread	Lower Initial Spread	Lower Ultimate Spread
Term 20	19	NPR	n/a	NPR	n/a	15%
ULSG	4	SR	SR	SR	2%	16
ULwo	19	NPR	NPR	NPR	11	11
VUL	24	NPR	n/a	DR	n/a	12

TABLE E.12c – Spreads +/- 100bp Sensitivity ULSG Business – Stochastic Reserve						
Product	**Participant**	**Dominant VM-20 Reserve Component**			**% Chg in Stoch. Reserve**	
		Baseline	**Lower Initial Spread**	**Lower Ultimate Spread**	**Lower Initial Spread**	**Lower Ultimate Spread**
Term 20	19	NPR	n/a	NPR	0%	0%
ULSG	4	SR	SR	SR	1	10
ULwo	19	NPR	NPR	NPR	n/a	n/a
VUL	24	NPR	n/a	DR	n/a	-6

Sensitivity 11 – Double Defaults

Description of Sensitivity Test:

Default rates are doubled compared to the baseline assumption.

Results of Sensitivity Test:

TABLE E.13a – Double Defaults Sensitivity Term Business						
Product	**Participant**	**Dominant VM-20 Reserve Component**		**% Chg from Baseline**		
		Baseline	**Double Defaults**	**DR**	**SR**	**Minimum**
Term 20	19	NPR	NPR	9%	n/a	0%
Term Agg	9	DR	DR	2	n/a	2

TABLE E.13b – Double Defaults Sensitivity ULSG Business						
Product	**Participant**	**Dominant VM-20 Reserve Component**		**% Chg from Baseline**		
		Baseline	**Double Defaults**	**DR**	**SR**	**Minimum**
ULSG	3	SR	SR	7%	6%	6%
ULSG	4	SR	SR	8	5	5
ULSG	9	SR	SR	7	9	9

TABLE E.13c – Double Defaults Sensitivity Other Business						
Product	**Participant**	**Dominant VM-20 Reserve Component**		**% Chg from Baseline**		
		Baseline	**Double Defaults**	**DR**	**SR**	**Minimum**
SIWL	21	NPR	NPR	0%	2%	0%
TWL	23	NPR	NPR	4	3	0
ULwo	19	NPR	NPR	0	n/a	0
VUL	24	NPR	DR	3	-3	2

Sensitivity 12 – Negative Cash Flow Strategy

Description of Sensitivity Test:

Participants were instructed to run the DR and SR reserves using three different disinvestment strategies:

d. Sell assets.

e. Borrow assets.

f. Use negative assets.

Results of Sensitivity Test:

Results for this sensitivity are shown on a per $1,000 of face amount basis since the baseline isn't necessarily to sell assets. Participants could choose the negative cash flow strategy for the baseline result.

TABLE E.14a – Negative Cash Flow Strategy Sensitivity

Term Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			VM-20 Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
Term 20	19	NPR	NPR	NPR	2.3	2.3	2.3
Term Agg	9	DR			1.7	7.2	1.7
Term Agg	10	SR	SR	SR	7.3	7.1	9.0

TABLE E.14b – Negative Cash Flow Strategy Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			Deterministic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
Term 20	19	NPR	NPR	NPR	-0.8	-0.8	-0.8
Term Agg	9	DR	n/a	n/a	n/a	7.2	n/a
Term Agg	10	SR	SR	SR	6.1	6.2	6.2

TABLE E.14c – Negative Cash Flow Strategy Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			Stochastic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
Term 20	19	NPR	NPR	NPR	n/a	n/a	n/a
Term Agg	9	DR	n/a	n/a	n/a	n/a	n/a
Term Agg	10	SR	SR	SR	7.3	7.1	9.0

TABLE E.14d – Negative Cash Flow Strategy Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			VM-20 Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
ULSG	3	SR	DR	SR	120.8	120.8	122.0
ULSG	4	SR	SR	DR	71.4	66.1	n/a
ULSG	9	SR	n/a	n/a	n/a	91.0	n/a

TABLE E.14e – Negative Cash Flow Strategy Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			Deterministic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
ULSG	3	SR	DR	SR	120.8	120.8	120.7
ULSG	4	SR	SR	DR	52.7	52.0	n/a
ULSG	9	SR	n/a	n/a	n/a	n/a	n/a

TABLE E.14f – Negative Cash Flow Strategy Sensitivity

ULSG Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component			Stochastic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
ULSG	3	SR	DR	SR	120.8	120.5	122.0
ULSG	4	SR	SR	DR	71.4	66.1	n/a
ULSG	9	SR	n/a	n/a	n/a	n/a	n/a

TABLE E.14g – Negative Cash Flow Strategy Sensitivity

Other Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component			VM-20 Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
SIWL	21	NPR	NPR	NPR	54.5	54.5	54.5
TWL	23	NPR	NPR	NPR	28.0	28.0	28.0
ULwo	19	NPR	NPR	NPR	30.7	30.7	30.7

TABLE E.14h – Negative Cash Flow Strategy Sensitivity

Other Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component			Deterministic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
SIWL	21	NPR	NPR	NPR	25.5	25.5	25.6
TWL	23	NPR	NPR	NPR	20.6	n/a	n/a
ULwo	19	NPR	NPR	NPR	20.1	20.1	20.1

TABLE E.14i – Negative Cash Flow Strategy Sensitivity Other Business – Stochastic Reserve							
Product	Participant	Dominant VM-20 Reserve Component			Stochastic Reserve per $1,000		
		Baseline	Borrow	Negative Assets	Sell Assets	Borrow	Negative Assets
SIWL	21	NPR	NPR	NPR	38.0	38.0	37.4
TWL	23	NPR	NPR	NPR	21.8	n/a	n/a
ULwo	19	NPR	NPR	NPR	n/a	n/a	n/a

Sensitivity 13 – ESG Starting Yield Curve

Description of Sensitivity Test:

The initial yield curve is revised based on three alternatives to produce three different sets of stochastic scenarios:

d. Plus 100 basis points.
e. Minus 100 basis points.
f. Inverted.

Results of Sensitivity Test:

TABLE E.15a – ESG Starting Yield Curve Sensitivity Term Business – Minimum Reserve								
Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
Term 10	22	NPR	NPR	NPR	NPR	0%	0%	0%
Term 15	22	NPR	NPR	NPR	NPR	0	0	0
Term 15R	22	SR	SR	SR	SR	-26	16	-9
Term 20	5	SR	NPR	SR	SR	-4	18	35

TABLE E.15a – ESG Starting Yield Curve Sensitivity

Term Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
Term 20	19	NPR	NPR	NPR	NPR	0	0	0
Term 20	22	SR	NPR	SR	SR	-9	8	-3
Term 20R	22	SR	SR	SR	SR	-21	13	-7
Term 30	22	SR	SR	SR	SR	-18	18	-6
Term 30R	22	SR	SR	SR	SR	-18	25	-5
Term Agg	8	DR	DR	DR	DR	-11	11	14
Term Agg	9	DR	DR	DR	DR	-3	2	1
Term Agg	10	SR	n/a	n/a	n/a	n/a	n/a	n/a
Term Agg	17	NPR	NPR	NPR	NPR	0	0	0

TABLE E.15b – ESG Starting Yield Curve Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Det. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
Term 10	22	NPR	NPR	NPR	NPR	0%	0%	0%
Term 15	22	NPR	NPR	NPR	NPR	-12	10	0
Term 15R	22	SR	SR	SR	SR	-38	29	-8
Term 20	5	SR	NPR	SR	SR	-17	16	11
Term 20	19	NPR	NPR	NPR	NPR	-12	9	-4
Term 20	22	SR	NPR	SR	SR	-14	12	-2
Term 20R	22	SR	SR	SR	SR	-27	20	-10
Term 30	22	SR	SR	SR	SR	-25	19	-12
Term 30R	22	SR	SR	SR	SR	-25	19	-13

TABLE E.15b – ESG Starting Yield Curve Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Det. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
Term Agg	8	DR	DR	DR	DR	-11	11	14
Term Agg	9	DR	DR	DR	DR	-3	2	1
Term Agg	10	SR	n/a	n/a	n/a	-9	8	2
Term Agg	17	NPR	NPR	NPR	NPR	2	-1	1

TABLE E.15c – ESG Starting Yield Curve Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Stoch. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
Term 10	22	NPR	NPR	NPR	NPR	-1%	3%	8%
Term 15	22	NPR	NPR	NPR	NPR	-16	13	9
Term 15R	22	SR	SR	SR	SR	-26	16	-9
Term 20	5	SR	NPR	SR	SR	-25	18	35
Term 20	19	NPR	NPR	NPR	NPR	n/a	n/a	n/a
Term 20	22	SR	NPR	SR	SR	-15	8	-3
Term 20R	22	SR	SR	SR	SR	-21	13	-7
Term 30	22	SR	SR	SR	SR	-18	18	-6
Term 30R	22	SR	SR	SR	SR	-18	25	-5
Term Agg	8	DR	DR	DR	DR	-11	13	16
Term Agg	9	DR	DR	DR	DR	-3	1	3
Term Agg	10	SR	n/a	n/a	n/a	n/a	n/a	n/a
Term Agg	17	NPR	NPR	NPR	NPR	n/a	n/a	n/a

TABLE E.15d – ESG Starting Yield Curve Sensitivity

ULSG Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
ULSG	3	SR	SR	SR	DR	2%	6%	-3%
ULSG	4	SR	SR	SR	SR	-4	4	3
ULSG	8	SR	SR	SR	SR	-11	17	17
ULSG	9	SR	SR	SR	SR	-7	12	8

TABLE E.15e – ESG Starting Yield Curve Sensitivity

ULSG Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Det. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
ULSG	3	SR	SR	SR	DR	-2%	4%	-2%
ULSG	4	SR	SR	SR	SR	-7	7	6
ULSG	8	SR	SR	SR	SR	-15	17	17
ULSG	9	SR	SR	SR	SR	-9	9	8

TABLE E.15f – ESG Starting Yield Curve Sensitivity

ULSG Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Stoch. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
ULSG	3	SR	SR	SR	DR	2%	6%	-4%
ULSG	4	SR	SR	SR	SR	-4	4	3
ULSG	8	SR	SR	SR	SR	-11	17	17
ULSG	9	SR	SR	SR	SR	-7	12	8

TABLE E.15g – ESG Starting Yield Curve Sensitivity

Other Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in VM-20 Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
SIWL	21	NPR	NPR	NPR	NPR	0%	0%	0%
TWL	23	NPR	NPR	NPR	NPR	0	0	0
ULwo	18	NPR	NPR	NPR	NPR	0	0	0
ULwo	19	NPR	NPR	NPR	NPR	0	0	0
VUL	24	NPR	NPR	DR	DR	0	3	0

TABLE E.15h – ESG Starting Yield Curve Sensitivity

Other Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Det. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
SIWL	21	NPR	NPR	NPR	NPR	-17%	13%	-5%
TWL	23	NPR	NPR	NPR	NPR	-1	1	-1
ULwo	18	NPR	NPR	NPR	NPR	1	0	0
ULwo	19	NPR	NPR	NPR	NPR	0	2	0
VUL	24	NPR	NPR	DR	DR	-3	3	1

TABLE E.15i – ESG Starting Yield Curve Sensitivity

Other Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component				% Chg in Stoch. Reserve		
		Base	+100bp	-100bp	Inverted	+100bp	-100bp	Inverted
SIWL	21	NPR	NPR	NPR	NPR	-10%	8%	-11%
TWL	23	NPR	NPR	NPR	NPR	-2	2	-1
ULwo	18	NPR	NPR	NPR	NPR	0	0	0
ULwo	19	NPR	NPR	NPR	NPR	0	0	0
VUL	24	NPR	NPR	DR	DR	11	-4	38

Sensitivity 14 – ESG Parameters

Description of Sensitivity Test:

The ESG parameters are revised based on four alternatives to produce four different sets of stochastic scenarios:

e. Long rate mean reversion point plus 100 basis points.
f. Long rate mean reversion point minus 100 basis points.
g. 150% long rate volatility.
h. 150% volatility of stochastic volatility.

Results of Sensitivity Test:

TABLE E.16a – ESG Parameters Sensitivity

Term Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in VM-20 Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
Term 10	22	NPR	NPR	NPR	NPR	NPR	0%	0%	0%	0%
Term 15	22	NPR	NPR	NPR	NPR	NPR	0	0	0	0
Term 20	22	SR	SR	SR	SR	SR	-3	5	-1	1
Term Agg	10	SR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

TABLE E.16b – ESG Parameters Sensitivity

Term Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in Det. Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
Term 10	22	NPR	NPR	NPR	NPR	NPR	0%	0%	0%	0%
Term 15	22	NPR	NPR	NPR	NPR	NPR	-2	2	0	0
Term 20	22	SR	SR	SR	SR	SR	-4	6	3	0
Term Agg	10	SR	n/a	n/a	n/a	n/a	-4	4	2	0

TABLE E.16c – ESG Parameters Sensitivity

Term Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in Stoch. Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
Term 10	22	NPR	NPR	NPR	NPR	NPR	0%	-2%	1%	-1%
Term 15	22	NPR	NPR	NPR	NPR	NPR	-2	1	1	-1
Term 20	22	SR	SR	SR	SR	SR	-3	5	-1	1
Term Agg	10	SR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

TABLE E.16d – ESG Parameters Sensitivity

Other Business – Minimum Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in VM-20 Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
ULwo	18	NPR	NPR	NPR	NPR	NPR	0%	0%	0%	0%
ULwo	19	NPR	NPR	NPR	NPR	NPR	0	0	0	0

TABLE E.16e – ESG Parameters Sensitivity

Other Business – Deterministic Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in Det. Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
ULwo	18	NPR	NPR	NPR	NPR	NPR	0%	1%	0%	0%
ULwo	19	NPR	NPR	NPR	NPR	NPR	-4	7	5	1

TABLE E.16f – ESG Parameters Sensitivity

Other Business – Stochastic Reserve

Product	Participant	Dominant VM-20 Reserve Component					% Chg in Stoch. Reserve			
		Base	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol	LT MRP +100bp	LT MRP -100bp	150% Long Rate Vol	150% Stoch Vol
ULwo	18	NPR	NPR	NPR	NPR	NPR	0%	0%	2%	1%
ULwo	19	NPR	NPR	NPR	NPR	NPR	0	0	0	0

Sensitivity 15 – Eliminate Post-Level Term Amounts

Description of Sensitivity Test:

This test applies to term products only. The shock lapse rate at the end of the level premium period is set to 100%, thus eliminating the impact of post-level premium period cash flows.

Results of Sensitivity Test:

TABLE E.17 – Eliminate Post-Level term Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
Term 20	5	SR	n/a	22%	n/a	n/a
Term Agg	9	DR	DR	1	n/a	1%
Term Agg	10	SR	SR	8	5	5
Term Agg	17	NPR	n/a	n/a	n/a	n/a

Sensitivity 16 – Double Compression of Model Points

Description of Sensitivity Test:

Participants were instructed to compress their in force liability model points to 50-75% of the baseline model. For example, use broader groupings in terms of issue age, underwriting classes, issue months or funding patterns.

Results of Sensitivity Test:

TABLE E.18a – Double Compression of Model Points Sensitivity

Term Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
Term 20	19	NPR	NPR	-56%	n/a	0%
Term Agg	9	DR	DR	0	n/a	0
Term Agg	10	SR	SR	-4	-3%	-3
Term Agg	17	NPR	NPR	-20	n/a	0

TABLE E.18b – Double Compression of Model Points Sensitivity

ULSG Business

Product	Participant	Dominant VM-20 Reserve Component		% Chg from Baseline		
		Baseline	Compression	DR	SR	Minimum
ULSG	4	SR	SR	0%	0%	0%
ULSG	9	SR	SR	1	2	2

TABLE E.18c – Double Compression of Model Points Sensitivity Other Business						
Product	**Participant**	**Dominant VM-20 Reserve Component**		**% Chg from Baseline**		
		Baseline	**Compression**	**DR**	**SR**	**Minimum**
SIWL	21	NPR	NPR	-25%	-13%	0%
TWL	23	NPR	NPR	-2	-2	0
ULwo	19	NPR	NPR	-7	n/a	0
VUL	24	NPR	NPR	-60	-93	0

Sensitivity 17 – Expand to 10 and 15 Years of Issues

Description of Sensitivity Test:

Participants were asked to extend the projections to durations 10 and 15. This could be accomplished by layering on an extra 5 or 10 years of issues or, if modeling systems had the capability, use one year of issues and project the reserves out to these extended durations.

Results of Sensitivity Test:

TABLE E.19a – DR/CRVM Ratios Layering 1 Year of New Business for N Years					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
SIWL	21	105%	47%	68%	78%
Term 20	19	n/a	n/a	16	24
Term Agg	10	101	75	61	46
TWL	23	n/a	74	87	91
ULwo	19	n/a	65	106	110

TABLE E.19b – DR/CRVM Ratios

Forecasting 1 Year of New Business to Duration N

Product	Participant	1 Year	5 Years	10 Years	15 Years
Term Agg	9	138%	77%	68%	68%
ULSG	3	126	139	120	103
ULSG	9	106	97	95	90
VUL	24	42	99	n/a	n/a

TABLE E.19c – SR/CRVM Ratios

Layering 1 Year of New Business for N Years

Product	Participant	1 Year	5 Years	10 Years	15 Years
SIWL	21	201%	70%	78%	83%
Term Agg	10	99	109	99	99
TWL	23	n/a	77	91	94

TABLE E.19d – SR/CRVM Ratios

Forecasting 1 Year of New Business to Duration N

Product	Participant	1 Year	5 Years	10 Years	15 Years
ULSG	3	127%	141%	123%	106%
ULSG	9	115	98	98	92
VUL	24	0	25	n/a	n/a

TABLE E.19e – NPR/CRVM Ratios

Layering 1 Year of New Business for N Years

Product	Participant	1 Year	5 Years	10 Years	15 Years
SIWL	12	100%	n/a	100%	100%
SIWL	21	100	100%	100	100

TABLE E.19e – NPR/CRVM Ratios Layering 1 Year of New Business for N Years					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
SIWL	25	100	12	100	100
Term 10	12	83	97	100	100
Term 20	12	53	62	68	69
Term 20	19	n/a	34	47	54
Term 30	12	12	38	60	62
Term Agg	10	76	43	51	58
TWL	23	100	100	100	100
ULwo	19	100	100	100	100

TABLE E.19f – NPR/CRVM Ratios Forecasting 1 Year of New Business to Duration N					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
Term Agg	9	26%	51%	64%	15%
Term Agg	17	40	n/a	36	38
ULSG	3	95	112	122	113
ULSG	9	119	130	134	127
VUL	24	100	100	n/a	n/a

TABLE E.19g – MR/CRVM Ratios Layering 1 Year of New Business for N Years					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
SIWL	21	201%	100%	100%	100%
Term 20	19	n/a	34	47	54
Term Agg	10	101	109	99	99
TWL	23	100	100	100	100

TABLE E.19g – MR/CRVM Ratios Layering 1 Year of New Business for N Years					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
ULwo	19	100	100	106	110

TABLE E.19h – MR/CRVM Ratios Forecasting 1 Year of New Business to Duration N					
Product	**Participant**	**1 Year**	**5 Years**	**10 Years**	**15 Years**
Term Agg	9	138%	77%	68%	68%
Term Agg	17	40	n/a	36	36
ULSG	3	127	141	123	113
ULSG	9	119	97	95	90
VUL	24	100	100	n/a	n/a

F: Survey Questions

This email is going out to the primary contact at each company that participated in the NAIC's VM-20 Impact Study. Thank you very much for your participation in the Impact Study. The data you have provided has been invaluable in gauging the impact that VM-20 has on current reserve levels, and understanding the drivers of VM-20.

To conclude the field test we are conducting this survey to gain insight into some of the more qualitative issues surrounding VM-20. Topics include information and comments on implementing VM-20 and reporting results, and documentation on your approach, assumptions and margins.

Your participation is in the survey is greatly appreciated and needed for the impact study to be successful. Plus it will give you a chance to share your thoughts on this important topic.

Survey responses should be submitted to Towers Watson and will be treated as a further submission to the Impact Study and bound by the confidentiality agreement in place.

In completing the survey, you may find it helpful to print a copy of the questions and review it prior to entering your responses electronically. The deadline to complete this survey is Friday, December 16th. Any questions you have may be directed to vm20.impactstudy@towerswatson.com.

Thank you again for your participation in the field test and completing this important survey.

Sincerely,

Towers Watson

Welcome to the survey on the VM-20 Impact Study.

Should you be interrupted while taking the survey, you can save your progress and return to the survey from the same computer at a later time. Some survey questions may not apply to you. Please answer all applicable survey questions if possible. Thank you for your consideration.

Page 1 - Question 1

Please provide your contact information

- Name
- Title
- Company
- Phone

Page 1 - Question 2 - Choice - One Answer (Bullets)

At the beginning of the field test, how would you describe the level of VM-20 knowledge of the people that calculated the VM-20 reserves for the Impact Study?

- Extensive expertise
- Very knowledgeable
- Understanding of the basics
- No knowledge
- Other, please specify

Page 1 - Question 3 - Choice - One Answer (Bullets)

How would you describe the current level of VM-20 knowledge of the people that calculated the VM-20 reserves for the Impact Study?

- Extensive expertise
- Very knowledgeable
- Understanding of the basics
- No knowledge
- Other, please specify

Page 1 - Question 4 - Choice - One Answer (Bullets)

What models did you use for the impact study?

- Models we built from scratch
- Existing CFT models without enhancements
- Existing CFT models with enhancements
- Other, please specify

Page 2 - Question 5 - Open Ended - Comments Box

What significant enhancements did you make?

Page 3 - Question 6 - Open Ended - Comments Box

Please list any significant future enhancements you plan to make to your models to prepare for VM-20

Page 4 - Question 7 - Choice - One Answer (Bullets)

Did you calculate stochastic reserves?

- Yes
- No

Page 5 - Heading

Stochastic Reserve Run Time

If you calculated the stochastic reserve for the field test, please provide the following information related to run time. You will be able to provide information for up to 8 model segments below. If you have less than 8 segments, please enter only the information for the segments you modeled and then skip to the next section.

Page 5 - Question 8

Product or Model Segment 1

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 9

Product or Model Segment 2

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 10

Product or Model Segment 3

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 11

Product or Model Segment 4

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 12

Product or Model Segment 5

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 13

Product or Model Segment 6

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 14

Product or Model Segment 7

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 5 - Question 15

Product or Model Segment 8

- Product or Model Segment
- Model Run Time (Hours)
- Number of Scenarios
- Number of Model Points
- Number of Processors

Page 6 - Question 16

Please estimate the time required to complete the following items based on the current version of VM-20. Please include elapsed time as well as man hours or average FTE utilized over elapsed time.

- Implement VM-20 for the Impact Study
- First time to perform VM-20 after adoption in the future
- Per a VM-20 calculation after the first time

Page 7 - Heading

Mortality Best-Estimate Assumption

Page 7 - Question 17 - Open Ended - Comments Box

Please describe the steps you took to develop your mortality best-estimate assumption. Include the reasoning behind the steps you took, as well as any approximations you ended up using.

Page 7 - Question 18 - Open Ended - Comments Box

What experience did you use?

Page 7 - Question 19 - Open Ended - Comments Box

What were your credibility segments and how granular were your mortality segments?

Page 7 - Question 20 - Open Ended - Comments Box

How many deaths were deemed to be fully credible?

Page 7 - Question 21 - Open Ended - Comments Box

Roughly what percentage of the 2008 VBT was your overall expectation of mortality, and how did your slope compare?

Page 7 - Question 22 - Open Ended - Comments Box

What method did you use to choose the Relative Risk (RR) table, the UCS tool or something else and why?

Page 7 - Question 23 - Open Ended - Comments Box

Did you use the option to move the mapped table up or down two tables? Why or why not?

Page 7 - Question 24 - Open Ended - Comments Box

On average, how long was the period where your data was credible?

Page 7 - Question 25 - Open Ended - Comments Box

How did you determine when you weren't credible any more, and what did you do when you had no credibility? Did you move immediately to 100% industry, or did you grade to industry over time? If you graded over time, over how many years (age and/or duration) did you grade to industry?

Page 7 - Question 26 - Choice - One Answer (Bullets)

What credibility blending approach did you use setting your mortality assumption?

- ❍ Limited fluctuation credibility with less granular "LRWG" approach
- ❍ Limited fluctuation credibility with more granular "full credibility" approach
- ❍ Other, please specify

Page 7 - Question 27 - Open Ended - Comments Box

What are your observations on the VM-20 mortality assumption setting process? Was it in line with your expectations?

Page 7 - Question 28 - Open Ended - Comments Box

Please describe the steps you took to develop all non-prescribed, non-mortality best-estimate assumptions. Include the reasoning behind the steps you took, as well as any approximations you ended up using. Please include a comparison to assumptions used for cash flow testing.

Page 7 - Question 29 - Open Ended - Comments Box

Describe your general approach to setting margins. Further describe the steps you took to individually develop all non-prescribed margins. Include the reasoning behind the steps you took, as well as any approximations you ended up using. Did you assume any reductions to margins due to a less than perfect correlation between risk factors? If so what were the reductions?

Page 7 - Question 30 - Open Ended - Comments Box

Besides those related to assumptions and margins and described elsewhere, describe all material approximations used in your implementation of VM-20 for the field test (e.g. “We couldn’t model defaults at the individual asset level so we used weighted averages for groups of assets”).

Page 7 - Question 31 - Open Ended - Comments Box

Please describe how you determined the number of scenarios to use for the stochastic reserve calculation.

Page 7 - Question 32 - Choice - One Answer (Bullets)

Other than then the representative scenario picker included with the ESG, did your company use any scenario reduction techniques in the field test?

- No
- Yes (please specify in next question)

Page 7 - Question 33 - Open Ended - Comments Box

If you answered "Yes" above, what type of scenario reduction techniques did you use?

Page 8 - Question 34 - Choice - Multiple Answers (Bullets)

Where did your company have challenges with the field test and where to you think your company will have challenges when implementing VM-20? Select all that apply.

- ❑ Interpreting VM-20
- ❑ Setting best estimate assumptions
- ❑ Setting margins
- ❑ Run time due to insufficient computing capacity (hardware)
- ❑ Making enhancements to models/software
- ❑ Sufficient actuarial resources and expertise
- ❑ Sufficient IT staffing resources
- ❑ Analysis of results
- ❑ Other, please specify

Page 9 - Question 35 - Open Ended - Comments Box

Please identify the areas of VM-20 in which you encountered challenges interpreting the language

Page 10 - Question 36 - Choice - One Answer (Bullets)

How would you rate your company's overall experience with the implementation of VM-20 as part of the Impact Study:

- ❍ Extremely challenging
- ❍ Challenging
- ❍ Moderately challenging
- ❍ Reasonable
- ❍ Easy
- ❍ Other, please specify

Page 10 - Question 37 - Choice - One Answer (Bullets)

Did you model any non-NAIC assets?

- ❍ Yes
- ❍ No

Page 11 - Question 38 - Open Ended - Comments Box

What non-NAIC assets did you model and how did you develop the default assumption on non-NAIC assets that aren't subject to the NAIC default framework?

Page 12 - Heading

Please answer the following questions on sensitivity tests

Page 12 - Question 39 - Open Ended - Comments Box

If you used sensitivity tests to aid in determining margins, please list the sensitivities performed and how you used them.

Page 12 - Question 40 - Open Ended - Comments Box

Other than the sensitivity tests done to aid in determining appropriate margins, what other sensitivity tests do you plan on performing to gain insight into the drivers of your VM-20 reserve?

Page 12 - Question 41 - Open Ended - Comments Box

Please describe how you use sensitivity tests to identify major risk components of your balance sheet.

Page 13 - Question 42 - Open Ended - Comments Box

What resource(s) did you find most helpful in aiding with VM-20 interpretation and implementation?

Page 13 - Question 43 - Choice - One Answer (Bullets)

Are you planning or expecting to make significant product modifications in light of VM-20?

- ❍ Not sure at this time
- ❍ No
- ❍ Yes, please specify

Page 14 - Heading

Please answer the following questions on starting asset iterations

Page 14 - Question 44 - Open Ended - Comments Box

List the average number of iterations required for starting assets to be within 2% of the modeled reserve (list for both the deterministic and stochastic reserve and for all products tested).

Page 14 - Question 45 - Open Ended - Comments Box

How do you think the numbers in above would change if the starting asset collar was relaxed to 5%? To 10%?

Page 14 - Question 46 - Open Ended - Comments Box

How much improvement was usually seen after the second iteration for the deterministic and stochastic reserve; e.g. did the error decrease by half?

Page 14 - Question 47 - Open Ended - Comments Box

If you think it took too many iterations to converge, why do you think this is so?

Page 14 - Question 48 - Open Ended - Comments Box

What did you use for original starting assets for the deterministic and stochastic reserve and how far off was it from final starting assets?

Page 15 - Question 49 - Open Ended - Comments Box

What is the most effective way for you to report and document reserve results, assumptions, margins, and sensitivity tests?

Page 15 - Question 50 - Open Ended - Comments Box

What are your comments, concerns or suggested refinements on how the above relates to VM-20 reporting requirements?

Page 15 - Question 51 - Open Ended - Comments Box

Please list any comments, concerns or suggested refinements you have related to VM-20.

G: Net Premium Reserve – Term Product Details

Detailed results of the relationship of the NPR to CRVM and other VM-20 components for term products are provided in this appendix.

TABLE G.1 – Table References and Range of Results

Term Results

Years of Issue	Dominant Reserve	Sample Size	Alternative	NPR/ CRVM	NPR/ DR	NPR/SR
1	NPR	20	1	0 – 209%		
1	DR	6	1	8 – 64	5 – 90%	
1	SR	4	1	6 – 77		25 – 82%
1	NPR	22	2	0 – 209		
1	DR	6	2	8 – 77	6 – 74	
1	SR	2	2	18 – 42		29 – 94
5	NPR	17	1	7 – 97		
5	DR	7	1	19 – 46	18 – 88	
5	SR	6	1	11 – 44		21 – 60
5	NPR	19	2	7 – 97		
5	DR	6	2	19 – 46	20 – 94	
5	SR	5	2	11 – 44		27 – 76

TABLE G.1a – Term NPR Relationships – 1 Year of Business

Minimum Reserve is NPR, Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 10	10	1.98	4.13	209%
	22	2.65	2.57	97

TABLE G.1a – Term NPR Relationships – 1 Year of Business

Minimum Reserve is NPR, Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
	12	0.58	0.48	83
	11	0.01	0.00	0
	16	1.49	2.73	184
	5	2.45	0.73	30
Term 15	22	2.64	2.24	85
	22	1.59	1.59	100
	5	2.16	0.61	28
Term 20	22	1.79	0.82	46
	12	0.84	0.46	55
	22	1.07	0.87	82
	11	0.52	0.00	0
	19	1.59	0.00	0
	5	2.86	0.41	14
Term 30	12	2.27	0.31	14
	22	2.95	0.45	15
Term Agg	17	2.08	0.57	28
	5	3.21	0.47	15
	15	1.24	0.06	5

TABLE G.1b – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 20	10	3.12	2.00	4.42	64%	45%
	16	4.38	1.23	3.09	28	40

TABLE G.1b – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 30	16	6.95	0.52	3.78	8	14
Term Agg	9	4.44	1.67	6.40	38	26
	8	3.14	0.37	7.05	12	5
	16	4.12	1.53	1.70	37	90

TABLE G.1c – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Stochastic Reserve (SR), Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/SR
		CRVM	NPR	SR		
Term 30	10	3.14	1.33	5.27	42%	25%
	22	1.99	0.36	0.44	18	82
	5	4.66	0.29	0.57	6	50
Term Agg	10	2.87	2.22	3.94	77	56

TABLE G.1d – Term NPR Relationships – 1 Year of Business

Minimum Reserve is NPR, Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 10	10	1.98	4.13	209%
	22	2.65	2.57	97
	12	0.58	0.48	83
	11	0.01	0.00	0
	16	1.49	2.73	184
	5	2.45	0.73	30

TABLE G.1d – Term NPR Relationships – 1 Year of Business

Minimum Reserve is NPR, Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 15	22	2.64	2.24	85
	22	1.59	1.59	100
	5	2.16	0.61	28
Term 20	22	1.79	0.82	46
	12	0.84	0.46	55
	22	1.07	0.87	82
	11	0.52	0.00	0
	19	1.59	0.00	0
	5	2.86	0.41	14
Term 30	5	4.66	0.29	6
	12	2.27	0.31	14
	22	2.95	0.45	15
Term Agg	17	2.08	0.57	28
	5	3.21	0.47	15
	15	1.24	0.06	5
	16	4.12	1.53	37

TABLE G.1e – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 20	10	3.12	2.00	3.57	64%	56%
	16	4.38	1.23	2.52	28	49

TABLE G.1e – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 30	16	6.95	0.52	2.71	8	19
Term Agg	9	4.44	1.67	5.91	38	28
	10	2.87	2.22	2.99	77	74
	8	3.14	0.37	6.07	12	6

TABLE G.1f – Term NPR Relationships – 1 Year of Business

Minimum Reserve is Stochastic Reserve (SR), Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/SR
		CRVM	NPR	SR		
Term 30	10	3.14	1.33	4.59	42%	29%
	12	1.99	0.36	0.38	18	94

TABLE G.1g – Term NPR Relationships – 5 Years of Business

Minimum Reserve is NPR, Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 10	10	6.09	4.33	71%
	22	7.75	3.10	40
	12	2.03	1.97	97
	11	2.94	0.19	7
	16	5.56	4.82	87
	5	5.28	1.52	29
Term 15	22	7.49	2.52	34
	5	7.33	2.43	33

TABLE G.1g – Term NPR Relationships – 5 Years of Business

Minimum Reserve is NPR, Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 20	12	5.00	3.13	63
	22	6.16	1.93	31
	11	3.93	0.78	20
	19	6.80	2.33	34
Term 30	12	6.25	2.40	38
	22	7.17	1.38	19
Term Agg	17	4.91	1.08	22
	5	7.27	1.84	25
	15	3.56	0.47	13

TABLE G.1h – Term NPR Relationships – 5 Years of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 20	10	9.30	4.29	8.36	46%	51%
	16	8.40	3.43	6.14	41	56
	5	7.02	1.98	2.23	28	88
Term 30	16	9.94	1.87	6.39	19	29
Term Agg	9	8.63	2.57	8.44	30	30
	8	6.26	1.64	9.06	26	18
	16	7.89	3.47	4.37	44	80

TABLE G.1i – Term NPR Relationships – 5 Years of Business

Minimum Reserve is Stochastic Reserve (SR), Alternative 1, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/SR
		CRVM	NPR	SR		
Term 15	22	27.31	5.86	15.53	21%	38%
Term 20	22	12.79	2.52	9.07	20	28
Term 30	10	8.85	2.72	10.23	31	27
	22	8.47	0.95	4.59	11	21
	5	9.07	1.64	2.73	18	60
Term Agg	10	8.41	3.69	9.12	44	40

TABLE G.1j – Term NPR Relationships – 5 Years of Business

Minimum Reserve is NPR, Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term 10	10	6.09	4.33	71%
	22	7.75	3.10	40
	12	2.03	1.97	97
	11	2.94	0.19	7
	16	5.56	4.82	87
	5	5.28	1.52	29
Term 15	22	7.49	2.52	34
	5	7.33	2.43	33
Term 20	12	5.00	3.13	63
	22	6.16	1.93	31
	11	3.93	0.78	20
	19	6.80	2.33	34
	5	7.02	1.98	28
Term 30	5	9.07	1.64	18
	12	6.25	2.40	38
	22	7.17	1.38	19

TABLE G.1j – Term NPR Relationships – 5 Years of Business

Minimum Reserve is NPR, Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts		NPR/CRVM
		CRVM	NPR	
Term Agg	17	4.91	1.08	22
	5	7.27	1.84	25
	15	3.56	0.47	13

TABLE G.1k – Term NPR Relationships – 5 Years of Business

Minimum Reserve is Deterministic Reserve (DR), Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/DR
		CRVM	NPR	DR		
Term 20	10	9.30	4.29	7.55	46%	57%
	16	8.40	3.43	5.55	41	62
Term 30	16	9.94	1.87	5.16	19	36
Term Agg	9	8.63	2.57	8.09	30	32
	8	6.26	1.64	8.06	26	20
	16	7.89	3.47	3.69	44	94

TABLE G.1l – Term NPR Relationships – 5 Years of Business

Minimum Reserve is Stochastic Reserve (SR), Alternative 2, Direct Basis

Product	Participant	Per $1,000 Amounts			NPR/CRVM	NPR/SR
		CRVM	NPR	SR		
Term 15	22	27.31	5.86	10.05	21%	58%
Term 20	22	12.79	2.52	5.46	20	46
Term 30	10	8.85	2.72	10.07	31	27
	22	8.47	0.95	1.25	11	76
Term Agg	10	8.41	3.69	9.10	44	41

H: Q&A

The Q&A in this section, including the groups Q&A are organized into, were taken directly from the Q&A tab of the VM-20 Bulletin Board for the Impact Study (https://oneplace.ehr.com/sites/NAIC/QandA/default.aspx).

As a resource to assist with implementing VM-20 for the Impact Study, participants were able to submit questions via the VM-20 email inbox. Questions were routed to appropriate members of the Professional and Industry Liaison group for answers, or were answered by TW if directly related to the field test.

Note that some of the Q&A were based on the October 16, 2010 exposure draft of VM-20, which participants were referred to before being asked to use the February 28, 2011 working draft of VM-20 for the Impact Study.

General Project Questions

4. Which version of VM-20 should be followed for the Field Test?

Please follow the 10/16/10 draft of VM-20 which is available on the bulletin board (note that this answer was superseded later in the Impact Study and the February 28, 2011 draft of VM-20 was used).

41. I cannot access the spreadsheet tools or the Economic Scenario Generator. How do I get access?

If you can access the OnePlace Portal, but cannot access the 'Standardized Inputs and Spreads' or the 'Economic Scenario Generator' sections, it is because your company has yet to agree to the Software Disclaimer.

If you cannot locate the Software Disclaimer, it has been posted to the website under the 'Instructions and Data Requests' Section. Please forward that along with the words "I agree" to vm20.impactstudy@towerswatson.com and your entire company will be able to access the spreadsheet tools and the Economic Scenario Generator.

42. How can I get access for others to the VM-20 Field Test Bulletin Board?

Please send the email address of the users you would like added to the project inbox vm20.impactstudy@towerswatson.com. They will then be added and provided information on how to access the Bulletin Board.

43. Has a delivery date for this project been determined yet?

The NAIC and the ACLI are working together to determine a reasonable deadline for the project. The timing of phase 1 and phase 2 of the project will depend on this determination and we will notify the participants with an update once this is done.

44. What is the expectation for companies that can not meet the March 31st deadline? Are you planning to narrow the list of survey participants?

We are not planning on eliminating field testing participants if they cannot meet the March 31 deadline. We will be working with those participants to determine if there are any shortcuts that don't compromise the objectives of the study, or, if we can make use of partial or late results.

45. If companies can't provide all information as requested within timeframe, can we take shortcuts or should we drop out of field test?

We encourage participants to stay in the study and reach out to us through the project inbox if they experience significant difficulties. We will provide guidance and support to help you follow reasonable methodology to circumvent excessive work.

46. The Phase 1 due date is currently March 31st. Are you expecting the participants to provide any intermediate deliverables between now and then?

We are expecting survey participants to answer a few questions updating us on their status once every week or two. Other than that, we are not expecting any intermediate deliverables before March 31, 2011. We would be happy to discuss results with individual participants at any time though.

47. What are the timing expectations for Phase 2?

Phase 2 results, which will mainly be sensitivities, will be expected at the end of May 2011.

48. Are there any other intermediate target dates we need to be aware of?

There are currently no intermediate target dates to be aware of.

49. Will you be gathering some kind of benchmark to be used to help determine if the resulting reserves are too high or too low? (e.g. GAAP Reserve)

Yes, we will be requesting a few benchmarks to help determine the reasonableness of the VM-20 reserve (e.g. GAAP reserve). We will also be making comparisons across companies and comparisons to our own illustrative model to help with the validation.

50. The Phase I Data Template only has assets for a single run. Should companies not be providing asset information for the 1 year and 5 years of business runs?

Yes. A revised data template has been posted with additional columns to the right of the original asset columns.

MINIMUM RESERVE

No questions

NET PREMIUM RESERVE

Note: The Section on Net Premium Reserve addresses expense allowances, interest, and lapse rate. Everything else that is not specified should follow CRVM, or the actuary's judgment. If you are doing anything nonstandard, please document and send to vm20.impactstudy@towerswatson.com

General Questions

5. Is the Net Premium Reserve an entirely new way to compute reserves, or is it a modification to the current CRVM?

The Net Premium Reserve is a modification to the existing CRVM. If the Net Premium Reserve as documented in VM20 Section 3 does not explicitly provide new guidance, then the existing literature, including regulations, ASOPs, practice notes, and historical practice can continue to be used for the Net Premium reserve.

51. In VM-20 §3, when calculating the final net premium reserve (e.g. mean, mid-terminal, exact, etc.), should the terminal reserves used as an interim step be floored at zero or at 1/2cx?

The intention when developing these was to parallel the current CRVM calculations. It is the reported reserve that is floored to prorated unearned premium or CSV and not the terminal reserves.

52. Should the policy fee be included in calculating the Net Premium Reserve, the Deterministic Reserve, and the Stochastic Reserve?

For the Net Premium reserve, consistent with current CRVM, the reserve directly considers only benefits and interest. The policy fee could impact the pattern of gross premiums and could be used in establishing the gross premium and adjusted gross premium that are used to establish the pattern of the Net Premium Reserve premiums.

For the deterministic and stochastic reserve calculations, the policy fee should be included as part of the cash flows of the policy.

53. Should there be a floor of 0 for the stochastic and deterministic reserves either on a seriatim basis or on an aggregate basis? This will make a difference in the early years of the policies.

The net premium reserve and the cash surrender value create the floor - neither the deterministic or stochastic reserve needs to have a zero floor.

A: Applicability

6. If net premium (fund based) is calculated at issue, is it re-calculated after a policy change?

The same concept that applies to CRVM applies here.

B: Definitions

7. How should VM-20 Section 3.B.8.b "z = an amount of $2.50 per $1,000 of insurance for the first policy year only" be applied for products that have varying amounts of insurance?

z = $2.50 per $1000 of insurance issued.

54. When a policyholder dies we reimburse them for the unearned premium that they have paid. For example if a policy holder pays an annual premium and dies 1 month later, we would reimburse them 11/12 of the premium. Should we be including this reimbursement in the Net Premium reserve calculation? What about the deterministic reserve?

Do as you would with CRVM. For deterministic reserves, do as you are currently doing.

55. Does the guaranteed gross premium definition include policy fee? Modal loading?

The same concept that applies to CRVM applies here. The language in the current valuation manual is what applies for annual premium mode.

56. How do you calculate the Net premium on non-level death benefit products where premium is guaranteed but DB is not?

Do the same as you are currently doing with CRVM. If you are doing something unusual, please document it and send to vm20.impactstudy@towerswatson.com

57. Is $2.50/1000 for initial DB amount? For ELRA?

The above amount applies in the first year.

58. There is an adjustment of $2.5/1000 in cell O5 of the AV & Res tab used in calculating the Valuation Net Premium Ratio but it is difficult to find where this is specified for ULSG products. Is this a hold-over from calculating the non-fund based Net Premium Reserve (Section 3.C.7.a), perhaps?

$2.50 per $1,000 is part of the expense allowance for UL products defined in VM20. It is defined for the base guarantees in 3.B.8.b. and for the Secondary Guarantee in 3.B.9.c.ii.

59. Section 3.B.8.e of the 10/16 VM-20 Draft (non-ULSG products) calls for using a guaranteed basis for mortality, interest, and expenses in projecting future benefits, but no basis is specified for ULSG product benefits under Section 3.B.9. Guidance is also lacking as to a beginning fund value and premium payment level to use in projecting the future benefits.

3.B.9.d. references development of a gross premium to satisfy the secondary guarantee. Contract benefits would be those that emerge from the assumption that those level annual premiums are paid and the Secondary Guarantee is in effect. The present values are then determined as defined in 3.B.9.e.

60. What lapse rate should be used for the at-issue present value calculations in Subsection 3.B.9.c.iii?

Subsection 3.B.9.e ("Actuarial present values referenced in this subsection B.9 are calculated using the interest, mortality and lapse assumptions prescribed in Subsection C of this section") indicates that a lapse rate is required, but the components needed to calculate Lx+t are not defined at issue and I don't see any other applicable guidance.

For at issue present value calculations on ULSG products, the lapse rate should be 1%. At issue, the FFSG is effectively the NSP, and appears in both the numerator and the denominator. ASG and LSG are both zero. Therefore R is 1, and Lx+t becomes 1.00%

61. There is confusion regarding the various directions on level annual premium. What if there is a contract whose premium is not level or is of a shorter duration?

The concept of level annual premium is only used in the context of flexible premium or fund based contracts. Where the premium is defined in the contract and is required to be paid, and if not paid the contract has some form of non-forfeiture event, then the contractual premium is used. In the case of a contractual premium it could be non-level, or for some period other than the life of the contract.

62. The Guidance Note following VM-20 §3.B.6 (see below) mentions both "an annual mode gross premium" and "the actual premium mode for the policy". Could you please clarify whether the Net Premium Reserve calculation should be based on (a) an annual premium mode or on (b) the actual premium mode for the policy?

The company's liability is based on the actual premium mode. That can be arrived at by computing the reserve using the actual mode, or by computing a reserve using an annual premium and making an adjusting entry for the difference between the reserve assumption and the actual mode. VM20 does not define the method, but the result should be consistent with an actual premium mode calculation.

63. The formula for the net premium reserve unamortized expense allowance in VM-20 is reproduced below. I note that in some places VM20 uses annuity due factors and in other places annuity immediate factors. Is this deliberate? If not, which one should we use?

Ex+t = (ax+t:s-t) [(x1+z)/ ax:s + y2-5 · Cx+t] for t < s

= 0 t ≥ s

Where:

Cx+t = 0 when t = 1

= ∑ (1/ äx+w:s-w) when 2 ≤ t ≤ 5, w varying from 1…(t-1)

= ∑ (1/ äx+w:s-w) when t > 5, w varying from 1…4

The formulas should all use an annuity due.

64. In the formulas above, can we assume the "s-w" and "s" subscript terms should have the conventional "┐" over them to represent the term of a temporary annuity?

Yes.

65. As written, it is not clear how to apply the formula when t is not an integer. For example, when calculating the reserve 1.25 years after policy issue, should we:

(1) Use the factor for Ex+1?

(2) Use the factor for Ex+2?

(3) Linearly interpolate between these two factors?

(4) Or, calculate from first principles, and for the annuity factors reflect payments at time 2, 3….etc?

As with the current SVL, formulas are written in the context of terminal reserves. Standard actuarial adjustments should be made for non-integer durations. These could be done using mean reserves with a deferred premium adjustment, or using interpolated terminal reserves with an unearned premium adjustment.

66. Is the "level gross premium" always level? Specifically, for a fixed premium product with non-level fixed premiums, would the level gross premium be level, or a level percentage of the fixed premium?

Level gross premium was to be used in the context of UL type products that have flexible rather than defined premiums. Where the contract has a defined premium, that gross premium should be used.

67. If, as appears to be the case, the "level gross premium" is always level, why is the valuation net premium defined to be "that uniform percentage (the valuation net premium ratio) of the respective gross premiums", as opposed to just a level dollar amount? Are there situations where the net premium ratio produces a different valuation net premium than the level dollar amount?

The level gross premium is an assumption used in the context of a product that has flexible, but undefined premiums. Where the contract has a defined premium, that defined premium, including its pattern, is used in the valuation process.

68. Should the level gross premium always be paid annually, irrespective of the actual premium mode of the policy? What if, for example, a fixed premium product required monthly premiums? Or what about a product which is technically flexible premium, but marketed as a single premium or 7-pay product?

As noted above, fixed premium products are to use the actual premium of the product. For flexible premium products, the proposal to LHATF was to base everything on the level annual premium, taking into account the actual premiums already paid. If the single premium paid is sufficient to fulfill the contract, then the future required premium is zero and the reserve is a single premium reserve. If the contract was sold on a limited pay basis, the premiums already paid will limit the amount of future premium required. In theory, although I haven't tested this, the present value of the level gross premium to maturity should equal the present value of the remaining limited premiums as marketed, except for differences in lapse assumptions.

69. Is the valuation net premium always annual, irrespective of the actual premium mode of the policy?

As noted above, this was written to provide a standard to compute terminal reserves for an annual premium contract. It is expected that standard actuarial adjustments can be made to adjust for different premium modes.

70. Does section 3.B.8.e also apply to ULSG products ?

All of 3.B.8. and 9. applies to ULSG products – 8 to the base guarantee, and 9 to the secondary guarantee.

71. Is it correct to interpret the above answer that the NPR from the base and secondary guarantee are additive? Or, is the final NPR the greater of the two (similar to the existing AG38 guidelines)?

The final NPR is the greater of the two per 3.B.9.

72. For ULSG: Which projection basis should be used for calculating the surrender benefits at issue for the purpose of calculating the net premium ratio? We are currently assuming that the projection should be based on the guaranteed basis applicable to the base fund, but please confirm or clarify if further direction has been provided. This would fall under Section 3.B.9.c.iii of VM-20, which is not clear and the practice notes do not seem to provide any guidance.

Yes – we agree with this interpretation. In the case of UL contracts that do not define a premium, use the guaranteed level annual premium derived by the terms of the contract, with cash values then determined as they are produced by the terms of the contract.

73. For ULSG: The expense allowance variable Ex+t uses a number of annuity factors. However, it is not clear whether some of the annuity factors need to be recalculated at each valuation date with the revised lapse rates which might have changed from the lapse rates used at issue. Considering the formula Ex+t = (ax+t:v-t) [(x1+z)/ ax:n + y2-5 • Cx+t] and assuming that x = 50 and t = 2 (= val date), Should ax:n be recalculated at time t = 2? If yes, what lapse rates should be used for ax:n when n <2 (the two years that have elapsed since the issue). It should also be noted that recalculating some of the annuity factors leads to an allowance which will change with a change in valuation date.

Values of Ax should be computed based on the current valuation date assumptions. A sentence parallel to 3.B.8.f.needs to be included in 3.B.9.

74. We have a question about the gross level premium (GLP) being calculated for purpose of calculating expense allowance. Is it true that this GLP would be different from the GLP used to calculate the net premium ratio? The NAIC reg Section 3.B.9.c. i & ii seem to suggest that the same premium should be used for both calculating net premium ratio and expense allowance.

The net premium ratio is based on the same gross premium as is used for the expense allowance.

75. VM-20 Section 3.B.8.d provides that the NPR as of a valuation date is the multiple of m(x+t) x r(x+t) where r(x+t)is a funding ratio (the numerator of which is the actual policy fund value on the valuation date). That funding ratio has a ceiling of one. However, when products with secondary guarantees are evaluated under 3.B.8 as is required under 3.B.9, this ratio may go negative. Was it intended that this ratio be floored at zero?

The ratio should be floored at zero.

76. Sections 3.B.4.(b), 3.B.5(b) and 3.B.6(b) define the "fully funded secondary guarantee," "actual secondary guarantee," and "level secondary guarantee" amounts, respectively, as follows for cumulative premium test designs:

Fully Funded Secondary Guarantee: For a cumulative premium secondary guarantee, the amount of cumulative premiums required to have been paid to that time that would result in no future premium requirements to fully fund the guarantee, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

Actual Secondary Guarantee: For a cumulative premium secondary guarantee, the actual premiums paid to that point in time, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

Level Secondary Guarantee: For a cumulative premium secondary guarantee, the amount of cumulative level gross premiums, determined according to Section 3.B.9.c,i, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

For cumulative premium test designs, I would expect that each of these amounts should rather be based on the amount of cumulative premiums paid in excess of the cumulative premium requirements, whereby both the cumulative premium payments and requirements should include any interest or accumulation factors per the contract provisions for the secondary guarantee. Making an analogy to AG 38, I would anticipate that these amounts should rather be defined as follows:

Fully Funded Secondary Guarantee: For a cumulative premium secondary guarantee, the amount of cumulative premiums paid in excess of the cumulative premium requirements that would result in no future premium requirements to fully fund the guarantee; where the cumulative premium payments and requirements should be accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

Actual Secondary Guarantee: For a cumulative premium secondary guarantee, the amount of the cumulative premiums paid in excess of the cumulative premium requirements, where the cumulative premium payments and requirements are both accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

Level Secondary Guarantee: For a cumulative premium secondary guarantee, the amount of cumulative level gross premiums, determined according to Section 3.B.9.c,i in excess of the cumulative premium requirements, where the cumulative level gross premiums and cumulative premium requirements are both accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

The suggested changes to the language are appropriate.

C: Net Premium Reserve Assumptions

8. "We've been doing some testing for the VM-20 Impact Study and I have a question about substandard policies. How should the increased mortality for substandard policies be accounted for in VM-20? For deterministic reserves it seems like we can increase the mortality assumption to account for this. However we're not sure what to do for the Net Premium Reserve. Section 3.C.1 in VM-20 talks about the mortality assumption but it doesn't give any direction on how to adjust for substandard policies. How should we account for this? "

For the net premium reserve, mortality for substandard should be adjusted in a manner consistent to what is done today under CRVM.

77. Is Lx+t calculated only once (using valuation date values for FFSGx+t, ASGx+t, and LSGx+t), then kept constant for all future policy years? A different interpretation, used in the Excel sample NPR calculation (Sample Net Premium Reserve Low Funded ULSG 01.26.11.xls), is that a projection should be made to arrive at an assumed ASGx+t and rx+t, then Lx+t is recalculated for every policy duration. This seems exceedingly complicated and would require new definitions for ASGx+t and rx+t so I'm hoping it's only a matter of revising the sample NPR calculation.

Lx+t is computed on each valuation date, based on the facts on that date and not based on future projected values. Section 3.C.3.c.ii. states: The lapse rate for the policy for durations t + 1 and later shall be . . . the intent of this sentence was that on any valuation date, one lapse rate would be determined and applied to all future policy years for that valuation. The goal was some degree of simplicity by not using forward projections to determine future values.

78. In section 6.C.4.b.iii of the VM 20 document, there is a clause that refers to guaranteed mortality, interest and expenses as follows:

iii. The guaranteed gross premium shall be the level gross premium at issue that would keep the policy in force for the entire period coverage is to be provided, based on the policy guarantees of mortality, interest and expenses;

For a level term contract, what are the guaranteed mortality, interest and expenses?

Unless the term policy is using a UL chassis, the gross premium should be defined in the contract. This section may need to be clarified as to application to the different product types.

79. Section 3.C.2.b says to use Moody's Composite Yield on seasoned corporate bonds to find some reference rate. Do you have a table of interest rates we should be using?

The language here is similar to that used in the SVL formula. The rate to be used is the current SVL life interest rate of 4.00% and 5.00% for no-cash surrender value benefit streams. No further reference to the Moody's rates is needed.

80. What lapse rate should be assumed after the level premium period. VM-20 gives guidance on what to do during the level period and the shock lapse, but not afterward. We noticed that the spreadsheet assumes a 10% lapse rate and was wondering where that comes from. In the net premium reserve assumption part of the VM-20 requirements applicable for term policies (Section 3.C.3.2.b) it states that the lapse rate should be "10% per year during any premium paying period after an initial level premium period of less than 5 years." Is this the 10% post-shock lapse rate? My interpretation is that this statement only pertains to plans with initial level premium periods of 1 to 4 years, and the statement does not apply to anything with a level premium period of 5 years or longer. Should I be interpreting it differently?

The intention of the drafters was to apply the 10% rate as defined in 3.C.3.b.ii. after the initial level premium period except in certain specific situations.

81. The spreadsheet uses the select 2001 CSO table during the level period, but jumps to the ultimate table afterwards. Is this what everyone should use to calculate the NPR?

This was consistent with current requirements defined in the Valuation of Life Insurance Policies model regulation (Reg triple X).

D: Net Premium Reserve Calculation and Cash Surrender Value Floor

1. What should we use for the reinsurance calculation in the NPR? For coinsurance, we can just adjust our premiums and amount of insurance to match the coinsurance. What should be done for YRT? There is a drafting note in VM20 that says a simplified assumption can be used and that the unearned annual tabular cost of insurance (interpolated Cx) is one potential option to examine. Is this what we should use for testing purposes?

We are currently seeking further clarification on this issue but for now, it is acceptable to adjust premiums and face for coinsurance and use interpolated Cx for YRT. Additionally, part B of Section 8 of VM-20 should provide guidance with coinsurance calculations.

E: NPR Sample Worksheets provided by ACLI

9. For the NPR Sample Term Worksheet, why did you calculate 'special' Net Premium for Mean Reserves (column Q on the Output tab) that is used to calculate the mean reserves? That is, why are you not using the Net Premium in column F on the output tab to calculate the mean reserves?

This has been fixed in the revised version of the Net Premium Reserve Calculator.

10. For the NPR Sample Term Worksheet, your mean reserve calculation (column R on the Output tab) uses this formula: Mean Reserve @t = [(NPM + Vt+1) + Vt+2]/2. where NPM is the Net Premium for Mean Reserves. Shouldn't the formula for the mean reserve be: Mean Reserve @t = [(NPM + Vt) + Vt+1]/2?

This has been fixed in the revised version.

11. We are calculating the Net Premium Reserve as if it is a mean reserve with a deferred premium asset. However we've come across two different definitions of mean reserve:

According to a valuation textbook by Louis Lombardi the mean reserve is a weighted average of (Last years Terminal Reserve + Net Annual Premium) and the current years Terminal Reserve. This means the mean reserve changes throughout the policy year ending up at the current years terminal reserve.

On the NPR tool that is up at oneplace.com the mean reserve is a straight 50/50 average between (Last years Terminal Reserve + Net Annual Premium) and the current years Terminal Reserve. This will be the reserve for the entire policy year. This is a method that is sometimes (often?) used in practice.

So which should we use?

The 50/50 average is a special case of the more general formula, based on an assumption of a uniform distribution of issues throughout the year that can be approximated by the assumption of a July 1 issue date being used for all policies. The intention of the Net Premium Reserve is not to change longstanding requirements or practices for approximation or simplifications. The example provided should be refined as needed to fit your specific situation.

82. Term Calculator - For policies subject to the shock lapse provision, the spreadsheet calculation reduces the net premiums in all situations – even if the ratio of (actuarial present value of net premiums for years following the shock lapse / actuarial present value of benefits for years following the shock lapse) is less than 135%. Is this correct?

The PV of net premium for policy years following the shock lapse cannot be more than 135% of the PV of benefits. If the ratio over the life of the contract is below 135%, no adjustment is needed. The calculation should have that condition coded, but a shortcut may have been taken assuming that the ratio would be routinely higher.

DETERMINISTIC RESERVE

A: Calculation of the Deterministic Reserve

1. **When a policyholder dies we reimburse them for the unearned premium that they have paid. We have two possible ways to account for this in the deterministic reserve: By factoring these cashflows into the reserve directly like any other benefit, or by adding the unearned premium to the deterministic reserve. Both methods seem valid to us, and the latter method is similar to our current practice. However the latter method has a much greater impact on the reserve than the former method so this decision will have an impact on our reserves. Which method should we use?**

   The deterministic reserve requires the projection of future cash flows that take into account all benefits and expenses paid by the company against future revenues. In this case, it seems most appropriate to include the payment of the unearned premium in the death benefit amount rather than simply adding the reserve to your calculated reserve. For purpose of the field test, please do it that way (not similar to your current practice) if possible.

2. **Currently we are calculating the deterministic reserve annually and then interpolating to get monthly reserves. Acquisition costs are included in the reserve at issue. Due to the interpolation the acquisition costs will impact policy reserves throughout the first year even though they're paid off at issue. Is this acceptable or should the acquisition costs be taken out?**

In the field test we are looking for the reserves at the end of the calendar year and again at the end of the 5th calendar year reflecting a block of business. The reserves for policies issued during the year should be calculated as you believe would normally calculate them if VM-20 was in effect. If you decide to interpolate using an “at issue” reserve and end of policy year one reserve for these policies, then yes a portion of the acquisition costs will be in the interpolated reserve. That is fine for the purpose of the field test.

STOCHASTIC RESERVE

No questions

STOCHASTIC AND DETERMINISTIC EXCLUSION TEST

A: Stochastic Exclusion Test

1. Is the Stochastic Exclusion Test optional and how does this relate to calculating the reserves?

The Stochastic Exclusion Test (SET) determines whether or not the stochastic reserves need to be calculated. As such, if you would like to calculate the stochastic reserves, the SET is not necessary. However, we would like to see the SET results to determine the adequacy of the test. It is not required currently especially if it is too burdensome but we may ask for it in the second phase of the project.

2. What starting assets should we use for the Stochastic Exclusion Test?

The stochastic exclusion test requires the calculation of various deterministic reserves as outlined in section 4.A, but adjusted per 6.B.2.a. The deterministic reserve of section 4.A is a gross premium reserve and to my knowledge, doesn't require a starting asset value.

3. Are the reserves calculated for Stochastic Exclusion Test on aggregate basis or seriatim basis? Related to this, are deterministic reserves on aggregate basis or seriatim basis?

These reserves do not need to be calculated on a seriatim basis, but they may be.

B: Deterministic Reserve Exclusion Test

12. Should the Deterministic Exclusion Test be on a Gross or Net of Reinsurance Basis?

Companies should perform the DRET twice - once Gross of Reinsurance, and then secondly Net of Reinsurance.

13. Section 6.C addresses the deterministic exclusion test. It appears that the valuation net premiums used in section 6.C are to be determined according to the old formulaic minimum reserve requirements for all non-term, non-ULSG products. And for term and ULSG policies, the valuation net premiums used in section 6.C. are to be determined according to Net Premium Reserve methodology outlined in Section 3, but with the 4 changes listed under 6.C.4.b. Is this correct?

This is an issue with the incorrect reference. See errata, and it has been made to the current working draft.

14. VM-20 specifies that no margins should be used for the SET, but we cannot find guidance for the DET. Is it correct to assume there should be no margins for the DET as well?

The DET is a formulaic test of two prescribed values. The comparison is of the Gross Premium to the Net Premium from the Net Premium Reserve (or CRVM) net premium. In neither case is the addition or removal of any margin contemplated. The gross premium is the maximum that can be charged under the contract for a scheduled premium contract or, in the case of a UL type product, the level annual premium that would be required to bring the contract to completion under the guarantees of the contract. The net reserve premium is defined by interest, mortality, and in some cases lapse - and has no added margin.

15. **Is the DET a one time test or an annual test? If we were to use the language from the VM20 document, a policy could pass the test in one year and fail the test the next year.**

As drafted in VM20, the test needs to be done annually, or at least be able to argue annually, that it is passed.

16. **For calculation of the guaranteed gross premium in the Deterministic Reserve Exclusion test, should the $2.50 per thousand initial expense be included in the present value of benefits and expenses?**

The $2.50 is part of the ‘expense allowance’ of the net premium reserve calculation and has no bearing on the gross premium. The guaranteed gross premium should be computed based on the terms of the contract. If it is a scheduled premium contract, the GP will be defined in the policy. If it is a UL type product, the premium will be what is needed under the terms of the contract.

17. **In 6.C.2, it says that policies pass if the sum of the valuation net premiums for the group of policies is less than the gross premiums, using the method of section 3. For term, we are to use the net premium reserve method based on this. Per 3.B.7.b.i, it says that the adjusted gross premium for the first policy year shall be set to 0. This also matches the sample excel file posted by John Bruins. So, the net premium is 0 for all policies issued in 2009 as of YE 2009. So, assuming that the gross premium is greater than 0, all of our 1-year files will fail the deterministic exclusion test. Is this interpretation correct?**

These policies would all pass. 6.C.2. says you pass if the sum of the valuation net premiums from section 3 is less than the guaranteed gross premiums.

18. **In 6.C.4.b.iv, it says that “if the anticipated mortality for the group of policies exceeds the valuation mortality, then the company shall substitute the anticipated mortality to determine the net premium.” By anticipated mortality, do you mean the mortality we calculated to use for the deterministic reserve, or do you mean what we are using as company experience in general? Due to the credibility built into the mortality for the deterministic reserve, there is a difference between the 2 sets of mortality and so there will be a difference in this comparison.**

When 6.C.4.b.iv refers to anticipated mortality, they mean the mortality that was calculated to use for the deterministic reserve (i.e. credibility adjusted mortality).

19. **Assuming the secondary guarantee on a ULSG is of the cumulative premium (10 year) genre. Would 6.C.4.b.ii apply here? I believe one could argue that the expiration of a safety net period could trigger shock lapses. If 6.C.4.b.ii does apply, we also have to "pass" a comparison based on the base guarantee, correct?**

    6.C.4.b.ii only applies to Term and 6.C.4.b.iii applies to ULSG.

20. **Assuming there are multiple secondary guarantees; a cumulative premium (10 year) and a shadow account (lifetime). Are we to only concerned with the longest guarantee? If so, here we'd choose the shadow account guarantee - and unlike the cumulative premium guarantee, it would not lend itself to a shock lapse situation. Thus, no need to be concerned with the base guarantee, correct?**

    For 6.C.4.b.iii, the participant should only be concerned with the longest guarantee, and calculate the guaranteed gross premium as the level gross premium at issue that would keep the policy in force for the entire period when coverage is to be provided, based on the policy guarantees of mortality, interest and expenses.

21. **When performing the Deterministic Exclusion Testing, what interest rate(s) should be used for discounting when calculating the PV of premiums?**

    The deterministic exclusion test is a simple sum, and not a present value.

22. **Is it true that we only need to use the gross premium from the level term period as the gross premium in this test? The confusion comes from 6.C.4.b.ii and iii where it says that we need to test this twice - once considering the initial premium period and another considering the contract over the entire lifetime. I am hoping that the 2nd one is referring to the ULSG-type policies and the first is for the term-type policies.**

    The test was designed to be a lifetime of the product test, but a special consideration was added for level period term policies to additionally test the initial level period on a stand-alone basis.

23. **(added 0512)) The DRET, per VM-20, is a comparison of net to gross premiums. Are they as of the issue date or as of the valuation date? The reason for the confusion is based on the slides we have from the KC meeting and the actual VM-20 language. Session #10 - slide 4 refers to a gross premium that reflects actual funding. This contradicts the VM-20 language that says the gross premium is as of the issue date (how can we calculate a gross premium at issue that reflects actual funding).**

    Maybe the slide is indicating that the gross premiums are to be recalculated as of the valuation date per Section 3 (net premium reserve section) in order to produce a new valuation date net premium. And perhaps this is the net premium to be used in the DRET?

If the answer is that both premiums are as of the issue date, then aren't we looking at a situation where once the test is passed/failed, then it is always passed/failed? And eliminating the need to re-test on each valuation date?

As VM20 is now written, the test needs to be passed annually. For any given policy, since the ratio of net to gross is fixed, the answer for the DET can't change. For a block of policies, the answer could change if some policies pass and some fail, and the mix within the block changes.

24. **Except as provided in subsection 6.C.1, a group of policies passes the deterministic reserve exclusion test, if the company demonstrates that the sum of the valuation net premiums for the group of policies, determined according to Section 3, is less than the sum of the corresponding guaranteed gross premiums for such policies.**

    a. **Is it the intention that the premiums are to be summed, and not present valued? I believe there are a couple presentations out there that show the DET as being a comparison between two present values.**

    The language of VM20 is to sum the premiums.

    b. **VM-20 should probably clarify whether this is a retrospective or prospective calculation. I believe the intention is for it to be prospective, correct?**

    Yes, this is a prospective calculation.

25. **Section 6.c.4.b i) states the lapse rates assumed for all duration are 0% based on the 2/28/11 draft of VM-20.**

    a. **Does it mean that net premium ratios should be based on 0% instead of section 3c when we are performing 6.C.2.? 6.C.4.b used to refer to 3.A.2 which does not apply to UL with secondary guarantees based on the 10/16/10 draft of VM-20.**

    Yes – the test was designed to test the gross premium against the net premium developed assuming no lapse.

    b. **Is it saying that the valuation net premium for purposes of the deterministic exclusion test, for policies that have a secondary guarantee longer than 5 years, is NOT the same as the net premium implied by the VM-20 calculations?**

    That is correct – the net premium for the DET will generally be higher than the net premium actually used in the reserve calculation due to the difference in lapse rate assumptions.

26. **Is the DET a one time test or an annual test? If we were to use the language from VM-20 document, a policy could pass the test in one year, and fail the test in the next year?" The answer provided was "As drafted in VM-20 the test needs to be done annually, or at least be able to argue annually that it is passed"**

Can you expand on how it's possible to pass in one year and not the next? Outside the instructions per section 6.C.4.b.iv., it's hard to determine how this happens? Is it perhaps due to specific design features causing a 'pass' then 'fail' scenario?

For any given policy, since the ratio of net to gross is fixed, the answer will not change from year to year. For a block of policies, if some pass and some fail, the answer for the block could change if the mix of business changes.

CASH FLOW MODELS

A: General Questions

27. What is the reason for doing a 5 year in force valuation?

The rationale behind using 5 years of in force business is to get a sense of the future while keeping the amount of work reasonable.

83. What volume of business should I assume? Will you prescribe an amount of business?

You can use your actual business written in 2009 and assume the same amount of business in 2005 through 2008. What is more important is using the standardized decrements.

84. What statutory formulaic reserve, if any, should we have in the CF models? Should the NPR reserve be in? Should there be none? Theoretically it shouldn't matter, since reserves affect timing of profits and taxes, neither of which the deterministic or stochastic reserves care about.

You can ignore formulaic and net premium reserves in doing the calculations for the deterministic and stochastic reserves. It's okay if your system calculates formulaic reserves; just don't use them in the calculation of the deterministic or stochastic reserves.

85. Since we are looking at one valuation date, what about reserves past duration 5 which this analysis will not tell us anything about?

We want to do the best we can with the current resources and do not want to put undue burden on participants. We understand that reserves beyond duration 5 are important but we would like to assess the current results first and then determine future plans.

86. There are products which will be damaged if Paid Up Additions (PUA) are excluded from the models. What is the appropriate way to incorporate them?

It makes sense to include the PUA into the calculation if their exclusion cripples the products significantly. In cases where exclusion would damage the product, we recommend these to be included for the testing and that you notify us through the project inbox.

87. Should 15-year term products be excluded from the Field Test?

Yes, please exclude 15-year term products.

88. Were there going to be scenario sets posted on the website to ensure all companies are using the same scenarios?

Scenarios have been posted to the bulletin board for the different possible projection period lengths as well as the different numbers of scenarios that can be run.

89. The instructions say that our liability inforce file should be such that:

It should be a hypothetical in force block issued from January 2005 through December 2009

2005 through 2008 will be clones of the products issued in 2009, even if those products were not actually issued in prior years or if the product had changed from prior year versions

Assume 5% of the business terminates each year to determine a hypothetical amount in force at 12/31/2009

Should we assume that the 5% excludes any forced lapses due to the secondary account going negative? If not, can we change our premium assumption so that the secondary account remains positive for all the policies during the 5-yr period (this would no longer be a perfect clone of the business)?

The 5% is just to keep the participants in the same general ballpark as to overall size of their blocks. Companies should do what makes sense for your block. For the purposes of the study, you should not change your premium assumption. Just include both the 5% and the amount of the forced lapses due to the secondary account going negative.

90. Have you heard from participating companies whether they plan to use real assets for the study or not? I saw in the Phase 1 approach letter that we could start our projections with cash and immediately invest it using a strategy that represents the assets backing the liabilities. It would make life much simpler than trying to get the actual assets for 10000 scenarios with the correct default/spread assumptions.

We have not had any participating companies specifically tell us what they were planning on doing with regard to asset modeling. It is fine to model the assets as you explain above using cash that is invested immediately. It is important though to make sure if this technique is used that the dividends / credited rates modeled are consistent with how the business is expected to be managed in the future and any guarantees that apply to the business.

B: QUESTIONS ON PIMR

In the construction of the projection models to be used for the Deterministic Reserve (DR) and possibly the Stochastic Reserve (SR) calculations, VM-20 requires that a non-cash Pre-Tax Interest Maintenance Reserve (PIMR) and its amortization be recognized and included both at the start of a scenario projection and as realized capital gains and losses develop over the projection period. The following presents some questions and issues related to the implementation of the VM-20 requirements for PIMR.

Section 7.D.2.d. provides for the inclusion of a PIMR balance in the selection of starting assets. Section 7.I further provides that PIMR is to be established for modeled capital gains and losses arising from changes in interest rates over future projection intervals.

28. Is a PIMR amount from net capital gains (and thus having a credit balance) arising prior to the start of the projection and allocated to the model at the beginning of the projection an asset with a positive value in the asset selection process?

No. Section 7.D.2.d states that the NEGATIVE of the PIMR balance is brought into starting assets. So if the PIMR has a positive (i.e. credit) balance that arose from prior period capital gains, the credit balance is reflected as a negative asset in starting assets. Thus, everything else being equal, the amount of invested assets included in starting assets will be “grossed up” by the amount of the PIMR. As a simple example: if the total starting assets equal $800m, and the PIMR has a positive (i.e. credit) balance of 20m, then starting assets would consist of invested assets of $820m and a PIMR asset of $(20)m.

29. For the purpose of determining the modeled starting assets, is any PIMR allocated to the model segment to be included in determining whether the aggregate annual statement value of starting assets is within the 98% to 102% range?

An issue with including positive PIMR as an initial starting asset is that, unless PIMR amortization is treated as a real cash flow in the projection model (as discussed in the alternative interpretation in 2 below), the modeled investment income from the actual starting investments may be less likely to be sufficient to meet obligations over the projection scenarios. Correspondingly, where a negative PIMR is assigned, a redundant level of starting investments may be required to be assigned to the model.

Yes. The total starting asset amount is unaffected by whether there is a PIMR balance or not. The total starting asset amount is compared to the resulting reserve for the 98 – 102 test.

30. **In preparing the cash flow models used in DR and SR calculations, investment activity is required to be modeled. Investment activity includes period net investment income from the modeled invested assets and reinvestment/disinvestment transactions arising from period cash flow needs resulting from net investment income and net liability cash flows. Section 7.F.1.c provides that in determining cash flows from fixed income invested assets, realized capital gains and losses are to be determined.**

    Does PIMR and its related amortization have an impact on the development of modeled invested assets over a scenario projection?

    No. The PIMR and its resulting amortization only impacts the timing of when capital gains are recognized for investment income purposes, but it has no impact on invested assets or cash investment income. Thus, if an asset with a BV of 100m is sold for 110m, and the capital gain of 10m is all due to interest rate movements, then 10m is transferred to the PIMR. Invested assets go up 10m (from 100m to 110m), and the cash flows off the reinvestment income will be modeled. The $10m capital gain is offset by a transfer to the PIMR, and the PIMR balance will go up. The capital gain will be recognized into income over time via the amortization of the PIMR.

31. **One interpretation is that PIMR should not impact modeled cash flows from invested assets or policyholder obligations within a scenario projection. In this interpretation, the impact of PIMR and its related amortization is limited to the calculation of the Net Asset Earned Rates (NAERs) used for discounting.**

    Correct interpretation.

32. **An alternative interpretation is that PIMR at the start of the projection represents an income stream (in the case of an initial positive PIMR allocation) from assets outside the model (in Surplus?) and that for modeling purposes the PIMR amortization should be modeled as real cash flows entering the model (in the case of positive PIMR amortization) or a negative cash flow out of the model (for amortization from a negative PIMR balance). These additional positive or negative cash flows would then be included in future reinvestment/disinvestment activities within the scenario projection.**

    Correspondingly, PIMR (and related amortization) arising from new capital gains and losses in the projection would be effectively treated as adjustments to modeled period investment income cash flows as well. Under this interpretation, those adjustments would be in the form of additional negative or positive cash flows introduced into the projection that would offset cash flows from capital gains and losses, respectively, when they occur, with corresponding cash flow reversals equivalent to PIMR amortization. In a sense, a positive PIMR then represents a pseudo-asset.

    Incorrect interpretation.

33. **Section 7.H provides that the DR calculation will be determined by discounting modeled cash flows by the path of the NAERs. These rates are calculated as the ratio of net**

investment earnings divided by invested assets as defined in that section. Section 7.H.2. provides that PIMR will impact the calculation of the NAER ratio.

How should the NAER calculation be adjusted for PIMR and related amortization? A reading of VM-20 appears to indicate that PIMR will impact the NAER ratio follows:

a. **PIMR amortization is included in the numerator of the NAER ratio (Section 7.H.2.c.iii) (in the case of positive starting PIMR, PIMR amortization would result in a higher NAER). New positive or negative PIMR arising from period capital gains and losses would also be included.**

b. **The invested assets are adjusted by the unamortized PIMR balance (Section 7.H.2.e) (in the case of positive starting PIMR, the unamortized balance would be added to the real invested asset balance, resulting in a lower NAER)**

Note that if PIMR is treated as described in the alternative interpretation in 2. above, these adjustments would appear to be redundant. This is because under that interpretation, investment income and invested assets (plus the unamortized PIMR) already reflect the deferral and amortization of capital gains and losses directly.

Your description of the above calculation is correct.

34. **How should the unamortized PIMR balance be treated when determining the GPVAD:**

In the determination of the GPVAD used in the SR, it is not clear whether there is a PIMR-related adjustment required by VM-20 to assets at the beginning and ending points over all the projection intervals. Section 5.B.1 requires that the "projected statement value of general and separate account assets" (whether positive or negative) be discounted in determining the scenario reserve.

The VM-20 language might be interpreted as including any unamortized PIMR as a general account asset and therefore be included with the modeled accumulated asset balance subject to the discounting by the one-year Treasury-based factors.

Alternatively, it might also be argued that the stochastic scenario reserve should reflect the asset deficiencies that arise from insufficient modeled cash flows, and therefore the PIMR ought to be excluded from the GPVAD calculation.

Section 7.D.5. states that the negative of any outstanding PIMR at any future point in time is to be included in the "projected statement value of assets". Thus, the PIMR is treated as a negative asset in all future periods when determining the "projected statement value of general and separate account assets" for the GPVAD calculation.

35. **Section 7.D.2.d.ii provides that the allocation of initial PIMR to the model is subject to the overall constraint that on a total company basis IMR (and PIMR) cannot be an asset. While**

it is expected that this constraint can be recognized at the start of a projection, it is not feasible to model such a limitation for all future intervals in all the scenario projections.

How should the PIMR limitation be applied over the combination of multiple model segments, durations and projection scenarios?

Section 7.D.2.d.ii provides some flexibility in determining whether the starting PIMR balance is positive or negative for each model segment. If the total company PIMR balance is positive, most actuaries would allocate the PIMR to each model segment based on the actual capital gains and losses from each segment, which means that that some model segments could have a negative PIMR. The process is not as straightforward when the total company PIMR is negative. Some actuaries might decide to set the starting PIMR at zero for all model segments. Other approaches could be used.

There is no limitation on PIMR being negative in future periods, either for specific model segments, or in total. Once the initial starting balance of the PIMR is determined for each model segment (could be positive or negative) the projected balance in future periods can go positive or negative, without limitation.

91. Section 7.H.2.c.i provides that the numerator in the NAER, the net investment earnings, should “include investment income plus capital gains and losses (excluding capital gains and losses that are included in PIMR).”

Is the language of VM-20 specific enough about what capital gains and losses must be in PIMR. Does this language provide an alternative to not establish a PIMR for projected capital gains and losses?

It is presumed that the reader of VM-20 understands that only interest-related capital gains and losses are transferred to the PIMR, and other (i.e. credit-related) capital gains and losses are not included in the PIMR. Perhaps this should be made clear in VM-20.

C: General Description of Cash Flow Projections

36. Should DAC tax be ignored since FIT is?

Yes.

D: Cash Flows from Invested Assets

37. Section 7.F.1.d of VM-20 requires the actuary to "Reflect any uncertainty in the timing and amounts of asset cash flows related to the paths of interest rates, equity returns or other

economic values." however, asset default rates are prescribed assumptions based on the methodology in VM-20. So if an actuary has an asset that would have uncertain cash flows (say a mortgage backed security during the crisis), how would the uncertainty in the cash flows be reflected?

Use the prescribed defaults without any adjustment.

REINSURANCE

38. Can there be simplified approaches for excess of retention YRT reinsurance?

There are suggested simplified approaches for excess of retention YRT reinsurance in VM-20. As long as the impact of the simplification is not material, you can utilize the approach.

ASSUMPTIONS

39. In the mortality assumption examples, the RR100 table is used to develop the "Anticipated Mortality Experience", which is then blended with the industry tables given from the UCS scoring (RR80 for Super Preferred). Is it reasonable to use the table from the UCS scoring or a pricing mortality table instead of the RR100 as the expected basis in developing the company experience mortality rates?

It is perfectly reasonable to us a table other than RR100 (e.g. a pricing table) to develop anticipated mortality experience.

92. Do you have any other examples of how a company could develop their credibility adjusted experience rates?

We currently do not have or know of other examples of how companies can develop their credibility adjusted experience rates. Given that more than a few companies have asked this question, we (Towers Watson) are currently looking into developing an example as an aid to participants.

93. What persistency rates are to be utilized to build the 5 year populations?

Please use standard 95% persistency and a 5% termination rate each year. This is meant to be a total decrement rate and not an incremental amount over normal mortality.

94. What shock lapse rates should be used for 30yr-term products?

Companies should use the same shock lapses as the 20yr-term products.

95. Will the margin analysis in Phase 2 measure the inherent margins in prescribed assumptions i.e. credit spreads?

We want to run prudent estimate vs. anticipated experience and do not want to have a view on the anticipated margins. As part of Phase 1, however, we are only asking for prudent estimates.

96. Are the recovery rates in Appendix 2 of the VM-20 document already built into the baseline annual default cost factors or do we need to model them explicitly?

The recovery rates are built into the baseline default cost and do not need to me modeled explicitly.

97. Should we be using the single "Total Default Cost" for the whole company (cells F9:I9 in the provided spreadsheet) to apply to all assets? Or, do we input the calculated default cost associated with each separate asset into the model?

The default cost associated with each separate asset should be input into the model. The latest version of the default calculator has been modified to clarify this point.

98. Given that long term spreads in Appendix 2 (Tables H and I) are used for 12/31/2009 current spreads, can the long term spreads also be used for the other calculations such as the OAS for the hypothetical asset net spread and the gross spreads for the Alternative 2 reinvestment method?

For the field test, wherever VM-20 calls for using current spreads, the participants should instead use the long term spread tables (H and I), including the calculation of OAS for hypothetical asset net spreads, and the calculation of gross spreads under Alternative 2.

99. Should assets that are excluded in the prescribed methodology (commercial mortgage loans etc.) be included in calculating the weighted average spread of the segmented asset portfolio in regards to the maximum net spread investment factor calculation?

Excluded assets are not subject to the prescribed methodology, and thus, are not subject to (and not included in) the maximum net spread investment factor. This is provided in section 9.F.1.c.i. : "For each asset included in the model segment and subject to this subsection 9.F.1 calculate . . . ."

100. The PBR credit rating conversion is dependent on whether an asset's NAIC designation is not solely derived from the unadjusted Moody's or S&P rating. An example was given of a non-agency MBS. Is that also in general the case for other types of securitized assets (such as ABS, CMBS, agency MBS, etc.)? For example, a NAIC 1, AAA rated securitized asset would then have a PBR credit rating of 6 (the second least favorable rating associated with NAIC 1). If that is not correct and the asset should be treated like a

corporate bond, then it would have a PBR credit rating of 1 (the average numeric rating corresponding to the Moody's or S&P rating).

Yes. For an NAIC 1 asset backed security, if a security's NAIC designation is not based solely on ratings from Acceptable Rating Organizations ("ARO") ratings, then the PBR credit rating would be 6. The VM-20 rating system is meant to evolve with the NAIC's new direction on designations as it moves from ARO ratings to security level modeling results to determine the NAIC designation (currently PIMCO for MBS and Blackrock for CMBS, with other ABS classes under consideration). For the field test, please remember to use the year-end 2009 NAIC ratings basis.

101. From KC, this was a slide from the presentation:

Alternative 1: A simple net spread formula favored by the NY State Insurance Dept:

The net yield on reinvestment assets equals the then-current U.S. Treasury interest rate curve times 104% plus 25 basis points.

Since the net spread is prescribed, no assumption is needed for default costs.

This does not currently address what to use for the gross spread assumption to compute market values when modeling asset sales.

Is there any clarification regarding the third bullet? If not, are there any suggestions for calculating such market values in the field test?

Please do what you think is appropriate.

An excerpt from the NY Special Considerations Letter has been posted to the document library for your reference.

One solution would be to split asset categories into those for existing assets and those for reinvestments assets.

For reinvestment assets, simply set current and ultimate spreads at 4% of the Treasury rates + a flat 25 basis points (per VM-20). Defaults are set at zero.

For existing assets, market values could be adjusted at the model start by setting the model spread to zero. Many models solve for a model spread at time zero that forces the modeled market value to equal the actual market value. By setting this to zero, market values would be “adjusted” to the new environment at time zero. However, note that any asset modeling errors that are usually “corrected” by using the model spread would now be present in the model. So it would be good to test that the net market spread at time zero is already close to zero. If not, asset market value calculation may need to be improved.

102. Regarding the maximum net spread investment factor, which involves comparing the weighted average spread of the segmented asset portfolio with a hypothetical portfolio of

triple B rated bonds. When I calculate the weighted average spread of the segmented asset portfolio, should I include the assets that are excluded in the prescribed methodology (commercial mortgage loans)?

No, do not include these assets.

103. For assets included in the prescribed methodology, I am assuming that the 12/31/2009 current spreads are the LT spreads in Appendix 2, Tables H and I (so the spread related factor is zero). Can I also use the LT spreads for the other calculations ---- such as the OAS for the hypothetical asset net spread, and the gross spreads for the Alternative 2 reinvestment method?

Yes. For testing purposes, the current spreads are equal to long-term.

104. What industry table is to be used for mortality?

Use the 2008 VBT.

105. The guidance note says "an analysis of the weighted average net reinvestment spread on new purchases by projection year (gross spread minus prescribed default costs minus investment expenses) of the model investment strategy compared to the weighted average net reinvestment spreads by projection year of the alternative strategy may suffice". Does this mean that as long as the weighted average net reinvestment spread on new purchases by projection year is lower than the one of the alternative strategy, compliance is achieved?

Yes. It should only get more complicated than that if the actual modeled investment strategy involves purchasing new assets with optionality such as callable bonds or residential mortgage-backed securities, and if additional option premium is assumed (i.e. higher gross spreads than those for non-callable assets). Since the additional option premium is fixed and the modeled cost of the options varies by scenario, it may not be as straightforward to prove compliance against the non-callable alternative portfolio. A dual reserve calculation may be necessary. In developing the requirements, we believed that most actuaries typically do not model these types of assets as part of the reinvestment strategy for asset adequacy modeling, using other simpler assets as proxies.

106. In the Mortality Assumption presentation by Mary Bahna-Nolan at the Kansas City Training to the mortality assumption for PBR. she applies credibility twice. Once to get the best estimate mortality experience rates. This is on slide 8. Then, credibility is applied again to get the credibility adjusted mortality experience rates, on slide 12. Based on my understanding of credibility theory, doing so will give too little weight to the actual experience.

Inconsistencies have been found in the different presentations on mortality credibility. We are currently waiting to hear further details. For the purpose of the field test, ignore the duplication and use VM-20 as your main source with the presentation as a guide. If we hear contradictory information, we will let participants know as soon as possible.

107. We are looking at the credibility factors for the mortality assumption and have a question. Is it better to calculate your credibility factors using limited fluctuation credibility using amounts or counts of claims? That is, should we calculate the variance in the formula using the face amounts or the policy counts? Our first pass on calculating the credibility factors showed lower credibility than expected based on the number of claims in the study. Our credibility segment has 1,500 claims but only 40% credibility. The AAA example has 1,300 claims but 97% credibility. It may be because we are using amounts in the calculations of the credibility which is giving us a larger variance and lower credibility than if we based on counts.

We are waiting for a response from Mary Bahna-Nolan on your question. We believe that the number of claims is what is expected companies will use (i.e., policy counts) for the credibility calculations. For the field test please base the credibility on counts. When we hear back from Mary, we will pass along her response.

108. Net reinvestment spreads are based on gross asset spreads, asset default costs and other factors. Gross asset spreads and asset default costs are all a function of PBR rating and weighted average life (WAL). Should the language here also say something about WALs of the assets in the alternative investment strategy?

It is implicit that the alternative portfolio has the same maturity structure characteristics as the modeled portfolio. Section 7.E.1.b indicates that these aspects are all determined by the company. There is no prescription regarding the cash flow structures, maturity, duration, etc. of the portfolio since the intent is to mimic the company's strategy. If we were to add language for clarity, it would have to be very general so as not to indicate another requirement.

109. The Economic Scenario Generator and the VM-20 documentation does not provide any details regarding an inflation assumption. Could you please advise on how to account for this model input? Some potential questions to be answered are as follows:

a. Should there be an explicit inflation assumption or is it reflected in the scenarios?

b. If inflation is tied to a Treasury rate, should there be a floor and/or cap on inflation?

The AAA scenario generator does not generate scenarios of inflation rates. My understanding is that the use of an inflation assumption, and the way it is determined and made consistent with the rest of the economic scenario, is up to the actuary.

110. What industry table should be used for Final Expense products?

The SOA's preneed table can be used. This table as well as the corresponding study has been posted to the Standardized Inputs and Spreads website.

111. The default cost factors are the sum of "baseline annual default cost factor," "spread related factor, " and "maximum net spread adjustment factor." For Phase I, do we have to determine all three items, or can we just use the baseline annual default cost factor?

For phase I of the field test, assume that 12/31/2009 credit spreads are equal to the long term credit spreads in Appendix 2 of VM-20 (tables H and I). This is a reasonable approximation given the movement of spreads from 9/30/2009 to 12/31/2009 and will greatly simplify the default cost calculations in VM-20. Other asset instructions should be followed as per VM-20. This will eliminate the “spread related factor” for purposes of the impact study.

APPENDICES

40. The electronic Word version of the VM-20 draft does not contain tables that are easily transferrable to Excel. Do the tables in the appendix exist in an Excel format anywhere currently?

An Excel version has been posted to the OnePlace site in the 'Standardized Inputs and Spreads' section.

CLARIFICATIONS

41. Can you please clarify the expense allowance calculation?

The premiums to be used in the determination of the expense allowance for years 1, 2 - 5, and 6 and later as outlined in VM20 Section 3.B.8.b. are defined by reference to Section 3.B.8.a. In a., the premiums are defined to be the level gross premium at issue, assuming payments are made each year for which premiums are permitted to be paid, such period defined as "s" in this Subsection, that would keep the policy in force for the entire period coverage is to be provided based on the policy guarantees of mortality, interest, and expense. The expectation was that the amount of unamortized expense allowances for the net premium reserve could be determined at issue similar to what is done today, and the future amortization would then be dependant on the amount of funding actually received.

“x1 = the gross premium for the first policy year"

= the level gross premium for all t

“y2-5 = 10% of the gross premium for each year from the second through fifth policy year"

= 10% of the level gross premium for all t

"z = an amount of $2.50 per $1,000 of insurance for the first policy year only"

= an amount of $2.50 per $1,000 of insurance issued for all

112. If a company's best estimate mortality assumption includes an allowance for future mortality improvement (i.e., beyond the projection start date), should that mortality improvement be considered as part of the Anticipated Experience assumptions for use in the Stochastic Exclusion Test?

For the purposes of the Field Test, do not include improvement.

113. Is preneed included or excluded in scope of VM-20?

Excluded

114. Is preneed subject to the NPR calc in section 3.B? Section 3.A.1 says no, but there is reference to preneed in section 3.C.1.b.

Not applicable (see above)

115. Is UL with no SG subject to the NPR calc in section 3.B? Section 3.A.1 says no, but there is reference to UL with no SG in section 3.B.8.

No. You should use the current formulaic approach for UL without Secondary Guarantees.

116. Does VM-20 require a Deferred Premium Asset of flexible premium products?

You are not required to calculate the DPA for the purposes of the field test, but if you are currently calculating it, you may continue to do so.

117. Please clarify the wording on the treatment of the dividend liability in starting assets Section 7.C.6

The liability for policyholder dividends declared but not yet paid that has been established according to statutory accounting principles as of the valuation date is reported separately from the statutory reserve. This dividend liability and the policyholder dividends that give rise to the liability may or may not be included in the Cash Flow Model at the company's option.

a. If both the dividend liability and the policyholder dividends that give rise to the liability are included in the Cash Flow Model then no adjustment is needed for the Deterministic and Stochastic Reserves.

b) If both the dividend liability and the policyholder dividends that give rise to the liability are not included in the Cash Flow Model then no adjustment is needed for the Deterministic and Stochastic Reserves.

c) If the dividend liability is not included in the Cash Flow Model, but the policyholder dividends that give rise to the liability are included in the Cash Flow Model, then the Deterministic and Stochastic reserve should be reduced by the amount of the dividend liability.

ERRATA

NOTE: There are several corrections to references that have been made to the current working version of the draft. However, these are not incorporated into the version of VM-20 being used for the Field Test. When we receive all the cross-reference errors, we will post them in this section.

42. The reference in section 6.C.4.b should be 3.A.1 instead of 3.A.2 (this is also a Q&A item under Cash Flow Model)

43. Section 9.F.6 has an incorrect reference to "starting fixed income assets except that subsection 9.F.c does not apply" 9.F.c should be 9.F.c.1

44. Section 4.A.1 has an incorrect reference to "the single economic scenario described in Section 7.E.3." 7.E.3 should be 7.G.1

45. Per the 10/16/10 exposure draft, 3.B.9 read:

    3.B.9 For any fund based policy for which the longest secondary guarantee period is more than five (5) years, during the secondary guarantee period the net premium reserve shall be the greater of the reserve amount determined according to subsection B.9, assuming the policy has no secondary guarantees, and the reserve amount for the policy determined according to the methodology and requirements subsections 3.B.8.b thru 3.B.8.e below.

    It was changed in the 2/28/11 working draft to read:

    3.B.9 For any fund based policy for which the longest secondary guarantee period is more than five (5) years, during the secondary guarantee period the net premium reserve shall be the greater of the reserve amount determined according to subsection B.9, assuming the policy has no secondary guarantees, and the reserve amount for the policy determined according to the methodology and requirements subsections 3.B.8.b thru 3.B.8.e below.

    Should read:

3.B.9 For any fund based policy for which the longest secondary guarantee period is more than five (5) years, during the secondary guarantee period the net premium reserve shall be the greater of the reserve amount determined according to subsection B.8, assuming the policy has no secondary guarantees, and the reserve amount for the policy determined according to the methodology and requirements subsections 3.B.9.b thru 3.B.9.e below.

46. Section 6.C.4.b.ii should reference Section 3.C.3.b.iii instead of 3.E as there is no Section 3.E.

CROSS REFERENCE CORRECTIONS

VM-20 CROSS REFERENCE CORRECTIONS **Based on October 16, 2010 Draft**		
Location in VM-20	**Current Reference**	**Corrected Reference**
3.B.7.a	3.C.7.b.iii	3.C.3.b.iii
3.B.9	3.B.9 (first reference)	3.B.8
3.B.9.c.ii	3.B.9.a	3.B.9.c.i
3.C.2.a.i	3.B.8	3.B.7
3.C.2.a.ii	3.B.9	3.B.8
3.C.2.d.i	3.B.8	3.B.7

I: VM-20 Draft Regulation

The working draft of VM-20 dated February 28, 2011 is attached.

Working Draft 2/28/11
Based on Exposure Draft: 10/16/10

This is a working draft provided for informational purposes. The NAIC is not yet soliciting comments on this document. A version of this document will be released for comment for a reasonable period of time prior to its adoption.

This draft includes two alternatives for determining the cash flows on reinvestment assets. Alternative 1 is based on a function of the appropriate U.S. Treasury interest rate plus a spread. Alternative 2 is based on deducting asset default costs and anticipated investment expenses form the gross investment income. There are two versions of Section 7.F and Section 9.F.6 for these alternatives.

VM-20: REQUIREMENTS FOR PRINCIPLE-BASED RESERVES FOR LIFE PRODUCTS

Table of Contents

Section 1. Purpose

A. These requirements establish the minimum reserve valuation standard for individual life insurance policies issued on or after the operative date of the valuation manual and subject to a principle-based reserve valuation with a net premium reserve floor under the Standard Valuation Law.

B. These requirements constitute the Commissioner's Reserve Valuation Method (CRVM) for policies of individual life insurance.

Definitions

A. The term "anticipated experience assumption" means an expectation of future experience for a risk factor given available, relevant information pertaining to the assumption being estimated.

B. The term "clearly defined hedging strategy" means a strategy undertaken by a company to manage risks that meet the criteria specified in the applicable requirement.

C. The term "credibility segment" means a group of policies subject to the same level of underwriting and same risk classification procedures that are grouped together for the purpose of determining whether the policies qualify for the simplified method to determine prudent estimate mortality assumptions in Section 9.C.

D. The term "deterministic reserve" means a reserve amount calculated under a defined scenario and a single set of assumptions. Deterministic reserves include, but are not limited to reserves calculated using formula based methods.

E. The term "gross reserve" means the minimum reserve held in the absence of any ceded reinsurance.

F. The term "margin" means an amount included in a prudent estimate assumption that is intended to provide for estimation error and adverse deviation related to a corresponding anticipated experience assumption.

G. The term "model segment" means a group of policies and associated assets that are modeled together to determine the path of net asset earned rates.

H. The term "mortality experience cell" means a subset of policies from a mortality segment that are grouped together when determining credibility adjusted experience rates.

I. The term "mortality segment" means a subset of policies from a credibility segment for which a separate mortality table representing the prudent estimate assumption will be determined.

J. The term "net asset earned rates" means the path of earned rates reflecting the net general account portfolio rate in each projection interval (net of appropriate default costs and investment expenses).

K. The term "net premium reserve" means the amount determined in Section 3.

L. The term "non-guaranteed element (NGE)" means either: (a) dividends under participating policies or contracts; or (b) other elements affecting life insurance or annuity policyholder/contract holder costs or values that are both established and subject to change at the discretion of the insurer.

M. The term "per policy reserve" means an amount determined for each policy that equals the greater of the cash surrender value and the seriatim reserve.

N. The term "policy" means an individual life insurance policy included in the scope of these requirements.

O. The term "policyholder efficiency" means the phenomenon that policy holders will act in their best interest with regard to the value of their policy. A policyholder acting with high policyholder efficiency would take actions permitted in their contract which would provide the greatest relative value. Such actions include but are not limited to not lapsing a low value or no value contract, persisting, surrendering, applying additional premium, exercising loan and partial surrender provisions.

P. The term "pretax interest maintenance reserve" or "PIMR" means the statutory interest maintenance reserve liability adjusted to a pre-tax basis for each model segment at the projection start date and at the end of each projection interval.

Q. The term "Principle-Based Reserve Actuarial Report" or "PBR Actuarial Report" means the document containing supporting information prepared by the company as required by VM-31.

R. The term "prudent estimate assumption" means a risk factor assumption developed by applying a margin to the anticipated experience assumption for that risk factor.

S. The term "reinsurance cash flows" means the amount paid under a reinsurance agreement between a ceding company and an assuming company. Positive reinsurance cash flows shall represent amounts payable from the assuming company to the ceding company; negative reinsurance cash flows shall represent amounts payable from the ceding company to the assuming company.

T. The term "reinsurance aggregate cash flows" means the difference between reinsurance cash flows and reinsurance discrete cash flows, as defined below. An example of reinsurance aggregate cash flows includes experience refunds.

Guidance Note: If a reinsurance agreement gives rise to reinsurance aggregate cash flows, the company should take care to examine and apply the guidance in Sections 8.A.3 through 8.A.5 with regard to the treatment of such cash flows.

U. The term "reinsurance discrete cash flows" means reinsurance cash flows determined by applying reinsurance terms to an individual covered policy, without reference to the circumstances and events of other policies. Examples of reinsurance discrete cash flows would be proportional sharing of one or more items of revenue or expense associated with an underlying reinsured policy.

V. The term "scenario" means a projected sequence of events used in the cash flow model, such as future interest rates, equity performance, or mortality.

W. The term "scenario reserve" means the amount determined on an aggregated basis for a given scenario that is used as a step in the calculation of the stochastic reserve.

X. A "secondary guarantee" is a guarantee that a policy will remain in force for some period of time (the secondary guarantee period) even if its fund value is exhausted, subject to one or more conditions.

Y. The term "seriatim reserve" means the amount determined for a given policy that is used as a step in the calculation of the deterministic reserve.

Z. The term "stochastic reserve" means the amount determined in Section 5.

AA. The term "stochastic exclusion test" means a test of reserves under specified economic scenarios to determine whether a group of policies is required to comply with stochastic modeling requirements.

BB. The term "universal life insurance policy" means a life insurance policy where separately identified interest credits (other than in connection with dividend accumulations, premium deposit funds, or other supplementary accounts) and mortality and expense charges are made to the policy. A universal life insurance policy may provide for other credits and charges, such as charges for cost of benefits provided by rider.

CC. The term "variable life insurance policy" means a policy that provides for life insurance the amount or duration of which varies according to the investment experience of any separate account or accounts established and maintained by the insurer as to the policy.

Section 2. Minimum Reserve

A. Except as provided in subsection 2.B, the minimum reserve equals the aggregate net premium reserve for all polices (determined pursuant to Section 3) plus, the excess, if any, of the greater of the aggregate deterministic reserve for all policies (determined pursuant to Section 4) and the stochastic reserve for all policies (determined pursuant to Section 5) over the difference between the aggregate net premium reserve and any deferred premium asset held on account of those policies.

B. The company may elect to exclude one or more groups of policies from the stochastic reserve calculation and the deterministic reserve calculation if the exclusion tests determined pursuant to section 6 are passed. If the company elects this alternative, the minimum reserve is the sum of the following:

1. For the group of policies that pass both the stochastic exclusion and the deterministic exclusion test: the aggregate net premium reserve for those policies.

2. For the group of policies that pass the stochastic exclusion test but fail the deterministic exclusion test: The aggregate net premium reserve plus, the excess, if any, of the deterministic reserve determined pursuant to Section 4 over the difference between the aggregate net premium reserve for those policies and any deferred premium asset held on account of those policies.

3. For the group of policies that fail the stochastic exclusion test, and for the group of policies not subject to the exclusion tests: The aggregate net premium reserve plus, the excess, if any, of the greater of the deterministic reserve determined pursuant to Section 4 and the stochastic reserve determined pursuant to Section 5 over the difference between the aggregate net premium reserve for those policies and any deferred premium asset held on account of those policies.

C. For purposes of this Section, the aggregate net premium reserve for a group of policies is the sum of the net premium reserve pursuant to Section 3 for each of the policies of the group less any credit for reinsurance ceded pursuant to Section 8 for the same group of policies.

D. The minimum reserve for each policy is equal to the net premium reserve for each policy calculated as specified in Section 3 less the policy's portion of any credit for reinsurance ceded as specified in Section 8 plus the policy's allocated portion of any deterministic reserve excess plus the policy's allocated portion of any stochastic reserve excess.

Drafting Note: It is the intent of this section to prescribe a method to allocate the minimum reserve back to the individual policy that gave rise to the reserve. The allocation to individual policies is needed, among other reasons, to allocate assets under the Life and Health Insurance Guaranty Association Model Act. Further work is needed to determine the method to allocate the excess of the deterministic reserve and the stochastic reserve over the aggregate net premium reserve.

E. If the company elects to perform the stochastic and deterministic exclusion tests in Section 6 pursuant to section 2.B above, then:

1. Stochastic reserves must be calculated for each group of policies that fail the stochastic exclusion test in Section 6.

2. Deterministic reserves must be calculated for each group of policies that fail either the deterministic exclusion or stochastic exclusion tests in Section 6.

3. If a company elects to calculate stochastic reserves for one or more groups of policies, the company is not required to perform the exclusion tests in Section 6 for those policies.

4. A group of policies for which neither deterministic nor stochastic reserves are required or calculated are not principle-based valuation reserves as defined under the Standard Valuation Law.

F. The company may calculate the deterministic reserve and the stochastic reserve as of a date no earlier than 3 months before the valuation date, using relevant company data, provided an appropriate method is used to adjust those reserves to the valuation date. Company data used for experience studies to determine prudent estimate assumptions are not subject to this 3-month limitation.

G. If a company has separate account business, the company shall allocate the minimum reserve between the general and separate accounts subject to the following:

1. The amount allocated to the general account shall not be less than zero and shall include any liability related to contractual guarantees provided by the general account; and

2. The amount allocated to the separate account shall not be less than the sum of the cash surrender values and not be greater than the sum of the account values attributable to the variable portion of all such contracts.

H. A company may use simplifications and approximations to calculate the net premium reserve, the deterministic reserve and/or the stochastic reserve required by this section if the company can demonstrate that the impact of such simplifications and approximations does not materially understate the resulting minimum reserve.

I. The reserves for supplemental benefits and riders shall be calculated consistent with the requirements for "Riders and Supplemental Benefits" in VM-00, Section II.

Section 3. Net Premium Reserve

A. Applicability

1. The net premium reserve for each term policy, universal life insurance with secondary guarantee policy (definitions of products to be included need to be determined) must be determined pursuant to Section 3.

2. Except for policies subject to Section 3.A.1 the net premium reserve shall be determined pursuant to applicable requirements in VM-A and VM-C.

B. For purposes of this Section 3, the following definitions apply:

1. A "fund based policy" is one where policyholder premiums are credited to a fund (or account value), from which explicit expense and/or mortality charges are deducted and to which explicit interest credits are added.

2. A "non-fund based policy" is one with guaranteed gross premiums over the lifetime of the contract, or gross premiums which are subject to a guaranteed maximum schedule of gross premiums over the lifetime of the contract, and for which policy benefits and values are fixed and determined at issue.

3. Any policy which satisfies the definition of a fund based policy in Section 3.B.1 and the definition of a non-fund based policy in Section 3.B.2 shall be considered a fund based policy for purposes of this Section 3.

4. The "fully funded secondary guarantee" at any time is:

a. For a shadow account secondary guarantee, the minimum shadow account fund value necessary to fully fund the secondary guarantee for the policy at that time.

b. For a cumulative premium secondary guarantee, the amount of cumulative premiums required to have been paid to that time that would result in no future premium requirements to fully fund the guarantee, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

5. The "actual secondary guarantee" at any time is:

a. For a shadow account secondary guarantee, the actual shadow account fund value at that time.

b. For a cumulative premium secondary guarantee, the actual premiums paid to that point in time, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

6. The "level secondary guarantee" at any time is:

a. For a shadow account secondary guarantee, the shadow account fund value at that time assuming payment of the level gross premium determined according to Subsection 3.B.9.c.i.

b. For a cumulative premium secondary guarantee, the amount of cumulative level gross premiums determined according to Section 3.B.9.c.i, accumulated with any interest or accumulation factors per the contract provisions for the secondary guarantee.

Guidance Note: The definition of the net premium reserve in subsections 7, 8, and 9 is intended to result in a terminal net premium reserve under the assumption of an annual mode gross premium. The gross premium referenced should be the gross premium for the policy assuming an annual premium mode. The reported reserve as of any valuation date should reflect the actual premium mode for the policy and the actual valuation date relative to the policy issue date either directly or through adjusting accounting entries.

7. For non-fund based policies, on any valuation date the net premium reserve shall be equal to the actuarial present value of future benefits less the actuarial present value of future annual valuation net premiums as follows:

a. The annual valuation net premiums shall be a uniform percent of the respective adjusted gross premiums, described in Section 3.B.7.b, such that at issue the actuarial present value of future valuation net premiums shall equal the actuarial present value of future benefits plus an amount equal to $2.50 per $1,000 of insurance for the first policy year only.

For policies subject to the shock lapse provisions of Section 3.C.~~7~~3.b.iii, valuation net premiums for policy years after the shock lapse shall be limited and may result in two uniform percents, one applicable to policy years prior to the shock lapse and one applicable to policy years following the shock lapse. For these policies, these percents shall be determined as follows:

i. Compute the actuarial present value of benefits for policy years following the shock lapse.

ii. Compute the actuarial present value of valuation net premiums for policy years following the shock lapse.

iii. If ii/i is greater than 135%, reduce the net valuation premiums in ii uniformly to produce a ratio of ii/i of 135%.

iv. If the application of iii produces an adjustment to the net valuation premiums following the shock lapse, increase the net valuation premiums for policy years prior to the shock lapse by a uniform percentage such that at issue the actuarial present value of future valuation net premiums ~~at~~ equals the actuarial present value of future benefits plus $2.50 per $1,000 of insurance for the first policy year only.

b. Adjusted gross premiums shall be determined as follows:

i. The adjusted gross premium for the first policy year shall be set at zero.

ii. The adjusted gross premium for any year from the second through fifth policy year shall be set at 90% of the corresponding gross premium for that policy year.

iii. The adjusted gross premium for any year after the fifth policy year shall be set equal to the corresponding gross premium for that policy year.

c. The gross premium in any policy year is the maximum guaranteed gross premium for that policy year.

d. Actuarial present values are calculated using the interest, mortality and lapse assumptions prescribed in Section 3.C.

8. For any fund based policy not containing a secondary guarantee and any fund based policy for which the longest secondary guarantee period is five (5) years or less, the net premium reserve shall be calculated as follows:

   a. Determine the level gross premium at issue, assuming payments are made each year for which premiums are permitted to be paid, such period defined as "s" in this Subsection, that would keep the policy in force for the entire period coverage is to be provided based on the policy guarantees of mortality, interest and expenses.

   b. Using the level gross premium from Section 3.B.8.a, determine the value of the expense allowance components for the policy at issue as x_1, $y_{2\text{-}5}$, and z defined below.

      x_1 = the gross premium for the first policy year

      y_{2-5} = 10% of the gross premium for each year from the second through fifth policy year

      z = an amount of \$2.50 per \$1,000 of insurance for the first policy year only

   c. Determine the annual valuation net premiums as that uniform percentage (the valuation net premium ratio) of the respective gross premiums, such that at issue the actuarial present value of future valuation net premiums shall equal the actuarial present value of future benefits.

   d. For a policy issued at age *x*, on any valuation date *t*, the net premium reserve shall equal $m_{x+t} \cdot r_{x+t}$ where:

      i. m_{x+t} = the actuarial present value of future benefits less the actuarial present value of future valuation net premiums and less the unamortized expense allowance for the policy,

         E_{x+t}, determined as:

$$E_{x+t} = a_{x+t\,:s-t} \quad \frac{(x_1+z)}{a_{x:s}} + y_{2-5} \cdot C_{x+t} \qquad \text{for } t < s$$

$$= 0 \qquad \text{for } t \geq s$$

         Where:

$$C_{x+t} = 0 \qquad \text{when } t = 1$$

$$= {}_{w=1}^{t-1}\left(\frac{1}{a_{x+w:5-w}}\right) \qquad \text{when } 2 \leq t \leq 5$$

$$= {}_{w=1}^{4}\left(\frac{1}{a_{x+w:5-w}}\right) \qquad \text{when } t > 5$$

      ii. r_{x+t} = equals the ratio $e_{x+t} \quad f_{x+t}$, but not greater than 1, with (e_{x+t}) and (f_{x+t}) defined as below:

         e_{x+t} = the actual policy fund value on the valuation date *t*

         f_{x+t}= The policy fund value on the valuation date *t* is that amount which, together with the payment of the future level gross premiums determined in subsection 3.B.8.a above, keeps the policy in force for the entire period coverage is to be provided, based on the policy guarantees of mortality, interest and expenses.

e. The future benefits used in determining the value of "m" shall be based on the policy fund value on the valuation date *t* together with the future payment of the level gross premiums determined in subsection 3.C.8.a above, and assuming the policy guarantees of mortality, interest and expenses.

f. The values of ä are determined using the net premium reserve interest, mortality and lapse assumptions applicable on the valuation date

g. Actuarial present values referenced in this subsection 3.B.8 are calculated using the interest, mortality, and lapse assumptions prescribed in Subsection C of this section.

9. For any fund based policy for which the longest secondary guarantee period is more than five (5) years, during the secondary guarantee period the net premium reserve shall be the greater of the reserve amount determined according to subsection B.9, assuming the policy has no secondary guarantees, and the reserve amount for the policy determined according to the methodology and requirements subsections 3.B.~~9~~8.b thru 3.B.~~9~~8.e below.

a. After the expiration of the secondary guarantee period, the net premium reserve shall be the net premium reserve determined according to subsection 3.B.8 only.

b. If the policy has multiple secondary guarantees, the net premium reserve shall be calculated as below for the secondary guarantee that provides the longest period for which the policy can remain in force under the provisions of the secondary guarantee, such period defined as "n" in this Subsection. The resulting net premium reserve shall be used in the comparison with the net premium reserve calculated in accordance with subsection 3.B.8.

c. As of the policy issue date:

i. Determine the level gross premium at issue, assuming payments are made each year for which premiums are permitted to be paid, such period defined as "v" in this Subsection that would keep the policy in force to the end of the secondary guarantee period, based on the secondary guarantee assumptions as to mortality, interest and expenses. In no event shall "v" be greater than "n" for purposes of the net premium reserve calculated in this Subsection.

ii. Using the level gross premium from subsection 3.B.9.~~a~~c.i above, determine the value of the expense allowance components for the policy at issue as x_1, y_{2-5}, and z defined below.

x_1 = the gross premium for the first policy year

y_{2-5} = 10% of the gross premium for each year from the second through fifth policy year

z = an amount of $2.50 per $1,000 of insurance for the first policy year only

iii. Determine the annual valuation net premiums at issue as that uniform percentage (the valuation net premium ratio) of the respective gross premiums such that at issue and over the secondary guarantee period the actuarial present value of future valuation net premiums shall equal the actuarial present value of future benefits. The valuation net premium ratio determined shall not change for the policy.

d. After the policy issue date, on each future valuation date, *t*, the net premium reserve shall be determined as follows:

i. Determine a level gross premium, assuming such payments are made each year for which premiums are permitted to be paid, such that it would keep the policy in force for the remainder of the secondary guarantee period, based on the secondary guarantee assumptions as to mortality, interest and expenses.

ii. Calculate the valuation net premiums, if any, by multiplying the gross premiums in subsection 3.B.9.d.i, above by the valuation net premium ratio determined for the policy in subsection 3.B.9.c.iii.

iii. The net premium reserve for an insured age *x* at issue at time *t* shall equal the actuarial present value of future benefits less the actuarial present value of future valuation net premiums, if any, over the remainder of the secondary guarantee period and less the unamortized expense allowance for the policy, E_{x+t}, determined as:

$$E_{x+t} = a_{x+t:s-t} \quad \frac{(x_1+z)}{a_{x:s}} + y_{2-5} \cdot C_{x+t} \qquad \text{for } t < v$$

$$= 0 \qquad \text{for } t \geq v$$

Where:

$$C_{x+t} = 0 \qquad \text{when } t = 1$$

$$= {}_{w=1}^{t-1}\left(\frac{1}{a_{x+w:5-w}}\right) \qquad \text{when } 2 \leq t \leq 5$$

$$= {}_{w=1}^{4}\left(\frac{1}{a_{x+w:5-w}}\right) \qquad \text{when } t > 5$$

and the expense allowance components x_1, y_{2-5}, and z are determined as in subsection 3.B.9.c.ii.

e. Actuarial present values referenced in this subsection B.9 are calculated using the interest, mortality and lapse assumptions prescribed in Subsection C of this section.

10. The actuarial present value of future benefits equals the present value of future benefits including, but not limited to, death, endowment (including endowments intermediate to the term of coverage), and cash surrender benefits. Future benefits are before reinsurance and before netting the repayment of any policy loans.

C. Net Premium Reserve Assumptions

1. Mortality Rates

a. Except as indicated in subsection 3.C.1.b., and subject to subsection 3.C.1.c., the mortality standard used in determining the present values described in Subsection B of this Section shall be the 2001 Commissioners Standard Ordinary (CSO) Mortality Table. The 2001 Commissioners' Standard Ordinary (CSO) Mortality Table means that mortality table, consisting of separate rates of mortality for male and female lives, developed by the American Academy of Actuaries CSO Task Force from the Valuation Basic Mortality Table developed by the Society of Actuaries Individual Life Insurance Valuation Mortality Task Force, and adopted by the NAIC in December 2002. The 2001 CSO Mortality Table is included in the *Proceedings of the NAIC (2nd Quarter 2002)* and supplemented by the 2001 CSO Preferred Class Structure Mortality Table. Unless the context indicates otherwise, the 2001 CSO Mortality Table includes both the ultimate form of that table and the select and ultimate form of that table and includes both the smoker and nonsmoker mortality tables and the composite mortality tables. . It also includes both the age-nearest-birthday and age-last-birthday bases of the mortality table. The 2001 CSO Preferred Class Structure Mortality Table means mortality tables with separate rates of mortality for Super Preferred Nonsmokers, Preferred Nonsmokers, Residual Standard Nonsmokers, Preferred Smokers, and Residual Standard Smoker splits of the 2001 CSO Nonsmoker and Smoker tables as adopted by the NAIC at the September, 2006 national meeting and published in the *NAIC Proceedings {3 rd Quarter 2006}*. Unless the context indicates otherwise, the 2001 CSO Preferred Class Structure Mortality Table includes both the ultimate form of that table and the select and ultimate form of that table. It includes both the smoker and nonsmoker mortality tables. It includes both the male and female mortality tables and the gender composite mortality tables. It also includes both the age-nearest-birthday and age-last-birthday bases of the mortality table.

Drafting Note: The company shall determine the appropriate table from the Preferred Structure Mortality Tables based on the anticipated mortality for the class of policies being valued. Need to bring in the requirements of Model 815 and AG 42.

b. For preneed insurance contracts, as defined in subsection 3.C.1.b., and similar policies and contracts, the minimum mortality standard for determining the present values described in Subsection B for both male and female insureds shall be the Ultimate 1980 CSO Mortality Table. The term Ultimate 1980 CSO means the Commissioners' 1980 Standard Ordinary Life Valuation Mortality Tables (1980 CSO) without ten-year (10-year) selection factors.

For the purposes of this section, preneed insurance is any life insurance policy or certificate that is issued in combination with, in support of, with an assignment to, or as a guarantee for a prearrangement agreement for goods and services to be provided at the time of and immediately following the death of the insured. Goods and services may include, but are not limited to embalming, cremation, body preparation, viewing or visitation, coffin or urn, memorial stone, and transportation of the deceased. The status of the policy or contract as preneed insurance is determined at the time of issue in accordance with the policy form filing.

Drafting Note: The valuation manual can be updated by the NAIC to define a new valuation table. Because of the various implications to systems, form filings, and related issues, lead time is needed to implement new requirements without market disruption. It is recommended that this transition be for a period of about 4 years – that is, that the table be adopted by July 1 of a given year, that it be optional until January 1 of the 4th following calendar year, thereafter mandatory. It is further intended that the adoption of such tables would apply to all business issues since the adoption of this valuation manual. The details of how to implement any unlocking of mortality tables needs to be addressed in the future.

2. Interest Rates

Drafting Note: This section describing the determination of the "calendar year net premium reserve interest rate" is intended to communicate that, unlike the "unlocking" of the net premium reserve mortality and lapse assumptions, the interest rate used in the net premium reserve calculation for a block of policies issued in a particular calendar year does not change for the duration of each of the policies in that issue year block.

a. For net premium reserve amounts calculated according to:

i. Section 3.B.~~8~~7 for policies and riders for which nonforfeiture benefits are provided; or

ii. Section 3.B.~~9~~8.

The calendar year net premium reserve interest rate *I* shall be determined according to this subsection 3.C.2.a and subsections 3.C.2.b and 3.C.2.c below and the results rounded to the nearer one-quarter of one percent (1/4 of 1%). This rate shall be used in determining the present values described in Subsection B of this Section for all policies issued in the calendar year next following its determination.

$$I = .03 + W * (R_1 - .03) + (W/2) * (R_2 - .09)$$

Where: R_1 is the lesser of R and .09

R_2 is the greater of R and .09

R is the reference interest rate defined in Subsection 2.b. below

W is the weighting factor for a policy, as defined in Subsection 2.c. below

However, if the calendar year net premium reserve interest rate *I* in any calendar year determined without reference to this sentence differs from the corresponding actual rate for the immediately preceding calendar year by less than one-half of one percent (1/2 of 1%), the calendar year net premium reserve interest rate shall be set equal to the corresponding actual rate for the immediately preceding calendar year.

b. The reference interest rate *R* for a calendar year shall equal the lesser of the average over a period of thirty-six (36) months and the average over a period of twelve (l2) months, ending on June 30 of the calendar year, of the monthly average of the composite yield on seasoned corporate bonds, as published by Moody's Investors Service, Inc.

c. The weighting factor *W* for a policy shall be determined from the table below:

Guarantee Duration (Years)	Weighting Factor
10 or less	.50
More than 10 but not more than 20	.45
More than 20	.35

The guarantee duration for the coverage guarantee is the maximum number of years the life insurance can remain in force on the basis guaranteed in the policy or under options to convert to plans of life insurance with premium rates or nonforfeiture values or both which are guaranteed in the original policy.

d. For reserve amounts calculated according to:

i. Section 3.B.~~8~~7 of this Section for policies and riders for which no nonforfeiture benefits are provided; or

ii. Section 3.B.9 of this Section

the calendar year net premium reserve interest rate shall be calculated by increasing the rate determined according to subsections 3.C.2.a thru 3.C.2.c above by 1.5%, but in no event greater than 125% of the rate determined according to subsection 3.C.2.a thru 3.C.2.c above.

Drafting Note: If a policy contains multiple coverage guarantees and each coverage guarantee stream is valued separately, it may be important to define which reserve interest rate(s) should be used for reporting and analysis purposes.

3. Lapse Rates

a. For non-fund based policies or riders which provide nonforfeiture values, fund based policies not containing a secondary guarantee, and fund based policies for which the longest secondary guarantee period is five (5) years or less the lapse rates used in determining the present values described in subsection 3.B shall be 0% per year during the premium paying period and 0% per year thereafter.

b. For non-fund based policies or riders which provide no nonforfeiture values (i.e. term policies), the lapse rates used to determine the present values described in subsection 3.B shall be:

i. 6% per year during the initial level premium period and during any subsequent level premium period of 5 or more years.

ii. 10% per year during any premium paying period after an initial level premium period of less than 5 years.

iii. For policies or riders having a level premium over a 5 year or longer period, a shock lapse rate at the end of the initial level premium period based on the length of the next renewal level premium period and the percent increase in the gross premium as shown in the table below.

Initial premium period	Length of Next Renewal Period	Percent increase in gross premium per $1,000	Shock Lapse Rate

1	YRT	Any	10%
5	YRT	Any	50%
5	5	Any	25%
10	YRT	< 400%	70%
10	YRT	Over 400%	80%
10	5	Any	50%
10	10	Any	25%
20	YRT	< 400%	70%
20	YRT	Over 400%	80%
20	5	Any	70%
20	10	Any	50%
20	20	Any	50%

Drafting Note: The ACLI is pursing development of an algorithm to generalize this factor and eliminate cliffs between categories.

c. For fund based policies, for which the longest secondary guarantee period is more than five (5) years, the lapse rate, L_{x+t}, used to determine the present values described in Subsection B at time *t* for an insured age *x* at issue shall be determined as follow

i. Determine the ratioR_{x+t} where:

$R_{x+t} = [FFSG_{x+t} - ASG_{x+t}]\ [FFSG_{x+t} - LSG_{x+t}]$ but not > 1

Where:

$FFSG_{x+t}$ = the fully funded secondary guarantee at time *t* for the insured age *x* at issue

ASG_{x+t} = the actual secondary guarantee at time *t* for the insured age *x* at issue

LSG_{x+t} = the level secondary guarantee at time *t* for the insured age *x* at issue.

ii. The lapse rate for the policy for durations *t+1* and later shall be set equal to:

$L_{x+t} = R_{x+t} \cdot 0.01 + (1 - R_{x+t}) \cdot 0.005 \cdot r_{x+t}$

Where r_{x+t} is the ratio determined in Subsection 3.B.8.d.ii.

D. Net Premium Reserve Calculation and Cash Surrender Value Floor

1. For a non-fund based policy, the net premium reserve shall not be less than the greater of:

a. The cost of insurance to the next paid to date. The cost of insurance for this purpose shall be determined using the mortality tables for the policy prescribed in subsection 3.C or

b. The policy cash surrender value, calculated as of the valuation date and in a manner that is consistent with that used in calculating the net premium reserve on the valuation date.

Drafting Note: It may be appropriate to consider potential simplifications for the net premium reserve for YRT reinsurance assumed. The unearned annual tabular cost of insurance (“interpolated C_x”) is one potential option to examine.

2. For a fund based policy, the net premium reserve shall not be less than the greater of:

a. The amount needed to cover the cost of insurance to the next processing date on which cost of insurance charges are deducted with respect to the policy. The cost of insurance for this purpose shall be determined using the mortality tables for the policy prescribed in subsection 3.B. or

b. The policy cash surrender value, calculated as of the valuation date and in a manner that is consistent with that used in calculating the net premium reserve on the valuation date.

The net premium reserve for fund based policies shall be determined assuming the premium payable for the policy is the level gross annual premium determined according to subsection 3.B.9.a., 3.B.10.c.i., or 3.B.10.d.i of this section, as applicable.

Section 4. Deterministic Reserve

For a group of one or more policies for which a deterministic reserve must be calculated pursuant to Sections 2.A or 2.B, the company shall calculate the deterministic reserve for the group as follows:

A. Calculate the deterministic reserve equal to the actuarial present value of benefits, expenses, and related amounts less the actuarial present value of premiums and related amounts where:

1. Cash flows are projected in compliance with the applicable requirements in Sections 7, 8 and 9 over the single economic scenario described in Section 7.~~E.3~~G.1.

2. Present values are calculated using the path of discount rates for the corresponding model segment determined in compliance with Section 7.H.4.

3. The actuarial present value of benefits, expenses and related amount equals the sum of

a. Present value of future benefits, but before netting the repayment of any policy loans;

Guidance Note: Future benefits include but are not limited to death and cash surrender benefits.

b. Present value of future expenses excluding federal income taxes and expenses paid to provide fraternal benefits in lieu of federal income taxes;

c. Policy account value invested in the separate account at the valuation date; and

d. Policy loan balance at the valuation date with appropriate reflection of any relevant due, accrued, or unearned loan interest, if policy loans are explicitly modeled under Section 7.E.

4. The actuarial present value of premiums and related amounts equals the sum of the present values of

a. Future gross premium payments and/or other applicable revenue;

b. Future net cash flows to or from the general account, or from or to the separate account;

c. Future net policy loan cash flows, if policy loans are explicitly modeled under Section 7.E;

Guidance Note: Future net policy loan cash flows include: loan interest paid in cash; additional loan principal; and repayments of principal, including repayments occurring at death or surrender (note that the future benefits in Section 4.A.3.a are before consideration of policy loans).

d. Future net reinsurance discrete cash flows determined in compliance with Section 8;

e. The future net reinsurance aggregate cash flows allocated to this group of policies as described in Subsection B of this section; and

f. The future derivative liability program net cash flows (i.e., cash received minus cash paid) that are allocated to this group of policies.

B. Future net reinsurance aggregate cash flows shall be allocated as follows:

1. Future net reinsurance aggregate cash flows shall be allocated to each policy reinsured under a given reinsurance agreement in the same proportion as the ratio of each policy's present value of future net reinsurance discrete cash flows to total present value of future net reinsurance discrete cash flows under the reinsurance agreement;

2. Future net reinsurance aggregate cash flows allocated to a group of policies is equal to the sum of future net reinsurance aggregate cash flows allocated to each policy in the group.

Section 5. Stochastic Reserve

The company shall calculate the stochastic reserve for all policies (pursuant to section 2.A) or for a group of policies (pursuant to section 2.B) as follows:

A. Project cash flows in compliance with the applicable requirements in Sections 7, 8 and 9 using the stochastically generated scenarios described in Section 7.G.

B. Calculate the scenario reserve for each stochastically generated scenario as follows:

1. For each model segment at the end and start of each projection year, calculate the discounted value of the negative of the projected statement value of general account and separate account assets using the path of discount rates for the model segment determined in compliance with Section 7.H.5 from the projection start date to the end of the respective projection year.

Guidance Note: The projected statement value of general account and separate account assets for a model segment may be negative or positive.

2. Sum the amounts calculated in Subparagraph a above across all model segments at the end and start of each projection year.

Guidance Note: The amount in Subparagraph b. above may be negative or positive.

3. Set the scenario reserve equal to the sum of the statement value of the starting assets across all model segments and the maximum of the amounts calculated in Subparagraph b above.

C. Rank the scenario reserves from lowest to highest.

D. Calculate CTE 70.

E. Add an additional amount to CTE 70 to capture any material risk included in the scope of these requirements but not already reflected in the cash flow models using an appropriate and supportable method and supporting rationale.

F. The stochastic reserve equals the amount determined in Subsection 5.E. If the company defines two or more subgroups for aggregation purposes as described in Section 7.B.2.b, the company shall calculate the amount determined in Section 5.E for each subgroup of policies on a standalone basis, and sum together those amounts for each subgroup to determine the total stochastic reserve.

Section 6. Stochastic and Deterministic Reserve Exclusion Tests

A. Stochastic Reserve Exclusion Test

1. Groups of policies pass the stochastic reserve exclusion test if

a. Annually and within 12 months before the valuation date the company demonstrates that the groups of policies pass the stochastic exclusion ratio test defined in Section 6.B; or

b. For groups of policies other than variable life or universal life with a secondary guarantee, the company provides a certification by a qualified actuary that the group of policies is not subject to material interest rate risk or tail risk, or asset risk. The company shall provide the certification to the Commissioner upon request.

2. A company may not exclude a group of policies for which there is one or more clearly defined hedging strategies from stochastic reserve requirements.

3. If a group of policies is excluded from the stochastic reserve requirements, the company may not include future transactions associated with non-hedging derivative programs in determining the deterministic reserve for those policies.

B. Stochastic Exclusion Tests

1. In order to exclude a group of policies from the stochastic reserve requirements using the method allowed under Section 6.A.1.a, a company shall demonstrate that the ratio of (b-a)/c is less than 4.5% where:

a. a = the adjusted deterministic reserve described in subsection 6.B.2.a using the baseline economic scenario described in subsection 6.B.2.b.

b. b = the largest adjusted deterministic reserve described in subsection 6.B.2.a under any of the other 15 economic scenarios described in subsection 6.B.2.b.

c. c = an amount calculated from the baseline economic scenario described in subsection 6.B.2.b that represents the present value of benefits for the policies, adjusted for reinsurance by subtracting ceded benefits. For clarity, premium, ceded premium, expense, reinsurance expense allowance, modified coinsurance reserve adjustment and reinsurance experience refund cash flows shall not be considered "benefits," but items such as death benefits, surrender or withdrawal benefits and policyholder dividends shall be. For this purpose, the company shall use the benefits cash flows from the calculation of quantity "a," and calculate the present value of those cash flows using the same path of discount rates as used for "a."

Drafting Note: Empirical testing of the reinsurance adjustment to "c" should encompass its impact in the case of YRT reinsurance as well as consistency of results among similar coinsurance, coinsurance with funds withheld, and modified coinsurance forms. A Guidance Note may prove necessary to address further judgment in the case of YRT.

2. In calculating the ratio in Paragraph 1 above, the company

a. Shall calculate an adjusted deterministic reserve for the group of polices for each of the 16 scenarios that is equal to the deterministic reserve defined in Section 4.A, but with the following differences:

i. using anticipated experience assumptions with no margins,

ii. using the interest rates and equity return assumptions specific to each scenario, and

iii. using net asset earned rates specific to each scenario to discount the cash flows.

b. Shall use the most current available baseline economic scenario and the 15 other economic scenarios published by the NAIC. The methodology for creating these scenarios can be found in Appendix 1 of the valuation manual.

c. Shall use anticipated experience assumptions within each scenario that are dynamically adjusted as appropriate for consistency with each tested scenario.

d. May not group together contract types with significantly different risk profiles for purposes of calculating this ratio.

3. Exclusion Requirements if the Stochastic Exclusion Test is Not Used

In order to exclude a group of policies from the stochastic reserve requirements using the method as allowed under Section 6.A.1.b above, the company must provide a demonstration in the PBR Actuarial Report in the first year and at least once every three calendar years thereafter that complies with the following:

a. The demonstration shall provide a reasonable assurance that if the stochastic reserve was calculated on a standalone basis for those polices subject to the stochastic reserve exclusion, the minimum reserve for those policies would not increase. The demonstration shall take into account whether changing conditions over the current and two subsequent calendar years would be likely to change the conclusion to exclude the group of policies from the stochastic reserve requirements.

b. If, as of the end of any calendar year, the company determines the minimum reserve for the group of policies no longer adequately provides for all material risks, the exclusion shall be discontinued and the company fails the stochastic reserve exclusion test for those policies.

c. The demonstration may be based on analysis from a date that proceeds the initial or subsequent exclusion period.

d. The demonstration shall provide an effective evaluation of the residual risk exposure remaining after risk mitigation techniques such as derivative programs and reinsurance.

4. The company may use one of the following or another method acceptable to the commissioner to demonstrate compliance with subsection 6.B.3:

a. Demonstrate that the greater of the deterministic reserve and the net premium reserve, less any associated deferred premium asset, is greater than the stochastic reserve calculated on a standalone basis.

b. Demonstrate that the greater of the deterministic reserve and the net premium reserve, less any associated deferred premium asset, is greater than the scenario reserve that results from each of a sufficient number of adverse deterministic scenarios.

c. Demonstrate that the greater of the deterministic reserve and the net premium reserve, less any associated deferred premium asset, is greater than the stochastic reserve calculated on a standalone basis, but using a representative sample of policies in the stochastic reserve calculations. or

d. Demonstrate that any risk characteristics that would otherwise cause the stochastic reserve calculated on a standalone basis to exceed greater of the deterministic reserve and the net premium reserve, less any associated deferred premium asset, are not present or have been substantially eliminated through actions such as hedging, investment strategy, reinsurance, or passing the risk on to the policyholder by contract provision.

C. Deterministic Reserve Exclusion Test

1. Group of policies that do not pass the stochastic exclusion test in Section 6.A do not pass the deterministic reserve exclusion test and the company is not required to calculate the deterministic reserve test for that group of policies.

2. Except as provided in subsection 6.C.1, a group of policies passes the deterministic reserve exclusion test, if the company demonstrates that the sum of the valuation net premiums for the group of policies, determined according to Section 3, is less than the sum of the corresponding guaranteed gross premiums for such policies.

3. A company may not group together policies of different contract types with significantly different risk profiles for purposes of the calculation in subsection 6.C.2.

4. For purposes of determining the valuation net premiums used in the demonstration in subsection 6.C.2:

a. If pursuant to Section 2 the net premium reserve is the minimum reserve required under Section 2.A of the Standard Valuation Law for policies issued prior to the operative date of the valuation manual, the valuation net premiums are determined according to those minimum reserve requirements;

b. If the net premium reserve is determined according to Section 3.A.~~2~~1:

i. The lapse rates assumed for all durations are 0%;

ii. For policies with guaranteed gross premium patterns that subject the policy to shock lapses, as defined in Section 3.E, the valuation net premiums comparison to the guaranteed gross premiums indicated in subsection 6.B.1 shall be performed twice, once considering only the initial premium period and another considering the contract over its entire lifetime;

iii. The guaranteed gross premium shall be the level gross premium at issue that would keep the policy in force for the entire period coverage is to be provided, based on the policy guarantees of mortality, interest and expenses;

iv. If the anticipated mortality for the group of policies exceeds the valuation mortality, then the company shall substitute the anticipated mortality to determine the net premium.

Section 7. Cash Flow Models

A. Model Structure

1. The company shall design and use a cash flow model that

a. Complies with applicable Actuarial Standards of Practice in develop cash flow models and projecting cash flows.

b. Uses model segments consistent with the company's asset segmentation plan, investment strategies, or approach used to allocate investment income for statutory purposes.

c. Assigns each policy subject to these requirements to only one model segment and shall use a separate cash flow model for each model segment.

d. Projects cash flows for a period that extends far enough into the future so that no obligations remain.

2. The company may use a simplified approach to developing cash flows, if the company shows that the approach produces reserves that are no less than those produced by a more robust cash flow model.

Guidance Note: For example, it may be reasonable to assume 100% deaths or 100% surrenders after some appropriate period of time.

B. General Description of Cash Flow Projections

1. For the deterministic reserve and for each scenario for the stochastic reserve, the company shall project cash flows ignoring federal income taxes and reflecting the dynamics of the expected cash flows for the entire model segment. The company shall reflect the effect of all material product features, both guaranteed and non-guaranteed. The company shall project cash flows including the following:

a. Revenues received by the company including gross premiums received from the policyholder.

b. Amounts charged to account values on general accounts business and use those amounts to determine any effects on future policy benefits, and not as revenue.

Guidance Note: Amounts charged to account values on general accounts business examples include cost of insurance and expense charges.

c. All material benefits paid to policyholders, including but not limited to, death claims, surrender benefits, and withdrawal benefits, reflecting the impact of all material guarantees.

d. Net cash flows between the general account and separate account for variable products.

Guidance Note: Cash flows going out from the general account to the separate account increase the reserve and cash flows coming in to the general account from the separate account decrease the reserve. Examples include allocation of net premiums to the separate account, policyholder-initiated transfers between fixed and variable investment options, transfers of separate account values to pay death or withdrawal benefits, and amounts charged to separate account values for cost of insurance, expense, etc.

e. Insurance company expenses (including overhead expenses), commissions, fund expenses, contractual fees and charges, and taxes (excluding federal income taxes and expenses paid to provide fraternal benefits in lieu of federal income taxes).

f. Revenue sharing income received by the company (net of applicable expenses) and other applicable revenue and fees associated with the policies and adjusting the revenue to reflect the uncertainty of revenue sharing income that is not guaranteed.

g. Net cash flows associated with any reinsurance as described in Section 8.

h. Cash flows from derivative liability and derivative asset programs, as described in Section 7.L.

i. Cash receipts or disbursements associated with investment income, realized capital gains and losses, principal repayments, asset default costs, investment expenses, asset prepayments, and asset sales. Cash flows related to policy loans are handled in the reserve calculation in a manner similar to cash flows to and from separate accounts.

Guidance Note: Since the projection of cash flows reflect premium mode directly, deferred premiums are zero under this approach.

2. In determining the deterministic reserve and stochastic reserve the company may perform the cash flow projections for each policy in force on the date of valuation or by grouping policies into representative cells of model plans using all characteristics and criteria having a material impact on the size of the reserve. If the company groups policies in representative cells the company shall develop the groups such that the resulting reserve is not materially different than the reserve that would result with no grouping.

Guidance Note: The actuary shall rely on guidance from applicable ASOPs to show compliance with this requirement.

Drafting Note: The Actuarial Standards Board is in the process of developing a new ASOP for principle-based reserves for life products. It is anticipated that this ASOP will provide guidance on how to group policies into representative modeling cells, as well as providing guidance on model granularity versus model accuracy

3. In determining the stochastic reserve, the company shall determine the number and composition of subgroups for aggregation purposes in a manner that is consistent with how the company manages risks across the different product types, and that reflects the likelihood of any change in risk offsets that could arise from shifts between product types. If a company is managing the risks of two or more different product types as part of an integrated risk management process, then the products may be combined into the same subgroup.

Guidance Note: Aggregation refers to the number and composition of subgroups of polices that are used to combine cash flows. Aggregating policies into a common subgroup allows the cash flows arising from the policies for a given stochastic scenario to be netted against each other (i.e., allows risk offsets between policies to be recognized).

C. Non-Guaranteed Element Cash Flows

1. Except as noted in subsection 7.C.5, the company shall include non-guaranteed elements (NGE) in the models to project future cash flows beyond the time the company has authorized their payment or crediting.

2. The projected NGE shall reflect factors that include but are not limited to the following (not all of these factors will necessarily be present in all situations):

   a. The nature of contractual guarantees;

   b. The company's past NGE practices and established NGE policies;

   c. The timing of any change in NGE relative to the date of recognition of a change in experience;

   d. The benefits and risks to the company of continuing to authorize NGE.

3. Projected NGE shall be established based on projected experience consistent with how actual NGE are determined.

4. Projected levels of NGE in the cash flow model must be consistent with the experience assumptions used in each scenario. Policyholder behavior assumptions in the model must be consistent with the NGE assumed in the model.

5. The company may exclude any portion of an NGE that:

   a. is not based on some aspect of the policy's or contract's experience, and

   b. is authorized by the Board of Directors and documented in the Board minutes, where the documentation includes the amount of the NGE that arises from other sources.

   However, if the Board has guaranteed a portion of the NGE into the future, the company must model that amount (unless excluded by subsection 7.C.6). In other words, the company cannot exclude from its model any NGE that the Board has guaranteed for future years, even if they could have otherwise excluded them, based on this subsection.

6. The liability for policyholder dividends declared but not yet paid that has been established according to statutory accounting principles as of the valuation date is reported separately from the statutory reserve. This liability may or may not be included in the Cash Flow Model at the company's option. If the dividend liability is included in the starting liabilities in the Cash Flow Model, then the policyholder dividends that give rise to the liability need not be included in the model.

D. Starting Assets

1. For each model segment, the company shall select starting assets such that the aggregate annual statement value of the assets at the projection start date equals the estimated value of the minimum reserve allocated to the policies in the appropriate model segment subject to the following:

   a. Starting asset values shall include the relevant balance of any due, accrued or unearned investment income.

   b. For an asset portfolio that supports both policies that are subject and not subject to these requirements, the company shall determine an equitable method to apportion the total amount of starting assets between the subject and non-subject policies.

   c. If for all model segments combined, the aggregate annual statement value of starting assets is less than 98% or greater than 102% of the final aggregate modeled (whether stochastic or deterministic) reserve, the company shall provide documentation in the PBR Actuarial Report that provides reasonable assurance that the aggregate modeled reserve is not materially understated as a result of the estimate of the amount of starting assets.

2. The company shall select starting assets for each model segment that consists of the following:

   a. All separate account assets supporting the policies.

   b. All policy loans supporting the policies that are explicitly modeled under Section 7.E.

   c. All derivative instruments held at the projection start date that are part of a derivative program and can be appropriately allocated to the model segment.

   d. The negative of any pretax interest maintenance reserve liability that can be allocated to each model segment at the projection start date subject to the following:

      i. The amount of PIMR allocable to each model segment is the approximate statutory interest maintenance reserve liability that would have developed for the model segment assuming applicable capital gains taxes are excluded. The allocable PIMR may be either positive or negative, resulting in either a decrease or increase to starting assets.

      ii. In performing the allocation to each model segment, the company shall use a reasonable approach to allocate any portion of the total company balance that is disallowable under statutory accounting procedures (i.e., when the total company balance is an asset rather than a liability).

      iii. The company may use a simplified approach to allocate the PIMR, if the impact of the PIMR on the minimum reserve is minimal.

   e. An amount of other general account assets such that the aggregate value of starting assets meets the requirements in Section 7.D.1. These assets shall generally be selected on a consistent basis from one reserve valuation to the next. Any material change in the selection methodology shall be documented in the PBR Actuarial Report.

3. The aggregate value of general account starting assets is the sum of the amounts in subsections 7.D.2.b through 7.D.2.e above.

   Guidance Note: The aggregate value of general account assets in subsection 7.D.3 may be negative. This may occur for example for model segments in which a substantial portion of policyholder funds are allocated to separate accounts. The assets in subsection 7.D2.e above may include negative assets or short-term borrowing, resulting in a projected interest expense.

4. The company shall calculate the projected values of starting assets in a manner consistent with their values at the start of the projection.

5. When calculating the projected statement value of assets at any date, the company shall include the negative of any outstanding PIMR. For purposes of these requirements, the projected PIMR for any model segment and for all model segments combined may be negative.

E. Reinvestment Assets and Disinvestment (Applies to Alternative 2 Only)

1. At the valuation date and each projection interval as appropriate, model the purchase of general account reinvestment assets with available cash and net asset and liability cash flows in a manner that is representative of and consistent with the company’s investment policy for each model segment, subject to the following requirements:

   a. The model investment strategy may incorporate a representation of the actual investment policy that ranges from relatively complex to relatively simple. In any case, the PBR actuarial report shall include documentation supporting the appropriateness of the representation relative to actual investment policy.

Guidance Note: A complex model representation may include, for example, illiquid or callable assets whereas a simple model representation may involve mapping of more complex assets to combinations of, for example, public non-callable corporate bonds, U.S. Treasuries, and cash.

b. The final maturities and cash flow structures of assets purchased in the model, such as the patterns of gross investment income and principal repayments, and fixed or floating rate interest basis, shall be determined by the company as part of the model representation.

c. The combination of price and structure for fixed income investments and derivative instruments associated with fixed income investments shall appropriately reflect the then-current U.S. Treasury curve along the relevant scenario and the requirements for gross asset spread assumptions stated below.

d. For purchases of public non-callable corporate bonds, use the gross asset spreads over Treasuries prescribed in Section 9.F. (For purposes of this subsection, "public" incorporates both registered and 144a securities.) The prescribed spreads reflect current market conditions as of the model start date and grade to long-term conditions based on historical data at the start of projection year four.

e. For transactions of derivative instruments associated with fixed income investments, reflect the prescribed assumptions in Section 9.F for interest rate swap spreads.

f. For purchases of other fixed income investments, if included in the model investment strategy, set assumed gross asset spreads over Treasuries in a manner that is consistent with, and results in reasonable relationships to, the prescribed spreads for public non-callable corporate bonds and interest rate swaps.

g. Notwithstanding the above requirements, the model investment strategy and/or any non-prescribed asset spreads shall be adjusted as necessary so that the minimum reserve is not less than would be obtained by substituting an alternative investment strategy in which all fixed income reinvestment assets are public non-callable corporate bonds with gross asset spreads, asset default costs, and investment expenses by projection year that are consistent with a credit quality blend of 50% PBR credit rating 6 ("A2/A") and 50% PBR credit rating 9 ("Baa2/BBB"). The following pertains to this requirement:

   i. Policy loans, equities, and derivative instruments associated with the execution of a clearly defined hedging strategy (in compliance with Sections 7.L and 7.M) are not impacted by this requirement.

   ii. The PBR actuarial report shall include documentation demonstrating compliance with this requirement.

Guidance Note: In many cases, particularly if the model investment strategy does not involve callable assets, it is expected that the demonstration of compliance will not require running the reserve calculation twice. For example, an analysis of the weighted average net reinvestment spread on new purchases by projection year (gross spread minus prescribed default costs minus investment expenses) of the model investment strategy compared to the weighted average net reinvestment spreads by projection year of the alternative strategy may suffice. The assumed mix of asset types, asset credit quality, or the levels of non-prescribed spreads for other fixed income investments may need to be adjusted to achieve compliance.

2. Model at each projection interval any disinvestment in a manner that is consistent with the company's investment policy and that reflects the company's cost of borrowing where applicable. Gross asset spreads used in computing market values of assets sold in the model shall be consistent with but not necessarily the same as the gross asset spreads in Sections 7.E.1.d and 7.E.1.f above, recognizing that starting assets may have different characteristics than modeled reinvestment assets.

3. Determine the values of reinvestment assets at the valuation date and each projection interval in a manner consistent with the values of starting assets that have similar investment characteristics.

F. Cash Flows from Invested Assets (Alternative 2)

The company shall determine cash flows from invested assets, including starting and reinvestment assets, as follows:

1. Determine cash flows for each projection interval for general account fixed income assets including derivative asset programs associated with these assets as follows:

   a. Model gross investment income and principal repayments in accordance with the contractual provisions of each asset and in a manner consistent with each scenario. Grouping of assets is allowed if the company can demonstrate that grouping does not materially understate the minimum reserve than would have been obtained using a seriatim approach.

   b. Reflect asset default costs as prescribed in Section 9.F and anticipated investment expenses through deductions to the gross investment income.

   c. Model the proceeds arising from modeled asset sales and determine the portion representing any realized capital gains and losses.

   Guidance Note: Examples of general account fixed income assets include public bonds, convertible bonds, preferred stocks, private placements, asset backed securities, commercial mortgage loans, residential mortgage loans, mortgage backed securities, and collateralized mortgage obligations.

   d. Reflect any uncertainty in the timing and amounts of asset cash flows related to the paths of interest rates, equity returns, or other economic values directly in the projection of asset cash flows.

2. Determine cash flows for each projection interval for general account equity assets (i.e., non-fixed income investments having substantial volatility of returns such as common stocks and real estate investments) including derivative programs associated with these assets as follows:

   a. Determine the grouping for equity asset categories (e.g. large cap stocks, international stocks, owned real estate, etc.) and the allocation of specific assets to each category as described in Section 7.J.

   b. Project the gross investment return including realized and unrealized capital gains for each investment category in a manner that is consistent with the prescribed general account equity return described in Section 7.G.

   c. Model the timing of an asset sale in a manner that is consistent with the investment policy of the company for that type of asset. Reflect expenses through a deduction to the gross investment return using prudent estimate assumptions.

3. Determine cash flows for each projection interval for policy loan assets by modeling existing loan balances either explicitly, or by substituting assets that are a proxy for policy loans (e.g., bonds, cash, etc.) subject to the following:

   a. If the company substitutes assets that are a proxy for policy loans, the company must demonstrate that such substitution

      i. Produces reserves that are no less than those produced by modeling existing loan balances explicitly; and

      ii. Complies with the policyholder behavior requirements stated in Section 9.D.

   b. If the company models policy loans explicitly, the company shall:

      i. Treat policy loan activity as an aspect of policyholder behavior and subject to the requirements of Section 9.D.

ii. For both the deterministic reserve and the stochastic reserve, assign loan balances either to exactly match each policy's utilization or to reflect average utilization over a model segment or sub-segments.

iii. Model policy loan interest in a manner consistent with policy provisions and with the scenario. In calculating the deterministic reserve, include interest paid in cash as a loan cash flow in that projection interval, but do not include interest added to the loan balance as a loan cash flow (the increased balance will require increased repayment cash flows in future projection intervals).

iv. Model principal repayments, including those which occur automatically upon death or surrender.

v. Model any investment expenses allocated to policy loans and include them either with loan cash flows or insurance expense cash flows.

4. Determine cash flows for each projection interval for all other general account assets by modeling asset cash flows on other assets that are not described in subsections 7.F.1 through 7.F.3 using methods consistent with the methods described in subsections 7.F.1 and 7.F.2. This includes assets that are a hybrid of fixed income and equity investments.

5. Determine cash flows or total investment returns as appropriate for each projection interval for all separate account assets in a manner that is consistent with the prescribed separate account asset returns described in Section 7.G.

Drafting Note: Section F was retained for testing Alternative 1 pursuant to amendment VM-20_100325_029.

F. Cash Flows from Reinvestment Assets (Alternative 1)

The company shall determine cash flows from reinvestment assets as follows:

1. Model any purchase of general account reinvestment assets with available net asset and liability cash flows in a manner that is representative of and consistent with the company's investment policy for each model segment. Determine the value in a manner consistent with the value of starting assets that have similar investment characteristics. Model any disinvestment in a manner consistent with the company's investment policy and that reflects the cost of borrowing.

2. Determine cash flows for each projection interval for general account fixed income assets including derivative asset programs associated with these assets as following:

a. For fixed income investments including derivative asset programs associated with these assets, at purchase of each asset, determine an appropriate combination of market price and future contractual cash flow provisions for which the resulting purchase yield appropriately reflects the then-current U.S. Treasury interest rate curve plus 4% of the appropriate U.S. Treasury interest rate curve plus .25%.

Drafting Note: The NAIC shall define the structure and levels of the prescribed net spreads over Treasuries. One recommendation being considered is that only the option-adjusted net spreads be prescribed. In such case, the company could add an appropriate option premium to the purchase yield as long as it also fully models the associated cash flow risks such as calls or prepayments.

b. For fixed income assets including derivative asset programs associated with these assets, after purchase, model the cash flows using the contractual provisions determined in Paragraph 2.a above and following the same methodology as described in Subsection 7.F.1 of the Section F for Alternative 2, except that no deduction for default costs and investment expenses is necessary since they are implicit in the prescribed net spreads.

3. Determine cash flows for general account equity assets assuming a 3% annual return.

4. Determine the cash flows for new policy loans following the same methodology as described in Subsection 7.F.3 of the Section F for Alternative 2.

5. Determine the cash flows for all other general account assets following the same methodology as described in Subsection 7.F.4 of the Section F for Alternative 2.

6. Determine the cash flows for separate account fixed income, equity and other assets following the same methodology as described in subsection 7.F.5 of the Section F for Alternative 2.

G. Economic Scenarios

1. Deterministic Economic Scenarios

a. For purposes of calculating the deterministic reserve under Section 4, the company shall use:

i. U.S. Treasury interest rate curves following Scenario 12 from the set of prescribed scenarios used in the stochastic exclusion test defined in Section 6.B; and

ii. Total investment return paths for general account equity assets and separate account fund performance consistent with the total investment returns for corresponding investment categories contained in Scenario 12 from the set of prescribed scenarios used in the stochastic exclusion test defined in Section 6.B.

b. The company shall map each of the proxy funds defined in Sections 7J and 7K to the prescribed fund returns defined in Section 7.G.1.a following the mapping process described in Section 7.G.2.b.

Guidance Note: The Scenario 12 interest rate yield curves and total investment returns are based on approximately a one standard deviation shock to the Economic conditions as of the projection start date, where the shock is spread uniformly over the first 20 years of the projection. It is anticipated that Scenario 12 will be updated quarterly and posted on the NAIC website, reflecting the current yield curve at the end of each quarter. The values in Scenario 12 are based on the same generator that is anticipated to be used for the stochastic scenarios, but that generator has not yet been adopted

2. Stochastic Economic Scenarios

a. For purposes of calculating the stochastic reserve under Section 4, the company shall use

i. U.S. Treasury interest rate curves following a prescribed economic scenario generator with prescribed parameters; and

ii. Total investment return paths for general account equity assets and separate account fund performance generated from a prescribed economic scenario generator with prescribed parameters.

Guidance Note: It is expected that the prescribed generator will produce prescribed returns for several different investment categories (similar to the 19 categories provided by the American Academy of Actuaries for C3P2: Treasuries at different tenors, money market/short term investments, U.S. Intermediate Term Government Bonds, U.S. Long Term Corporate Bonds, Diversified Fixed Income, Diversified Balanced Allocation, Diversified Large Capitalized U.S. Equity, Diversified International Equity, Intermediate Risk Equity, and Aggressive or Specialized Equity).

b. The company shall map each of the proxy funds defined in Sections 7J and 7K to the prescribed fund returns defined in Section 7.G.2.a. This mapping process may involve blending the accumulation factors from two or more of the prescribed fixed income and/or equity returns to create the projected returns for each proxy fund. If a proxy fund cannot be appropriately mapped to some combination of the prescribed returns, the company shall determine an appropriate return and disclose the rationale for determining such return.

Guidance Note: Mapping of the returns on the proxy funds to the prescribed funds returns is left to the judgment of the actuary, but the returns so generated must be consistent with the prescribed returns. This does not imply a strict functional relationship between the model parameters for various markets/funds, but it would generally be inappropriate to assume that a market or fund consistently "outperforms" (lower risk, higher expected return relative to the efficient frontier) over the long term.

When parameters are fit to historic data without consideration of the economic setting in which the historic data emerged, the market price of risk may not be consistent with a reasonable long-term model of market equilibrium. One possibility for establishing 'consistent' parameters (or scenarios) across all funds would be to assume that the market price of risk is constant (or nearly constant) and governed by some functional (e.g., linear) relationship. That is, higher expected returns can only be garnered by assuming greater risk (For example, the standard deviation of log returns is often used as a measure of risk).

Specifically, two return distributions *X* and *Y* would satisfy the following relationship:

$$\text{Market Price of Risk} = \left(\frac{\mathrm{E}[\mathrm{R}_X] - \mathrm{r}}{\sigma_X}\right) = \left(\frac{E[R_Y] - \mathrm{r}}{\sigma_Y}\right)$$

where $E[R]$ and σ are respectively the (unconditional) expected returns and volatilities and r is the expected risk-free rate over a suitably long holding period commensurate with the projection horizon. One approach to establish consistent scenarios would set the model parameters to maintain a near-constant market price of risk.

A closely related method would assume some form of 'mean-variance' efficiency to establish consistent model parameters. Using the historic data, the mean-variance (alternatively, 'drift-volatility') frontier could be a constructed from a plot of (mean, variance) pairs from a collection of world market indices. The frontier could be assumed to follow some functional form (quadratic polynomials and logarithmic functions tend to work well) with the coefficients determined by standard curve fitting or regression techniques. Recognizing the uncertainty in the data, a 'corridor' could be established for the frontier. Model parameters would then be adjusted to move the proxy market (fund) inside the corridor.

Clearly, there are many other techniques that could be used to establishing consistency between the return on the proxy funds and the prescribed returns. While appealing, the above approaches do have drawbacks and the actuary should not be overly optimistic in determining the fund returns.

c. A scenario reduction technique is a methodology that derives a reduced set of economic scenarios from a larger set while maintaining the characteristics and robustness of the larger set.

   Scenario reduction techniques may be considered acceptable as long as:

   i. the larger set of scenarios is prescribed by the NAIC;

   ii. the scenario reserves of a representative subset of policies, run using the reduced scenario set, are consistent with the scenario reserves of the same subset of policies, run using the larger scenario set; and

   iii. use of the full set of scenarios would not result in a materially greater reserve.

Drafting Note: Other necessary additions include: added documentation and a definition of the calibration criteria

Drafting Note: More guidance is needed on how many scenarios a company should generate.

H. Determination of Net Asset Earned Rates and Discount Rates

1. In calculating the deterministic reserve the company shall determine a path of net asset earned rates for each model segment that reflects the net general account portfolio rate in each projection interval (i.e., monthly, quarterly, annually) in compliance with Section 7, which will depend primarily on:

   a. Projected net investment earnings from the portfolio of starting assets.

   b. Pattern of projected asset cash flows from the starting assets and subsequent reinvestment assets.

   c. Pattern of net liability cash flows.

   d. Projected net investment earnings from reinvestment assets.

2. The company shall calculate the net asset earned rate as the ratio of net investment earnings divided by invested assets subject to the following:

   a. The impact of separate accounts and policy loans is excluded.

   b. The net asset earned rate for each projection interval is calculated in a manner that is consistent with the timing of cash flows and length of the projection interval of the related cash flow model.

   c. Net investment earnings include:

      i. Investment income plus capital gains and losses (excluding capital gains and losses that are included in the PIMR), minus appropriate default costs and investment expenses;

      ii. Income from derivative asset programs; and

      iii. Amortization of the PIMR.

   d. Invested assets are determined in a manner that is consistent with the timing of cash flows within the cash flow model and the length of the projection interval of the cash flow model.

   e. Invested assets are adjusted to reflect the negative of the outstanding PIMR.

   f. The annual statement value of derivative instruments or a reasonable approximation thereof is in invested assets.

   g. All items reflected in the ratio are consistent with statutory asset valuation and accrual accounting, including reflection of due, accrued or unearned investment income where appropriate.

3. The company may use a grouped liability model to calculate the path of net asset earned rates for the deterministic reserve and then perform the seriatim reserve calculation for each policy based on those net asset earned rates.

Guidance Note: Section 7.A.2 permits the use of simplified approaches to calculate the deterministic reserve and stochastic reserve. This availability for simplification includes ways to determine appropriate net asset earned rates. Small to intermediate size companies, or any size company with smaller blocks of business, have options to create net asset earned rates under simplified approaches if they continue to meet the requirement that the approach produces reserves that are no less than those produced by a more robust cash flow model.

4. The company shall use the path of net asset earned rates as the discount rates for each model segment in the deterministic reserve calculations in Section 4, and the stochastic exclusion test in Section 6.

5. The company shall use the path of one-year U.S. Treasury interest rates in effect at the beginning of each projection year multiplied by 1.05 for each model segment within each scenario as the discount rates in the stochastic reserve calculations in Section 5.

Guidance Note: The use of different discount rate paths for the seriatim and scenario reserves is driven by differences in methodology. The seriatim reserve is based on a present value of all liability cash flows, with the discount rates reflecting the investment returns of the assets backing the liabilities. The scenario reserve is based on a starting estimate of the reserve, and assets that support that estimate, plus the greatest present value of accumulated deficiencies. Here, the discount rates are a standard estimate of the investment returns of only the marginal assets needed to eliminate either a positive or negative deficiency.

I. Future Pretax Interest Maintenance Reserve Amounts

The company shall spread realized capital gains and losses arising from changes in interest rates over future projection intervals by establishing a new PIMR amount and future amortization schedule in a manner that is reasonably consistent with statutory accounting procedures under the assumption that capital gains tax is zero.

J. Grouping of Equity Investments in the General Account

1. The company may group the portion of the general account starting assets that are equity investments (e.g., common stocks, real estate investments) for modeling using an approach that establishes various equity investment categories with each investment category defined to reflect the different types of equity investments in the portfolio.

2. The company shall design a proxy for each equity investment category in order to develop the investment return paths and map each investment category to an appropriately crafted proxy investment category normally expressed as a linear combination of recognized market indices (or sub-indices). The company shall include an analysis in the proxy construction process that establishes a firm relationship between the investment return on the proxy and the specific equity investment category.

K. Grouping of Variable Funds and Subaccounts for Separate Accounts

1. Similar to the approach used for general account equity investments, the company may group the portion of the starting asset amount held in the separate account represented by the variable funds and the corresponding account values for modeling using an approach that recognizes the investment guidelines and objectives of the funds.

2. Similar to the approach used for general account equity investments, the company shall design an appropriate proxy for each variable subaccount in order to develop the investment return paths and map each variable account to an appropriately crafted proxy fund normally expressed as a linear combination of recognized market indices (or sub-indices). The company shall include an analysis in the proxy construction process that establishes a firm relationship between the investment return on the proxy and the specific variable funds.

L. Modeling of Derivative Programs

1. When determining the deterministic reserve and the stochastic reserve, the company shall include in the projections the appropriate costs and benefits of derivative instruments that are currently held by the company in support of the policies subject to these requirements. The company shall also include the appropriate costs and benefits of anticipated future derivative instrument transactions associated with the execution of a clearly defined hedging strategy; and the appropriate costs and benefits of anticipated future derivative instrument transactions associated with non-hedging derivative programs (e.g. replication, income generation) undertaken as part of the investment strategy supporting the policies provided they are normally modeled as part of the company's risk assessment and evaluation processes.

Guidance Note: The prohibition in these minimum reserve requirements against projecting future hedging transactions other than those associated with a clearly defined hedging strategy is intended to address initial concerns expressed by various parties that reserves could be unduly reduced by reflection of programs whose future execution and performance may have greater uncertainty. The prohibition appears however to be in conflict with Principle 2 listed in the valuation manual. Companies may actually execute and reflect in their risk assessment and evaluation processes hedging strategies similar in many ways to clearly defined hedging strategies but lack sufficient clarity in one or more of the qualification criteria. By excluding the associated derivative instruments, the investment strategy that is modeled may also not reflect the investment strategy the company actually uses. Further, since the future hedging transactions may be a net cost to the company in some scenarios and a net benefit in other scenarios, the exclusion of such transactions can result in a minimum reserve that is either lower or higher than it would have been if the transactions were not excluded. The direction of such impact on the reserves could also change from period to period as the actual and projected paths of economic conditions change. A more graded approach to recognition of non-qualifying hedging strategies may be more theoretically consistent with Principle 2. The requirements stated here for handling hedging strategies are essentially consistent with those included in the CTE methodology portion of the September 2006 exposure draft of Actuarial Guideline VACARVM for variable annuity reserving. It is recommended that, as greater experience is gained by actuaries and regulators with the principle-based approach, and as industry hedging programs mature, the various requirements of this section be reviewed.

2. For each derivative program that is modeled, the company shall reflect the company's established investment policy and procedures for that program, project expected program performance along each Scenario, and recognize all benefits, residual risks, and associated frictional costs. The residual risks include, but are not limited to: basis, gap, price, parameter estimation, and variation in assumptions (mortality, persistency, withdrawal, etc.). Frictional costs include, but are not limited to: transaction, margin (opportunity costs associated with margin requirements) and administration. For clearly defined hedging strategies, the company may not assume that residual risks and frictional costs have a value of zero, unless the company demonstrates in the PBR Actuarial Report that "zero" is an appropriate expectation.

3. In circumstances where one or more material risk factors related to a derivative program is not fully captured within the cash flow model used to calculate CTE 70, the company shall reflect such risk factors by increasing the stochastic reserve as described in Section 5.B.5.

Guidance Note: The previous two paragraphs address a variety of possible situations. Some hedging programs may truly have zero or minimal residual risk exposure, such as when the hedge program exactly replicates the liability being hedged. With dynamic hedging strategies, residual risks are typically expected; however, in some cases the cash flow model supporting the CTE calculation may be able to adequately reflect such risks through margins in program assumptions, adjustments to costs and benefits, etc. In other cases, reference to additional external models or analyses may be necessary where such results cannot be readily expressed in a format directly amenable to a CTE calculation. In such cases, the company will need to combine the results of such models by some method that is consistent with the objectives of these requirements. Emerging actuarial practice will be relied on to provide approaches for a range of situations that may be encountered.

Guidance Note: Statutes, laws or regulations of any state or jurisdiction related to the use of derivative instruments for hedging purposes supersede these provisions and therefore these provisions should not be used to determine whether a company is permitted to use such instruments in any state or jurisdiction.

M. Clearly Defined Hedging Strategy

1. A clearly defined hedging strategy must identify:

   a. The specific risks being hedged (e.g., cash flow, policy interest credits, delta, rho, vega, etc.).

   b. The hedge objectives.

   c. The risks that are not hedged (e.g., variation from expected mortality, withdrawal, and other utilization or decrement rates assumed in the hedging strategy, etc.).

   d. The financial instruments used to hedge the risks.

   e. The hedge trading rules including the permitted tolerances from hedging objectives.

   f. The metrics for measuring hedging effectiveness.

   g. The criteria used to measure effectiveness.

   h. The frequency of measuring hedging effectiveness.

   i. The conditions under which hedging will not take place.

j. The person or persons responsible for implementing the hedging strategy.

k. Areas where basis, gap or assumption risk related to the hedging strategy have been identified.

l. The circumstances under which hedging strategy will not be effective in hedging the risks.

2. A clearly defined hedging strategy may be dynamic, static or a combination of dynamic and static.

3. Hedging strategies involving the offsetting of the risks associated with other products outside of the scope of these requirements is not a clearly defined hedging strategy.

Guidance Note: For purposes of the above criteria, "effectiveness" need not be measured in a manner as defined in NAIC Accounting Practices and Procedures.

Section 8. Reinsurance

A. General Considerations

1. In this section reinsurance includes retrocession and assuming company includes retrocessionaire.

Guidance Note: In determining reserves, one party to a reinsurance transaction may make use of reserve calculations of the other party. If the company chooses assumptions that differ from those used by the other party, the company must either rerun the reserve calculation or be prepared to demonstrate that appropriate adjustments to the other party calculation have been made.

2. The company shall assume that the laws and regulations in place as of the valuation date regarding credit for reinsurance remain in effect throughout the projection period.

3. A company shall include a reinsurance agreement or amendment in calculating the minimum reserve if, under the terms of the Accounting Practices and Procedures Manual, the agreement or amendment qualifies for credit for reinsurance.

4. If a reinsurance agreement or amendment does not qualify for credit for reinsurance, but treating the reinsurance agreement or amendment as if it did so qualify would result in a reduction to the company's surplus, then the company shall increase the minimum reserve by the absolute value of such reductions in surplus.

Guidance Note: Section 8.A.3 provides that, in general, if a treaty does not meet the requirements for credit for reinsurance, it should not be allowed to reduce the reserve. Thus, it should not be allowed a reinsurance credit to the net premium reserve and its cash flows should not be included in the cash flow models used to calculate the deterministic or stochastic reserve. Section 8.A.4 introduces the exception that if allowing a net premium credit and including the treaty cash flows in the cash flow models would produce a more conservative result, then that more conservative result should prevail.

B. Determination of a credit to the net premium reserve to reflect reinsurance ceded

1. Determination of the credit to the net premium reserve to reflect reinsurance shall be done in accordance with SSAP No. 61.

Guidance Note: The credit taken under a coinsurance arrangement shall be calculated using the same methodology and assumptions used in determining its net premium reserve, but only for the percentage of the risk that was reinsured. If the reinsurance is on a yearly renewable term basis, the credit shall be calculated using the assumptions used in determining the net premium reserve, but for the net amount at risk.

Drafting Note: The wording in subsection 8.B.1 may be replaced after the VM-20 Impact Study is completed.

2. If a company cedes portions of a policy under more than one reinsurance agreement, then the company shall calculate a credit separately for each such agreement. The credit for reinsurance ceded for the policy shall be the sum of the credits for all such agreements.

3. The credit for reinsurance ceded applied to a group of policies shall be the sum of the credit for reinsurance ceded for each of the policies of the group.

C. Reflection of reinsurance cash flows in the deterministic reserve or stochastic reserve

In calculations of the deterministic reserve or stochastic reserve pursuant to Sections 4 and 5:

1. The company shall use assumptions and margins that are appropriate for each company pursuant to a reinsurance agreement. In such instance, the ceding and assuming companies are not required to use the same assumptions and margins for the reinsured policies.

2. To the extent that a single deterministic valuation assumption for risk factors associated with certain provisions of reinsurance agreements will not adequately capture the risk the company shall:

   a. Stochastically model the risk factors directly in the cash flow model when calculating the stochastic reserve; or

   b. Perform a separate stochastic analysis outside the cash flow model to quantify the impact on reinsurance cash flows to and from the company. The company shall use the results of this analysis to adjust prudent estimate assumptions or to determine an amount to adjust the stochastic reserve to adequately make provision for the risks of the reinsurance features.

   Guidance Note: Examples of reinsurance provisions where a single deterministic valuation assumption will not adequately capture the risk are stop-loss reinsurance.

Drafting Note: Additional guidance in an ASOP may be needed to explain further what features give rise to this stochastic modeling requirement.

3. The company shall determine cash flows for reinsurance ceded subject to the following:

   a. The company shall include the effect of projected cash flows received from or paid to assuming companies under the terms of ceded reinsurance agreements in the cash flows used in calculating the deterministic reserve in Section 4 and stochastic reserves in Section 5.

   b. If cash flows received from or paid to assuming companies under the terms of any reinsurance agreement are dependent upon cash flows received from or paid to assuming companies under other reinsurance agreements, the company shall first determine reinsurance cash flows for reinsurance agreements with no such dependency and then use the reinsurance cash flows from these independent agreements to determine reinsurance cash flows for the remaining dependent agreements.

   c. The company shall use assumptions to project cash flows to and from assuming companies that are consistent with other assumptions used by the company in calculating the deterministic or stochastic reserve for the reinsured policies, and that reflect the terms of the reinsurance agreements.

4. The company shall determine cash flows for reinsurance assumed subject to the following:

   a. The company shall include the effect of cash flows projected to be received from and paid to ceding companies under the terms of assumed reinsurance agreements in the cash flows used in calculating the deterministic reserve in Section 4 and the stochastic reserve in Section 5.

   b. If cash flows received from or paid to ceding companies under the terms of any reinsurance agreement are dependent upon cash flows received from or paid to ceding companies under other reinsurance agreements, the company shall first determine reinsurance cash flows for reinsurance agreements with no such dependency and then use the reinsurance cash flows from these independent agreements to determine reinsurance cash flows for the remaining dependent agreements.

5. If a company assumes a policy under more than one reinsurance agreement, then the company may treat each agreement separately for the purposes of calculating the reserve.

6. An assuming company shall use assumptions to project cash flows to and from ceding companies that reflect the assuming company's experience for the business segment to which the reinsured policies belong, and reflect the terms of the reinsurance agreement.

7. The company shall assume that the counterparties to a reinsurance agreement are knowledgeable about the contingencies involved in the agreement and likely to exercise the terms of the agreement to their respective advantage, taking into account the context of the agreement in the entire economic relationship between the parties. In setting assumptions for the non-guaranteed elements in reinsurance cash flows the company shall include, but not be limited to the following:

    a. The usual and customary practices associated with such agreements.

    b. Past practices by the parties concerning the changing of terms, in an economic environment similar to that projected.

    c. Any limits placed upon either party's ability to exercise contractual options in the reinsurance agreement.

    d. The ability of the direct-writing company to modify the terms of its policies in response to changes in reinsurance terms.

    e. Actions that might be taken by a party if the counterparty is in financial difficulty.

8. The company shall account for any actions that the ceding company and, if different, the direct-writing company have taken or are likely to take that could affect the expected cash flows of the reinsured business in determining assumptions for the minimum reserve.

    Guidance Note: Examples of actions the direct-writing company could take include 1) instituting internal replacement programs or special underwriting programs, both of which could change expected mortality rates, or 2) changing non-guaranteed elements in the reinsured policies, which could affect mortality, policyholder behavior, and possibly expense and investment assumptions. Examples of actions the ceding company could take include: 1) the exercise of contractual options in a reinsurance agreement to influence the setting of non-guaranteed elements in the reinsured policies, or 2) the ability to participate in claim decisions.

9. For actions taken by the ceding company, and, if different, the direct-writing company, set assumptions in a manner consistent with Section 9.D. Note that these assumptions are in addition to, rather than in lieu of, assumptions as to the behavior of the underlying policyholders.

10. The company shall use assumptions in determining the minimum reserve that account for any actions that the assuming company has taken or is likely to take that could affect the expected cash flows of the reinsured business.

    Guidance Note: Examples of such actions include, but are not limited to changes to the current scale of reinsurance premiums and changes to expense allowances.

11. The company shall consider all elements of a reinsurance agreement that the assuming company can change and assumptions for those elements are subject to the requirements in Section 7.C. Appropriate assumptions for these elements may depend on the scenario being tested. The company shall take into account all likely consequences of the assuming company changing an element of the reinsurance agreement, including any potential impact on the probability of recapture by the ceding company.

Guidance Note: The ability of an assuming company to change elements of reinsurance agreement, such as reinsurance premiums or expense allowances, may be thought of as comparable to the ability of a direct-writing company to change non-guaranteed elements on policies.

12. The company shall set assumptions in a manner consistent with subsection 8.C.8 taking into account any ceding company option to recapture reinsured business. Appropriate assumptions may depend on the scenario being tested (analogous to interest-sensitive lapses).

Guidance Note: The right of a ceding company to recapture is comparable to policyholder surrender options for a direct-writing company. Cash flows associated with recapture include recapture fees or other termination settlements.

13. The company shall set assumptions in a manner consistent with subsection 8.C.10 taking into account an assuming company's right to terminate in-force reinsurance business. In the case in which the assuming company's right to terminate is limited to cases of non-payment of amounts due by the ceding company or other specific, limited circumstances, the company may assume that the termination option would be expected to have insignificant value to either party and therefore may exclude recognition of this right to terminate in the cash flow projections. However, if a reinsurance agreement contains other termination provisions with material impact, the company shall set appropriate assumptions for these provisions consistent with the particular scenario being tested.

14. If under the terms of the reinsurance agreement, some of the assets supporting the reserve are held by the counterparty or by another party, the company shall

a. Consider the following in order to determine whether to model such assets for purposes of projecting cash flows:

i. The degree of linkage between the portfolio performance, and the calculation of the reinsurance cash flows.

ii. The sensitivity of the valuation result to the asset portfolio performance.

b. If the company concludes that modeling in unnecessary, document the testing and logic leading to that conclusion.

c. If the company determines that modeling is necessary, comply with the requirements in Section 7.E and Section 9.F and taking into account:

i. The investment strategy of the company holding the assets, as codified in the reinsurance agreement or otherwise based on current documentation provided by that company; and

ii. Actions that may be taken by either party that would affect the net reinsurance cash flows (e.g. a conscious decision to alter the investment strategy within the guidelines).

Guidance Note: In some situations, it may not be necessary to model the assets held by the other party. An example would be modeling by an assuming company of a reinsurance agreement containing provisions, such as experience refund provisions, under which the cash flows and effective investment return to the assuming company are the same under all Scenarios.

Guidance Note: Special considerations for modified coinsurance. Although the modified coinsurance (ModCo) reserve is called a reserve, it is substantively different from other reserves. It is a fixed liability from the ceding company to the assuming company in an exact amount, rather than an estimate of a future obligation. The ModCo reserve is analogous to a deposit. This concept is clearer in the economically identical situation of funds withheld. Therefore, the value of the modified coinsurance reserve will generally not have to be determined by modeling. However, the projected modified coinsurance interest may have to be modeled. In many cases, the modified coinsurance interest is determined by the investment earnings of an underlying asset portfolio, which in some cases will be a segregated asset portfolio or in others the ceding company's general account. Some agreements may use a rate not tied to a specific portfolio.

15. If a ceding company has knowledge that an assuming company is financially impaired, the ceding company shall establish a margin for the risk of default by the assuming company. In the absence of knowledge that the assuming company is financially impaired, the ceding company is not required to establish a margin for the risk of default by the assuming company.

16. If an assuming company has knowledge that a ceding company is financially impaired, the assuming company shall establish a margin for the risk of default by the ceding company. Such margin may be reduced or eliminated if the assuming company has a right to terminate the reinsurance upon non-payment by the ceding company. In the absence of knowledge that a ceding company is financially impaired, the assuming company is not required to establish a margin for the risk of default by the ceding company.

17. In setting any margins required by subsections 8.C.15 and 8.C.16 to reflect potential uncertainty regarding the receipt of cash flows from a counterparty, the company shall take into account the ratings, risk-based capital ratio or other available information related to the probability of the risk of default by the counterparty, as well as any security or other factor limiting the impact on cash flows.

D. Determination of a pre-reinsurance-ceded minimum reserves

1. The minimum reserve pursuant to Section 2 is a post-reinsurance-ceded minimum reserve. The company shall also calculate a pre-reinsurance-ceded reserve as specified in D.2 below, for financial statement purposes where such a pre-reinsurance ceded amount is required. Similarly, where a reserve credit for reinsurance may be required, the credit for reinsurance ceded shall be the excess, if any, of the pre-reinsurance ceded minimum reserve over the post-reinsurance-ceded minimum reserve._Note that due allowance for reasonable approximations may be used where appropriate.

2. The pre-reinsurance-ceded minimum reserve shall be calculated pursuant to the requirements of this Valuation Manual VM-20, using methods and assumptions consistent with those used in calculating the minimum reserve, but excluding the effect of ceded reinsurance.

   a. If, when ceded reinsurance is excluded, a group of policies is not able to pass the exclusion tests pursuant to Section 6, then the required deterministic or stochastic reserves shall be calculated in determining the pre-reinsurance-ceded minimum reserve even if not required for the minimum reserve.

   b. The company shall use assumptions that represent company experience in the absence of reinsurance, for example assuming that the business was managed in a manner consistent with the manner that retained business is managed, when computing such reserves.

Drafting Note: After the VM-20 Impact Study is completed, the allocation of the reinsurance credit to each reinsurance agreement should be reevaluated. The Task Force needs some basis for the allocation.

Section 9. Assumptions

A. General Assumption Requirements

1. The company shall use prudent estimate assumptions in compliance with this section for each risk factor that is not prescribed or is not stochastically modeled by applying a margin to the anticipated experience assumption for the risk factor.

2. The company shall establish the prudent estimate assumption for each risk factor in compliance with the requirements in Section 12 of the NAIC Standard Valuation Law and must periodically review and update the assumptions as appropriate in accordance with these requirements.

3. The company shall model the following risk factors stochastically unless the company elects the stochastic modeling exclusion defined in Section 6:

   a. Interest rate movements (i.e., Treasury interest rate curves) and

b. Equity performance (e.g., S&P 500 returns and returns of other equity investments).

4. If the company elects to stochastically model risk factors in addition to those listed in A.3 above, the requirements in this section for determining prudent estimate assumptions for these risk factors do not apply.

5. In determining the stochastic reserve the company shall use prudent estimate assumptions that are consistent with those prudent estimate assumptions used for determining the deterministic reserve, modified as appropriate to reflect the effects of each scenario.

6. The company shall use its own experience, if relevant and credible, to establish an anticipated experience assumption for any risk factor. To the extent that company experience is not available or credible, the company may use industry experience or other data to establish the anticipated experience assumption, making modifications as needed to reflect the circumstances of the company.

   a. For risk factors (such as mortality) to which statistical credibility theory may be appropriately applied, the company shall establish anticipated experience assumptions for the risk factor by combining relevant company experience with industry experience data, tables, or other applicable data in a manner that is consistent with credibility theory and accepted actuarial practice.

   b. For risk factors (such as premium patterns on flexible premium contracts) that do not lend themselves to the use of statistical credibility theory, and for risk factors (such as the current situation with some lapse assumptions) to which statistical credibility theory can be appropriately applied, but cannot currently be applied due to lack of industry data, the company shall establish anticipated experience assumptions in a manner that is consistent with accepted actuarial practice and that reflects any available relevant company experience, any available relevant industry experience, or any other experience data that are available and relevant. Such techniques include:

      i. Adopting standard assumptions published by professional, industry or regulatory organizations to the extent they reflect any available relevant company experience or reasonable expectations;

      ii. Applying factors to relevant industry experience tables or other relevant data to reflect any available relevant company experience and differences in expected experience from that underlying the base tables or data due to differences between the risk characteristics of the company experience and the risk characteristics of the experience underlying the base tables or data;

      iii. Blending any available relevant company experience with any available relevant industry experience and/or other applicable data using weightings established in a manner that is consistent with accepted actuarial practice and that reflects the risk characteristics of the underlying policies and/or company practices.

   c. For risk factors that have limited or no experience or other applicable data to draw upon, the assumptions shall be established using sound actuarial judgment and the most relevant data available, if such data exists.

   d. For any assumption that is set in accordance with the requirements of Section 9.A.6.c, the actuary shall use sensitivity testing and disclose the analysis performed to assure that the assumption is set at the conservative end of the plausible range.

   The appointed actuary shall annually review relevant emerging experience for the purpose of assessing the appropriateness of the anticipated experience assumption. If the results of statistical or other testing indicate that previously anticipated experience for a given factor is inadequate, then the appointed actuary shall set a new, adequate, anticipated experience assumption for the factor.

7. The company shall examine the results of sensitivity testing to understand the materiality of prudent estimate assumptions on the minimum reserve and the company shall:

a. Perform sensitivity testing using samples of the policies in force and is not required that the entire valuation be done for each alternative assumption set. The company's choice of sample must not have a material impact on the results of the sensitivity testing;

b. Perform sensitivity testing using data from prior periods when appropriate; and

c. Update the sensitivity tests as appropriate, considering the materiality of the results of the tests. The company may update the tests less frequently when the tests show less sensitivity of the minimum reserve to changes in the assumptions being tested or the experience is not changing rapidly.

8. The company shall vary the prudent estimate assumptions from scenario to scenario within the stochastic reserve calculation in an appropriate manner to reflect the scenario dependent risks.

B. Assumption Margins

The company shall include margins to provide for adverse deviations and estimation error in the prudent estimate assumption for each risk factor that is not stochastically modeled or prescribed, subject to the following:

1. The company shall determine an explicit set of initial margins for each material assumption independently (i.e., ignoring any correlation among risk factors) in compliance with this section. Next, if applicable, the level of a particular initial margin may be adjusted to take into account the fact that risk factors are not normally 100% correlated. However, in recognition that risk factors may become more heavily correlated as circumstances become more adverse, the initially determined margin may only be reduced to the extent the company can demonstrate that the method used to justify such a reduction is reasonable considering the range of scenarios contributing to the CTE calculation or considering the scenario used to calculate the deterministic reserve as applicable or considering appropriate adverse circumstances for risk factors not stochastically modeled.

   If not stochastically modeled or prescribed, assumptions that are generally considered material include but are not limited to mortality, morbidity, interest, equity returns, expenses, lapses, partial withdrawals, loans, and option elections.

2. The greater the uncertainty in the anticipated experience assumption, the larger the required margin, with the margin added or subtracted as needed to produce a larger minimum reserve than would otherwise result. For example, the company shall use a larger margin when:

   a. The experience data have less relevance or lower credibility.

   b. The experience data are of lower quality, such as incomplete, internally inconsistent, or not current.

   c. There is doubt about the reliability of the anticipated experience assumption, such as, but not limited to recent changes in circumstances or changes in company policies.

   d. There are constraints in the modeling that limit an effective reflection of the risk factor.

3. In complying with the sensitivity testing requirements in Subsection A.7 above greater analysis and more detailed justification are needed to determine the level of uncertainty when establishing margins for risk factors that produce greater sensitivity on the minimum reserve.

4. A margin is not required for assumptions when variations in the assumptions do not have a material impact on the minimum reserve.

5. A margin should reflect the magnitude of fluctuations in historical experience of the company for the risk factor, as appropriate.

6. The company shall apply the method used to determine the margin consistently on each valuation date.

C. Mortality Assumptions

1. Procedure for Setting Prudent Estimate Mortality Assumptions

a. The company shall determine credibility segments for the purpose of determining which policies will qualify for the simplified method described in subsection 9.C.1.e. The determination of each credibility segment shall be subject to the following:

i. Each credibility segment shall consist of policies with similar underwriting and mortality experience characteristics.

ii. The company may group policies with different plans of insurance into the same credibility segment, if underwriting and mortality experience characteristics are similar for all the policies.

Guidance Note: It is anticipated that most companies will define a credibility segment to be a block of policies with similar underwriting rules, such as guaranteed issue, or regularly underwritten policies.

iii. The company may remove from the credibility segments any policies for which the experience is reflected through adjustments to the prudent estimate mortality rate assumptions under Paragraph f below, including policies insuring impaired lives and those for which there is a reasonable expectation, due to conditions such as changes in premiums or other policy provisions, that policyholder behavior will lead to mortality results that vary significantly from those that would otherwise be expected.

b. The company shall determine mortality segments for the purpose of determining separate credibility adjusted experience rates and prudent estimate mortality tables by grouping policies within each credibility segment that the company expects will have similar underwriting methods and mortality experience.

c. The company shall determine the credibility data set subject to the following:

i. The company shall review the mortality experience described in subparagraph i and ii above at least once every three years and update as needed.

ii. The credibility data set for each credibility segment shall include the most recent three year study as defined in subparagraph i and shall include the in force and claim data pertaining to the study period for all policies currently in the credibility segment or that would have been in the credibility segment at any time during the period over which experience is being evaluated.

iii. The period of time used for data should be at least three years and should not exceed ten years.

iv. The company shall use actual mortality experience directly applicable to the credibility segment, when available.

v. The company may use actual experience data of one or more mortality pools in which the policies participate under the terms of a reinsurance agreement, provided that the policies in the credibility segment have underwriting methods and mortality experience characteristics similar to those of the policies in the pool and the aggregate pool data are available to the company.

d. If the number of deaths within the credibility data set for a credibility segment is at least 30, the company shall establish mortality assumptions using experience mortality rates, blended with industry experience as appropriate. The company should use the following procedure:

i. Select a credibility procedure that describes the method by which the experience data for a mortality segment and appropriate industry experience are used to produce credibility adjusted experience rates subject to the following:

1) The credibility procedure shall be based on a statistical method consistent with accepted actuarial practice; and

2) As the credibility in the experience data set for a mortality segment or for a cell or group of call included in a mortality segment increases, the credibility adjusted experience rates produced by the credibility procedure shall approach the actual experience rates.

ii. Use the procedure described in subsection 9.C.2 to determine which of the industry basic tables shall serve as the applicable industry table for that mortality segment required by the selected credibility procedure.

iii. Determine the experience mortality rates.

iv. Apply the selected credibility procedure to determine credibility adjusted experience rates, as provided in subsection 9.C.3.

v. Determine the Credibility Factor for the credibility segment using the same credibility procedure as in subsection 9.C.1.d.i.

vi. Determine margin for each credibility segment as provided in subsection 9.C.4 below using the Credibility Factor determined in subsection 9.C.1.d.v.

vii. Set the prudent estimate mortality assumption equal to the credibility adjusted experience rates increased by the margin determined in subsection 9.C.1.d.vi.

In order to determine mortality expectations for the mortality experience of subsets of a credibility segment that were recently subdivided into smaller classes, mortality for the new classes could be determined by using the actual experience from the credibility segment prior to being subdivided and reclassifying policies based on the new criteria used for more recent issues.

Other actuarially sound methods of determining credibility blended mortality expectations are also acceptable.

Guidance Note: Based on a Limited Fluctuation Method calculation which sets the standard for full credibility as being within 3% of the true value with 90% probability, assuming a Poisson distribution for the number of deaths and assuming no variation in net amount at risk, the number of deaths required for 10% credibility is 30 and for 20% credibility it is 120. Because the purpose of the credibility criterion is to provide a simple test that would improve the efficiency of the principles-based valuation process by exempting small blocks of business, it may be appropriate to determine the level of deaths that is consistent with this goal by, for example, surveying small companies.

e. If the number of deaths within the credibility data set for a credibility segment is less than 30, the company shall use the following simplified method to determine prudent estimate assumption for the credibility segment:

i. Determine the applicable industry basic table using the underwriting scoring procedure described in subsection 9.C.2, or by other actuarially sound methods.

ii. Set the Credibility Factor for the credibility segment equal to zero.

iii. Determine the margin as provided in subsection 9.C.4.

iv. Set the prudent estimate mortality equal to the applicable industry basic table determined in Subparagraph 9.C.1e.i increased by the margin determined in subparagraph e.iii above.

f. Adjust the prudent estimate mortality assumptions to reflect differences associated with impaired lives, and differences due to policyholder behavior if there is a reasonable expectation that due to conditions such as changes in premiums or other policy provisions, policyholder behavior will lead to mortality results that vary from the mortality results that would otherwise be expected.

i. The adjustment for impaired lives shall follow established actuarial practice, including the use of mortality adjustments determined from clinical and other data.

ii. The adjustment for policyholder behavior shall follow accepted actuarial practice, including the use of dynamic adjustments to base mortality.

2. Determination of Applicable Industry Basic Tables

a. The company may apply the underwriting criteria scoring procedure described in Subparagraph b below to determine:

i. The industry basic table that can serve as the industry table under the selected credibility procedure for mortality segments within those credibility segments that do not qualify for the simplified method to determine the prudent estimate mortality assumptions as described in subsection 9.C.1.d above.

ii. The applicable industry basic table for mortality segments within those credibility segments that qualify for the simplified method to determine prudent estimate mortality assumptions as described in subsection 9.C.1.e above.

b. The underwriting criteria scoring procedure is the algorithm described in pages 8 to 27 of the Interim 2007 Report of the Society of Actuaries and American Academy of Actuaries Joint Preferred Mortality Project and embedded in the Underwriting Criteria Score Calculator which is maintained on the Society of Actuaries web site, http://www.soa.org/research/individual-life/2008-score-calc.aspx .

i. In using the underwriting criteria scoring procedure to determine the appropriate industry basic table for a particular mortality segment, the company shall take into account factors that are not recognized in the underwriting scoring algorithm but which are applicable to policies that are issued in that mortality segment.

Guidance Note: Examples of such factors include the number of underwriting exceptions that are made, the quality and experience level of the underwriters, and characteristics of the distribution system. For example, if a company deviates from its preferred criteria on a regular basis, then it needs to take that into consideration since the underwriting criteria scoring procedure is not designed to quantify that risk.

ii. In using the underwriting criteria scoring procedure to determine the appropriate industry basic table for policies that are issued subject to simplified underwriting and policies that are issued without underwriting, the company shall take into account factors not recognized in the underwriting scoring algorithm but which are applicable to such policies.

iii. In taking into account factors that are not recognized in the underwriting scoring algorithm, a company may adjust the industry basic tables up or down 2 tables from that determined by application of the underwriting criteria scoring procedures. Further adjustments to reflect risk characteristics not captured within the underwriting criteria scoring tool may be allowed upon approval by the Commissioner.

Drafting Note: Should the number of tables that could be adjusted equal 2 in subparagraph iii?

c. As an alternative to the Underwriting Criteria Scoring Tool, the company may use other actuarially sound methods to determine the applicable basic tables related to subdivisions of mortality segments.. The company shall document the analysis performed to demonstrate the applicability of the chosen method and resulting choice in tables and reasons why the results using the Underwriting Criteria Scoring Tool may not be suitable.

Guidance Note: For example, the company may determine a more all inclusive basic table as a table appropriate for the whole credibility segment (appropriately modified by the removal of classified lives, term conversions or any other legitimately excludable class) and then subdivide that segment using actuarially sound methods including but not limited to the UCS

d. If no industry basic table appropriately reflects the risk characteristics of the mortality segment, the company may use any well-established industry table that is based on the experience of policies having the appropriate risk characteristics in lieu of an industry basic table.

Guidance Note: Subsection 9.C.2.c above is intended to provide flexibility needed to handle products based on group-type mortality, etc., for which there might not be an industry basic table.

3. Determination of Company Experience Mortality Rates

a. For each mortality segment, the company shall determine experience mortality rates based on the experience data set defined in subsection 9.C.3.b.

b. If the number of deaths within the credibility data set for a credibility segment is less than 30, the company shall set the mortality experience rates equal to the applicable industry table determined in subsection 9.C.1.e.i.

c. If the number of deaths within the credibility data set for a credibility segment is at least 30, the company shall determine the experience data set used to determine experience mortality rates as follows:

i. The experience data set shall include, at a minimum, the portion of the credibility data set defined in subsection 9.C.1.c for the class of business.

ii. The company may use actual experience data of one or more mortality pools in which the policies participate under the terms of a reinsurance agreement, provided that the policies in the credibility segment have underwriting and mortality experience characteristics similar to those of the policies in the pool and the aggregate pool data are available to the company.

iii. If actual experience data is not available or has limited credibility, the company may include in the experience data set data from other sources if available and appropriate. Data from other sources is appropriate if the source has underwriting and mortality experience characteristics that are similar to policies in the credibility segment.

iv. The company shall review, and update as needed, the experience mortality described in subsections 9.C.3.c.i, 9.C.3.c.ii and 9.C.3.c.iii, whether based on actual experience or data from other sources, at least every five years; however, whenever updated experience data becomes available, the company shall reflect changes implied by the updated data to the extent such changes are significant and are expected to continue into the future. More frequent updates should result in lower margins under in subsection 9.C.4.

d. The company may adjust the mortality experience rates for each mortality segment to reflect the expected incremental change due to the adoption of risk selection and underwriting practices different from those underlying the experience data identified above, provided that:

i. The adjustments are supported by published medical or clinical studies; and

ii. The rationale and support for the use of the study and for the adjustments are disclosed in the PBR Actuarial Report.

Guidance Note: It is anticipated that such adjustments to experience will rarely be made. Since these adjustments are expected to be rare, and since it is difficult to anticipate the nature of these adjustments, the commissioner may wish to determine the level of documentation or analysis that is required to allow such adjustments. The NAIC may want to consider whether approval by a centralized examination office would be preferable to approval by the commissioner.

4. Process to Blend Company and Industry Experience Rates.

a. If the number of deaths within the credibility data set for a credibility segment is at least 30, the company shall determine credibility adjusted experience rates using the credibility procedure selected in accordance with subsection 9.C.1.d above.

b. The company shall use, in conjunction with the credibility method, the industry basic table or appropriate weighted average of industry basic tables determined in subsection 9.C.2 for the mortality segment or the mortality segments to which the mortality experience cell or cells belong.

c. If company experience mortality rates by age and duration only exist for some of the mortality experience cells within a mortality segment, the company shall determine the remainder of the table by grading into an industry mortality table or a modified industry mortality table where the modification is based on the credible experience in the earlier policy years. Such grading must be reasonable and consistent with accepted actuarial practice and shall take into account the level of partial credibility, the trend in actual to expected ratios, the shape and level of the resulting mortality rates, and the reasons for differences in mortality results relative to industry mortality rates such as differences in underwriting, market and other factors.

d. The company may reflect mortality improvement only up to the projection start date based on applicable published industry-wide experience in the credibility adjusted experience rates. Any adjustment made shall be for the period from the experience weighted average date underlying the company experience used in the credibility process to the projection start date.

Drafting Note: Because mortality improvement beyond the projection start date is not allowed to be reflected in the prudent estimate assumption, then the lack of using mortality improvement is an implicit margin, and should be included in the disclosure of the total margin (in addition to the explicit margin for mortality defined in Section 9.B).

5. Determination of Mortality Margin

a. The mortality margin shall be in the form of a percentage increase applied to the Anticipated Experience Assumption.

b. A mortality margin shall be included for Random Fluctuation Risk and Company Variation Risk.

i. Random Fluctuation Risk covers deviations in the mortality experience resulting from periodic variations of the experience from the mean (i.e., random fluctuation from the expected results of credible component of a company's mortality). The margin for random fluctuation risk shall:

1) take into consideration the sophistication of the method used to estimate credibility and the number of years experience modeled, i.e. using the number of claims to determine credibility might or fewer years to measure variation in experience from year to year indicate the need for a greater margin than using a more robust statistical approach or less years to measure variability;

2) be no less than 1% and no greater than 10%; and

3) vary by the size of the credibility factor whereby mortality segments with a lower credibility factor have a load at the higher end of the permitted range.

ii. Company variation risk covers deviations from a selected industry mortality due to differences in underwriting practices and the demographics of the underlying insured lives. The margin for company variation risk shall:

1) be set to zero for credibility segments in which the credibility factor is 1.00;

2) for credibility segments where the credibility factor is less than 1.00, be equal to the percentages in the American Academy of Actuaries' Mortality Margin Table in Appendix 3.

c. Within each mortality segment, the mortality margin shall be set equal to the Credibility Factor as determined in subsection 9.C.1.d.4 or subsection 9.C.1.e.ii times the margin for random fluctuation risk determined in Subparagraph 9.C.5.b.i plus (1 - the Credibility Factor) times the margin for company variation risk determined in subsection 9.C.5.b.ii.

d. This margin shall be increased, as appropriate to reflect the level of uncertainty related to situations, including but not limited to the following:

i. The reliability of the company's experience studies is low due to imprecise methodology, length of time since the data was updated or other reasons. The longer the time since the experience data was updated, the larger the margin.

ii. The underwriting or risk selection risk criteria associated with the mortality segment have changed since the experience on which the credibility adjusted experience rates are based was collected.

iii. The data underlying the credibility adjusted experience rates lack homogeneity.

iv. Unfavorable environmental or health developments are unfolding and are expected to have a material and sustained impact on the insured population.

v. The company's marketing or administrative practices or market forces expose the policies to the risk of anti-selection.

Guidance Note: For example, the secondary market for life insurance policies

vi. Underwriting is less effective than expected.

vii. Errors occur.

D. Policyholder Behavior Assumptions

1. General Prudent Estimate Policyholder Behavior Assumption Requirements

The company shall determine prudent estimate policyholder behavior assumptions such that the assumptions

a. Reflect expectations regarding variations in anticipated policyholder behavior relative to characteristics that have a material impact on the minimum reserve, which, may include gender, attained age, issue age, policy duration, time to maturity, tax status, level of account and cash value, surrender charges, transaction fees or other policy charges; distribution channel, product features and whether the policyholder and insured are the same person or not.

b. Are appropriate for the block of business being valued, giving due consideration to other assumptions used in conjunction with the cash flow model and to the Scenarios whose results are likely to contribute to the minimum reserve.

c. Are based on actual experience data directly applicable to the block of business being valued (i.e., direct data) when available. In the absence of directly applicable data, the company should next use available data from any other block of business that is similar to the block of business being valued, whether or not that block of business is directly written by the company. If data from a similar block of business are used, the company shall adjust the anticipated experience assumption to reflect material differences between the business being valued and the similar block of business.

d. Reflect the outcomes and events exhibited by historical experience only to the extent such experience are relevant to the risk being modeled.

e. Reflect the likelihood that policyholder behavior will be affected by any significant increase in the value of a product option, such as term conversion privileges or policy loans.

f. Are assigned to policies in a manner that provides an appropriate level of granularity.

Guidance Note: Anticipated experience policyholder behavior assumptions for policyholder behavior risk factors include, but are not limited to, assumptions for premium payment patterns, premium persistency, surrenders, withdrawals, allocations between available investment and crediting options, benefit utilization, and other option elections. For fixed premium products, many of the premium payment patterns, premium persistency and partial withdrawal behavior assumptions may not apply and do not need to be considered.

2. Dynamic Modeling

a. The company shall use a dynamic model or other scenario-dependent formulation to determine anticipated policyholder behavior unless the behavior can be appropriately represented by static assumptions.

b. For risk factors that are modeled dynamically the company shall use a reasonable range of future expected behavior that is consistent with the economic scenarios and other variables in the model.

c. The company is not required to model extreme or "catastrophic" forms of behavior in the absence of evidence to the contrary.

3. Margins for Prudent Estimate Policyholder Behavior Assumptions

The company shall establish margins for policyholder behavior assumptions in compliance with subsection 9.B subject to the following:

a. To the extent that there is an absence of relevant and fully credible data, the company shall determine the margin such that the policyholder behavior assumption is shifted toward the conservative end of the plausible range of behavior which is the end of the range that serves to increase the minimum reserve.

b. The company must assume that policyholders' efficiency will increase over time unless the company has relevant and credible experience or clear evidence to the contrary.

c. The company must reflect the data uncertainty associated with using data from a similar but not identical block of business to determine the anticipated experience assumption.

d. The company shall establish a higher margin for partial withdrawal and surrender assumptions in the case where the company's marketing or administrative practices encourages anti-selection.

4. Additional Sensitivity Testing for Policyholder Behavior Assumptions

The company shall examine the sensitivity of assumptions on the minimum reserve as required under Subsection A.3 of this section and shall at a minimum sensitivity test:

a. Premium payment patterns, premium persistency, surrenders, partial withdrawals, allocations between available investment and crediting options, benefit utilization, and other option elections if relevant to the risks in the product;

b. For policies that give policyholders flexibility in the timing and amount of premium payments

i. Minimum premium scenario.

ii. No further premium payment scenario.

iii. Pre-payment of premiums – Single premium scenario.

iv. Pre-payment of premiums – Level premium scenario.

5. For a universal life policy that guarantees coverage to remain in force as long as the secondary guarantee requirement is met and during projection periods in which the cash value is zero or minimal, industry experience, for purposes of complying with Section 9.A.6, shall be the *Lapse Experience under Term-to-100 Insurance Policies* published by the Canadian Institute of Actuaries in October, 2007. During projection periods in which the cash value is zero or minimal, the assumption shall grade from credible company experience to the rates in the *Lapse Experience under Term-to-100 Insurance Policies* published by the Canadian Institute of Actuaries in October, 2007 in 5 projection years from the last duration where substantially credible experience is available.

Guidance Note: The term "minimal cash value" means that the cash value is of such small value that its presence would not significantly impact a policyholder's decision to lapse the policy in comparison to a situation with zero cash value.

E. Expense Assumptions

1. General Prudent Estimate Expense Assumption Requirements

In determining prudent estimate expense assumptions the company:

a. Shall use expense assumptions for the deterministic and stochastic scenarios that are the same except for differences arising from application of inflation rates.

b. May spread certain information technology development costs and other capital expenditures over a reasonable number of years in accordance with accepted statutory accounting principles as defined in the Statements of Statutory Accounting Principles.

Guidance Note: Care should be taken with regards to the potential interaction with the considerations above.

c. Shall assume that the company is a going-concern.

d. Shall choose an appropriate expense basis that properly aligns the actual expense to the assumption. If values are not significant they may be aggregated into a different base assumption.

Guidance Note: For example, death benefit expenses should be modeled with an expense assumption that is per death incurred

e. Shall reflect the impact of inflation.

f. May not assume future expense improvements.

g. Shall not include assumptions for federal income taxes (and expenses paid to provide fraternal benefits in lieu of federal income taxes) and foreign income taxes.

h. Shall use assumptions that are consistent with other related assumptions.

i. Use fully allocated expenses.

Guidance Note: Expense assumptions should reflect the direct costs associated with the block of policies being modeled as well as indirect costs and overhead costs that have been allocated to the modeled policies;

j. Shall allocate expenses using an allocation method that is consistent across company lines of business. Such allocation must be determined in a manner that is within the range of actuarial practice and methodology and consistent with applicable Actuarial Standards of Practice. Allocations may not be done for the purpose of decreasing the minimum reserve.

k. Shall reflect expense efficiencies that are derived and realized from the combination of blocks of business due to a business acquisition or merger in the expense assumption only when any future costs associated with achieving the efficiencies are also recognized.

Guidance Note: For example, the combining of two similar blocks of business on the same administrative system may yield some expense savings on a per unit basis, but any future cost of the system conversion should also be considered in the final assumption. If all costs for the conversion are in the past then there would be no future expenses to reflect in the valuation.

l. Shall reflect the direct costs associated with the policies being modeled as well as an appropriate portion of indirect costs and overhead (i.e. expense assumptions representing fully allocated expenses should be used.) including expenses categorized in the annual statement as 'taxes, licenses and fees' (Exhibit 3 of the Annual Statement) in the expense assumption.

m. Shall include acquisition expenses associated with business in force as of the valuation date and significant non-recurring expenses expected to be incurred after the valuation date in the expense assumption.

n.. For policies sold under a new policy form or due to entry into a new product line the company shall use expense factors that are consistent with the expense factors used to determine anticipated experience assumptions for policies from an existing block of mature policies taking into account:

i. Any differences in the expected long term expense levels between the block of new policies and the block of mature policies; and

ii. That all expenses must be fully allocated as required under Subparagraph b above.

2. Margins for Prudent Estimate Expense Assumptions

The company shall determine margins for expense assumptions according to the requirements given in subsection 9.B.

F. Asset Assumptions

Guidance Note: This subsection includes requirements for prescribed asset default costs, certain prescribed asset spreads, and handling of uncertainty of timing and amounts of cash flows due to embedded options in the assets.

1. Procedure for Setting Annual Default Cost Factors by Projection Year for Starting Fixed Income Assets with an NAIC Designation

The company shall determine a set of total annual default cost factors, by projection year, for each starting fixed income asset that has an NAIC designation, expressed as percentages of the statement value in each projection year. In making such determination for each asset, the company shall use certain inputs from company records according to 9.F.2, assign a PBR credit rating according to the procedure in 9.F.3, and use prescribed tables or other sources as indicated in this subsection and contained or referenced in Appendix 2. The total annual default cost factor in each year shall be the sum of three prescribed components (a) + (b) + (c) as follows:

a. The "baseline annual default cost factor" in all projection years shall be taken from the most current available baseline default cost table published by the NAIC using the PBR credit rating and weighted average life (WAL) of the asset on the valuation date. The methodology for creating this table can be found in Appendix 2 of this section VM-20. Table A of Appendix 2 shall be the initial NAIC table for this purpose.

b. The "spread related factor" shall grade linearly in yearly steps from the prescribed amount in year one to zero in years four and after. The prescribed amount in year one may be positive or negative and shall be calculated as follows:

   i. Multiply 25% by the result of (ii) minus (iii).

   ii. The current market benchmark spread published by the NAIC consistent with the PBR credit rating and WAL of the asset on the valuation date.

   iii. The most current available long-term benchmark spread published by the NAIC consistent with the PBR credit rating and WAL of the asset on the valuation date.

   iv. The resulting amount shall not be less than the negative of the baseline annual default cost in year one and shall not be greater than two times the baseline annual default cost in year one.

Drafting Note: Table H (investment grade spreads) and Table I (below investment grade spreads) in Appendix 2 need to be combined into one table.

c. The "maximum net spread adjustment factor" shall be the same amount for each starting fixed income asset within a model segment and shall grade linearly in yearly steps from the prescribed amount in year one to zero in years four and after. The prescribed amount in year one shall be calculated as follows:

   i. For each asset included in the model segment and subject to this subsection 9.F.1 calculate a preliminary year one net spread equal to the option adjusted spread of the asset on the valuation date less the sum of the amounts from 9.F.1.a and 9.F.1.b for the asset and less the investment expense for the asset.

   ii. Calculate a weighted average preliminary year one net spread for the model segment using a weight applied to the amount in 9.F.1.c.i for each asset equal to that asset's statement value on the valuation date multiplied by the lesser of 3 years and the asset's WAL on the valuation date.

   iii. Calculate the amount in 9.F.1.c.i above for a hypothetical asset with the following assumed characteristics (the regulatory threshold asset):

      1) A PBR credit rating of 9.

      2) A WAL equal to the average WAL on the valuation date for the assets in the model segment and subject to this subsection 9.F.1.

      3) An option adjusted spread equal to the current market benchmark spread published by the NAIC for the assumed PBR credit rating and WAL. The methodology for determining this published spread can be found in Appendix 2.

      4) Investment expense of 0.10%.

Drafting Note: Table F of Appendix 2 provides illustrative current benchmark spreads as of a particular date, but the intent of the requirement is that the published spread be as of or close to the valuation date.

iv. The prescribed amount in year one is the excess, if any, of the result in 9.F.1.c.ii over the result in 9.F.1.c.iii.

Guidance Note: A broader explanation for this factor. For each model segment, a comparison is to be made of two spread amounts, both being net of the default costs calculated thus far and net of investment expenses. In each case, the gross option adjusted spread is based on current market prices at the valuation date. The first result represents the weighted average net spread for all the assets in the model segment (and subject to this subparagraph), as if all the assets were purchased at their current market spreads. The second result represents the net spread for a portfolio of index Baa bonds (NAIC 2, PBR credit rating of 9) as if the index Baa portfolio were purchased at the current average market spread. If the first result is higher than the second, additional default costs must be added to each asset until the two results are equal for the first projection year. This additional amount of default cost on each asset then grades off linearly in the model until it reaches zero in year four and after. This process is repeated each actual valuation date. A company that invests in an asset mix earning an average gross spread greater than Baa bonds initially, or an asset mix whose average market spread could widen significantly relative to market spreads for Baa bonds are examples of situations likely to trigger additional assumed default costs either initially or in the future.

Drafting Note: The maximum net spread adjustment factor still needs further study as to potential reserve volatility it could produce.

2. Company-Determined Inputs for Each Asset

The company shall determine certain items for each asset that are necessary to calculate the total annual default cost factors.

a. "Investment expense" for each asset shall mean the company's anticipated experience assumption for assets of the same type, expressed as an annual percentage of statement value.

b. "Option adjusted spread (OAS)" for each asset shall mean the average spread over zero coupon Treasury bonds that equates a bond's market price as of the valuation date with its modeled cash flows across an arbitrage free set of stochastic interest rate scenarios. For floating rate bonds, the OAS shall be calculated as the equivalent spread over Treasuries if the bonds were swapped to a fixed rate. Market conventions and other approximations are acceptable for the purposes of this subsection.

c. "Weighted average life (WAL)" for each asset shall mean the weighted average number of years until 100% of the outstanding principal is expected to be repaid, rounded to the nearest whole number but not less than 1. For bonds or preferred stocks that are perpetual or mature after 30 years, the WAL shall be 30. Market conventions and other approximations are acceptable for the purposes of this subsection.

Guidance Note: OAS is a metric used for callable corporate bonds and other bonds with optionality such as residential mortgage backed securities. Any excess of the nominal spread of an asset over its OAS represents additional return for taking on the risk of embedded options. This additional return is not considered when using OAS to make adjustments to annual default cost factors because the additional return is assumed to be related to the cost of embedded options which must be modeled directly by the company along each scenario in the cash flow model (see 9.F.8). OAS is dependent on market prices, which may be gathered by companies in a variety of ways for financial reporting purposes. For instance, prices and OAS may be developed internally for assets with less relative liquidity such as private placements. The general sources of market prices used to determine OAS as well as the method or source for the OAS calculation should be documented in the PBR actuarial report. In some cases OAS may not be available due to unavailability of market prices. When such is the case the asset may be excluded from the particular calculation.

3. Determination of PBR Credit Rating

a. Table K of Appendix 2 converts the ratings of NAIC Approved Ratings Organizations (AROs) and NAIC designations to a numeric rating system from 1-20 that is to be used in the steps below. A rating of 21 applies for any ratings of lower quality than those shown in the table.

b. For an asset with an NAIC designation that is derived solely by reference to underlying ARO ratings without adjustment, the company shall determine the PBR credit rating as the average of the numeric ratings corresponding to each available ARO rating, rounded to the nearest whole number.

c. For an asset with an NAIC designation that is not derived solely by reference to underlying ARO ratings without adjustment, the company shall determine the PBR credit rating as the second least favorable numeric rating associated with that NAIC designation.

Guidance Note: The 1-21 PBR credit rating system attempts to provide a more granular assessment of credit risk than has been used for establishing NAIC designations for risk based capital and asset valuation reserve purposes. The reason is that unlike for RBC and AVR, the VM-20 reserve cash flow models start with the gross yield of each asset and make deductions for asset default costs. The portion of the yield represented by the purchase spread over Treasuries is often commensurate with the more granular rating assigned, such as A+ or A-. Thus, use of the PBR credit rating system may provide a better match of risk and return for an overall portfolio in the calculation of VM-20 reserves. However, for assets that have an NAIC designation that does not rely directly on ARO ratings, a more granular assessment consistent with the designation approach is not currently available.

Guidance Note: The Purposes and Procedures Manual of the NAIC Securities Valuation Office which establishes the rules for setting NAIC designations has been undergoing significant change during 2009-2010, particularly in the area of assessing the credit risk of structured securities. The Valuation of Securities Task Force of the NAIC (VOSTF) implemented an interim solution in 2009 to set designations for non-agency residential mortgage-backed securities based on modeling by a third party firm. VOSTF is developing a long-term solution for these and other structured securities such as commercial mortgage-backed securities that may involve a combination of modeling and other methods such as "notching up" or "notching down" the result derived by reference to ARO ratings. In all such cases where the ARO rating basis is either not used at all or is adjusted in some way, the intent is that paragraph (c) be used to determine the PBR credit rating. Another common example where (c) is to be used would be securities that are not SVO Filing Exempt, such as many private placement bonds. For example, a private placement that was not Filing Exempt and was rated by the SVO as NAIC 1 would be assigned a PBR credit rating of 6 (second least favorable), equivalent to A2.

4. Special Situations

For an asset handled under 9.F.3.c, and for which the NAIC designation varies depending on the company's carrying value of the asset, the company must avoid overstatement of the net return of the asset when projecting future payments of principal and interest together with the prescribed annual default costs.

Guidance Note: For example, if a non-agency residential mortgage-backed security is rated NAIC 2 if held at a particular company's carrying value but NAIC 4 if held at par, and that company's cash flow model first projects the full recovery of scheduled principal and interest, it would be more appropriate to then deduct annual default costs consistent with NAIC 4 rather than NAIC 2. If the company's cash flow model has already incorporated a reduced return of principal and interest consistent with the company's carrying value, then it would be more appropriate to deduct annual default costs consistent with NAIC 2. Modeling of assets with impairments is an emerging topic, and methods for handling in vendor and company projection models vary.

5. Annual Default Cost Factors for Starting Fixed Income Assets without an NAIC Designation

For starting assets that do not have an NAIC Designation, the default assumption shall be established such that the net yield shall be capped at 104% of the applicable corresponding historical U.S. Treasury yield rate most closely coinciding with the dates of purchase and maturity structure of supporting assets plus 25 basis points.

6. Annual Default Cost Factors for Reinvestment Fixed Income Assets

Alternative 1

Drafting Note: The version below was retained for testing Alternative 1 pursuant to amendment VM-20_100325_029.

Purchase spreads over Treasuries on reinvestment assets are prescribed as an amount that is already net of default costs. Therefore, the annual default cost factors for these assets are zero.

Alternative 2

Drafting Note: The version below was added for testing Alternative 2 pursuant to amendment VM-20_100325_029.

The sets of annual default cost factors for reinvestment fixed income assets are determined following the same process as for starting fixed income assets except that subsection 9.F.c.1 does not apply to reinvestment assets.

7. Amount of Assumed Default Costs

The assumed default costs in the cash flow model for a projection interval shall be the sum over all fixed income assets of the result of the total annual default cost factor for each asset, adjusted appropriately for the length of the projection interval, multiplied by the appropriate credit exposure for each asset.

Drafting Note: The following subsection 8 and 9 were added for testing Alternative 2 pursuant to amendment VM-20_100325_029.

8. Procedure for Setting Prescribed Gross Asset Spreads by Projection Year for Certain Asset Transactions and Operations in the Cash Flow Model

   a. Gross asset spreads over Treasuries for public non-callable corporate bonds purchased in projection year one shall be the current market benchmark spreads published by the NAIC consistent with the PBR credit rating and WAL of assets purchased.

   b. Gross asset spreads over Treasuries for public non-callable corporate bonds purchased in projection years four and after shall be the most current available long-term benchmark spreads published by the NAIC consistent with the PBR credit rating and WAL of assets purchased.

   c. The prescribed gross asset spreads for these asset types shall grade linearly between year one and year four in yearly steps.

   d. Interest rate swap spreads over Treasuries shall be prescribed by the NAIC for use throughout the cash flow model wherever appropriate for transactions and operations including but not limited to purchase, sale, settlement, and cash flows of derivative positions, and reset of floating rate investments. A current and long-term swap spread curve shall be prescribed for year one and years four and after, respectively, with yearly grading in between. The 3-month and 6-month points on the swap spread curves represent the corresponding LIBOR spreads over Treasuries.

9. Basis of NAIC Long-Term Benchmark Spreads

Drafting Note: The detailed methodology and data source used to create the initial long-term benchmark spread table is described in Appendix 2 of this section VM-20. Until a different table is published by the NAIC, Table H of Appendix 2 shall be the NAIC table for this purpose. This subsection spells out the principles to be used by the NAIC to apply to any particular data source for developing future tables. It is expected that the current table would be reviewed annually.

The prescribed long-term benchmark spread table established by the NAIC shall to the extent practicable:

   a. Reflect recent historical market data based on actual daily trading activity.

   b. Reflect an expanding observation period that uses the most recent reported data, with a minimum observation period of seven years expanding to a maximum observation period of 15fifteen years.

   c. Be based on an "85% conditional mean" of the periodic market data. This measure is defined as the mean obtained after excluding from the observation period the trading days involving the 7.5% highest and 7.5% lowest observed spreads for "A" rated 7-10 year maturities or other most similar asset category available from the source data. For other asset categories, the mean shall be obtained after excluding the same trading days that were excluded for the primary asset category.

d. Provide a table of bond spreads by PBR credit rating and WAL and swap spreads by maturity. If needed, interpolation and/or smoothing techniques should be applied to the source data to provide sufficient granularity and logical relationships by credit quality.

Guidance Note: Long-term prescribed spreads are targeted at the historical mean because any biased measure could either add or subtract conservatism depending on whether assets are predominantly being purchased or being sold in the cash flow model. The conditional mean concept is intended to limit the volatility of the long-term prescribed spreads from one valuation date to the next by excluding a limited number of observations in both tails within the averaging period. Empirical analysis during the 2000-2009 time period showed little change in volatility or the level of prescribed spreads from excluding more than the highest and lowest 7.5% observations.

10. Modeling of Embedded Options in Assets

Reflect any uncertainty in the timing and amounts of asset cash flows related to the paths of interest rates, equity returns, or other economic values contained in the various Scenarios directly in the projection of asset cash flows under the various scenarios within the stochastic reserve calculation model and under the deterministic scenario within the deterministic reserve calculation model.

Guidance Note: For example, model the impact on cash flows of embedded prepayment, extension, call and put options in a manner consistent with current asset adequacy analysis practice.

G. Revenue Sharing Assumptions

1. The company may include income from projected future revenue sharing (as defined in these requirements equals gross revenue sharing income (GRSI)) net of applicable projected expenses (net revenue sharing income) in cash flow projections, if:

   a. The GRSI is received by the company;

   b. Signed contractual agreement or agreements are in place as of the valuation date and support the current payment of the GRSI; and

   c. The GRSI is not already accounted for directly or indirectly as a company asset.

2. For purposes of this section, GRSI is considered to be received by the company if it is paid directly to the company through a contractual agreement with either the entity providing the GRSI or an affiliated company that receives the GRSI. GRSI would also be considered to be received if it is paid to a subsidiary that is owned by the company and if 100% of the statutory income from that subsidiary is reported as statutory income of the company. In this case the actuary shall assess the likelihood that future GRSI is reduced due to the reported statutory income of the subsidiary being less than future GRSI received.

3. If the requirements in Section 9.G.1 are not met, and GRSI is not included in cash flow projections, applicable projected expenses are also not included.

4. In determining the anticipated experience assumption for GRSI, the company shall reflect factors that include but are not limited to the following (not all of these factors will necessarily be present in all situations):

   a. The terms and limitations of the agreement(s), including anticipated revenue, associated expenses and any contingent payments incurred or made by either the company or the entity providing the GRSI as part of the agreement(s);

   b. The relationship between the company and the entity providing the GRSI that might affect the likelihood of payment and the level of expenses;

c. The benefits and risks to both the company and the entity paying the GRSI of continuing the arrangement;

d. The likelihood that the company will collect the GRSI during the term(s) of the agreement(s) and the likelihood of continuing to receive future revenue after the agreement(s) has ended;

e. The ability of the company to replace the services provided to it by the entity providing the GRSI or to provide the services itself, along with the likelihood that the replaced or provided services will cost more to provide; and

f. The ability of the entity providing the GRSI to replace the services provided to it by the company or to provide the services itself, along with the likelihood that the replaced or provided services will cost more to provide.

5. The company shall include all expenses required or assumed to be incurred by the company in conjunction with the arrangement providing the GRSI, as well as any assumed expenses incurred by the company in conjunction with the assumed replacement of the services provided to it in the projections as a company expense. In addition, the company shall include expenses incurred by either the entity providing the net revenue sharing income or an affiliate of the company in the applicable expenses that reduce the GRSI.

6. In determining the prudent estimate of projected GRSI the company shall reflect a margin (which decreases the assumed GRSI) related to the uncertainty of the revenue. Such uncertainty is driven by many factors including but not limited to the potential for changes in industry trends. Contractually guaranteed GRSI shall not reflect a margin, although Company expenses related to contractually guaranteed GRSI shall reflect a margin.

7. The actuary is responsible for reviewing the revenue sharing agreements, verifying compliance with these requirements, and documenting the rationale for any source of GRSI used in the projections.

8. The amount of net revenue sharing income assumed in a given scenario shall not exceed the sum of a) and b), where:

a. Is the contractually guaranteed GRSI, net of applicable expenses projected under the scenario, and

b. Is the actuary's estimate of non-contractually guaranteed net revenue sharing income multiplied by the following factors:

i. 1.0 in the first projection year;

ii. 0.9 in the second projection year;

iii. 0.8 in the third projection year;

iv. 0.7 in the fourth projection year;

v. 0.6 in the fifth projection year;

vi. 0.5 in the sixth and all subsequent projection years. The resulting amount of non-contractually guaranteed net revenue sharing Income after application of this factor shall not exceed 0.25% per year on separate account assets in the sixth and all subsequent projection years.

Guidance Note: Provisions such as one that gives the entity paying the gross revenue sharing income the option to stop or change the level of income paid would prevent the income from being guaranteed. However, if such an option becomes available only at a future point in time, and the revenue up to that time is guaranteed, the income is considered guaranteed up to the time the option first becomes available.

Guidance Note: If the agreement allows the company to unilaterally take control of the underlying fund fees that ultimately result in the gross revenue sharing income then the revenue is considered guaranteed up until the time at which the company can take such control. Since it is unknown whether the company can perform the services associated with the revenue sharing arrangement at the same expense level, it is presumed that expenses will be higher in this situation. Therefore, the revenue sharing income shall be reduced to account for any actual or assumed additional expenses.

Appendix 1. Stochastic Exclusion Test Scenarios

This appendix describes the set of 16 scenarios for the Stochastic Exclusion Test in VM-20. Starting with yield curve on the valuation date, the scenarios are created using the American Academy of Actuaries' stochastic scenario generator using predefined sets of random numbers, where each random number is a sample from a normal distribution with mean zero and variance 1.

The rationale for this approach is twofold. First, the scenarios should be realistic in that they could be produced by the generator. Second, in some way the likelihood of any scenario occurring can be measured.

One way to measure the likelihood of a scenario occurring is to measure the likelihood of its series of random shocks, that is, the random numbers used in the generator. Given any sequence of random numbers, their sum can be compared with a mean of zero and a standard error equal to the square root of the number of deviates in the sequence. With the mean and standard error, we can determine, in a crude way, where the sum of deviates in our sequence lies in the distribution of the sum of all such sequences.

For example, if we want a sequence that is always one standard error above average, we start with a value of 1.0 as the first deviate. The value of the n^{th} deviate is the excess of the square root of n over the square root of n-1. So the second value is 1.414 – 1 = 0.414 and the third value is 1.732 - 1.414 = 0.318.

A. Generating Interest Rates

The American Academy of Actuaries'interest rate generator uses 3 random numbers per period. These are:

1. A random shock to the 20-year treasury rate
2. A random shock to the spread between 1-year and 20-year treasury rates
3. A random shock to the volatility

In generating the scenarios for the test, zero shocks to volatility are used.

When generating scenarios for the test, upward shocks to the 20-year treasury are associated with downward shocks to the spread, making the yield curve less steep (or potentially inverted).

B. Generating Equity Returns

The American Academy of Actuaries' equity generators (C3 phase 2) use two random numbers per period. These are:

1. A random shock to make the return more or less than the mean
2. A random shock to the volatility

This test uses zero shocks to volatility in defined scenarios.

The random numbers that define the scenarios are as follows:

Scenario 1 – Pop up, high equity

Interest rate shocks are selected to maintain the cumulative shock at the 90% level (1.282 standard errors).

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 2 – Pop up, low equity

Interest rate shocks are selected to maintain the cumulative shock at the 90% level (1.282 standard errors).

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Scenario 3 – Pop down, high equity

Interest rate shocks are selected to maintain the cumulative shock at the 10% level (1.282 standard errors).

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 4 – Pop down, low equity

Interest rate shocks are selected to maintain the cumulative shock at the 10% level (1.282 standard errors).

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Scenario 5 – Up/down, high equity

Interest rate shocks are selected that, for each five-year period, are consistently in the same direction. The cumulative shock for each 5-year period is at the 90% level during "up" periods and at the 10% level during "down" periods.

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 6 – Up/down, low equity

Interest rate shocks are selected that, for each five-year period, are consistently in the same direction. The cumulative shock for each 5-year period is at the 90% level during "up" periods and at the 10% level during "down" periods.

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Scenario 7 – Down/up, high equity

Interest rate shocks are selected that, for each five-year period, are consistently in the same direction. The cumulative shock for each 5-year period is at the 90% level during "up" periods and at the 10% level during "down" periods.

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 8 – Down/up, low equity

Interest rate shocks are selected that, for each five-year period, are consistently in the same direction. The cumulative shock for each 5-year period is at the 90% level during "up" periods and at the 10% level during "down" periods.

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Scenario 9 – Baseline scenario

All shocks are zero.

Scenario 10 – Inverted yield curves

There are no shocks to long term rates and equities.

There are shocks to the spread between short and long rates that are consistently in the same direction for each three-year period. The shocks for the first three-year period are in the direction of reducing the spread (usually causing an inverted yield curve). Shocks for each subsequent three year period alternate in direction.

Scenario 11 – Volatile equity returns

There are no shocks to interest rates

There are shocks to equity returns that are consistently in the same direction for each two-year period, and then switch directions.

Scenario 12 – Deterministic scenario for valuation

There are uniform downward shocks each month for 20 years, sufficient to get down to the 80% point on the distribution of 20 year shocks. After 20 years, shocks are at a level that keeps the cumulative shock at the 80% level (or the 20% level, depending on how you look at it).

Scenario 13 – Delayed pop up, high equity

There are interest rate shocks that are zero for the first 10 years, followed by 10 years of shocks each 1.414 (square root of 2) times those in the first 10 years of Scenario 1. This gives the same 20-year cumulative shock as scenario 1 but all the shock is concentrated in the second 10 years. After 20 years, the same as scenario 1.

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 14 – Delayed pop up, low equity

There are interest rate shocks that are zero for the first 10 years, followed by 10 years of shocks each 1.414 (square root of 2) times those in the first 10 years of Scenario 2. This gives the same 20-year cumulative shock as scenario 2 but all the shock is concentrated in the second 10 years. After 20 years, the same as scenario 1.

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Scenario 15 – Delayed pop down, high equity

There are interest rate shocks that are zero for the first 10 years, followed by 10 years of shocks each 1.414 (square root of 2) times those in the first 10 years of Scenario 3. This gives the same 20-year cumulative shock as scenario 3 but all the shock is concentrated in the second 10 years. After 20 years, the same as scenario 3.

Equity returns are selected to maintain the cumulative equity return at the 90% level.

Scenario 16 – Delayed pop down, low equity

There are interest rate shocks that are zero for the first 10 years, followed by 10 years of shocks each 1.414 (square root of 2) times those in the first 10 years of Scenario 4. This gives the same 20-year cumulative shock as scenario 4 but all the shock is concentrated in the second 10 years. After 20 years, the same as scenario 4.

Equity returns are selected to maintain the cumulative equity return at the 10% level.

Appendix 2. Tables for Calculating Asset Default Costs and Asset Spreads, Including Basis of Tables

This appendix describes the basis for certain prescribed asset default cost and asset spread tables to be updated and published periodically by the NAIC via website. These tables are needed for insurers to comply with the requirements of Subsection 9.F for asset default costs and asset spreads in VM-20. In some cases, as specified in 9.F, tables published in this appendix will serve as the NAIC published table until a different table is published. The development of the various tables is described in subsections A-E of this appendix. The actual tables are shown in subsection F of this appendix. Certain tables were developed based on various source material referenced herein. Other tables are simply compilations or presentations of data from such sources.

It is important to note up front that the development of prescribed default costs is based entirely on analysis of corporate bonds. Default costs for other fixed income securities are assumed to follow those of corporate bonds with similar NAIC designations through a mapping tool called "PBR credit rating." Examples of other fixed income securities are structured securities, private placements, and preferred stocks. Discussions at the NAIC during 2009-2010, particularly at the Valuation of Securities Task Force (VOSTF), have focused on the observation that similarly-rated assets of different types may have similar likelihood of default or loss of principal but may have a significantly different distribution of the severity of that loss. Discussions have particularly focused on the different drivers of severity between structured securities and corporate bonds. As a result, VOSTF has been developing updated methods to assign NAIC designations for C-1 risk based capital purposes for structured securities in order to better take into account these differences. The VM-20 procedure to assign a PBR credit rating has been structured so that in the cases where VOSTF decides to go away from directly using the ratings of approved ratings organizations, the PBR credit rating will be based on the NAIC designation rather than underlying ratings. Where VOSTF continues to authorize use of underlying ratings, the PBR credit rating will also be based on those ratings. However, VM-20 uses the underlying ratings to assign the PBR credit rating in a somewhat different manner.

Subsection 9.F.3 describes the process the company must follow to assign a PBR credit rating for any fixed income asset with an NAIC designation.

A. Baseline Annual Default Cost Factors

The general process followed to determine the baseline annual default cost factors shown in Table A (see subsection F) was as follows:

1. Determine from historical corporate bond data a matrix of cumulative default rates, for maturities of 1 to 10 years and for 20 ratings classes (Aaa, Aa1, Aa2, Aa3 … Caa2, Caa3, Ca).

2. Determine also from historical corporate bond data a set of recovery rates that varies only by rating class.

3. Determine a matrix of baseline annual default cost factors (in basis points), where for a given rating the Baseline Annual Default Cost Factor for a bond with maturity or weighted average life of t = 10,000* (1-Recovery Rate) * (1-[1-Cumulative Default Rate (t)]^[1/t]).

4. Items 1) and 2) above were determined from Moody's reports that were published in February 2008. In February 2009 and February 2010, Moody's published updated versions of these reports but there is no commitment from Moody's to continue updating these reports in the future. It was not explored whether another source for one or both elements might be preferable. If the NAIC decides to use Moody's as the source going forward, then the matrix of baseline annual default cost factors could be updated after Moody's publishes any updated research.

Details of steps 1 and 2 above are contained in subsections B and C below. Essentially though, step 1 involved gathering from Moody's historical data the cumulative default rates for key maturities over many cohort years, ranking those rates, and applying a CTE 70 metric. For example, for the period 1970-2007, representing 37 years, there were 37 one year cohorts, 33 five year cohorts, and 28 ten year cohorts. A CTE 70 for ten year maturities involved averaging the 8 cohorts with the highest ten year cumulative default rates. Step 2 involved gathering from Moody's historical data the annual recovery rates for various bond categories from 1982-2007, ranking those rates, and calculating sample mean and CTE 70 statistics. The final recovery rate table uses the mean for higher quality investment grade rating classes, uses the CTE 70 for lower quality below investment grade rating classes, and grades in between.

In subsection F below,

1. Table A shows Baseline Default Costs using Moody's Data as of February 2008, and

2. Table B shows Baseline Default Cost Margin as of February 2008 (Table A rates minus the historical mean rates).

B. Cumulative Default Rates Used in Baseline Annual Default Cost Factors

The current process to determine cumulative default rates is as follows:

1. Obtain the most recent Moody's report on Default Rates (e.g., Moody's 2008-02-11 Special Comment - Corporate Default & Recovery Rates 1920-2007).

2. Extract 1 year, 5 year and 10 year average cumulative default rate data by whole letter rating (e.g., Aaa, Aa, …CCC) from the report (e.g., Exhibit 27 - Average Cumulative Issuer-Weighted Global Default Rates, 1970-2007*).

3. Extract 1 year, 5 year and 10 year cumulative default rate cohort data by whole letter rating from the report (e.g., Exhibit 36 - Cumulative Issuer-Weighted Default Rates by Annual Cohort, 1970-2007). Calculate the mean of these 1y, 5y and 10y cumulative default rates, which should be close to the result in (2) for each whole letter rating.

4. Sort the data in 3) to calculate preliminary CTE 70 1y, 5y and 10y cumulative default rates at each whole letter rating.

5. Adjust the result in 4) to reflect any differences between 2) and 3). 5) = 4) + [2) - 3)].

6. Use linear interpolation to determine cumulative default rates for maturities 2 to 4 and 6 to 9.

7. Transform the data into a matrix that varies by rating notch (e.g., Aaa, Aa1, Aa2, Aa3, A1,…, Caa2, Caa3, Ca) using an algorithm to ensure that in the new matrix the rows are monotonic by maturity, the columns are monotonic by rating, and to the extent possible the new matrix has a shape comparable to another Moody's cumulative default rate table that varies by notch (e.g., Moody's Idealized Cumulative Default Rates).

8. For maturities greater than 10 years define baseline annual default cost factors as equal to those for 10 year maturities.

In subsection F below,

1. Table C shows Empirical CTE 70 Default Rates from Moody's Data as of Feb 2008.

2. Table D shows Prescribed Cumulative Default Rates derived from Moody's Data as of Feb 2008.

C. Recovery Rate Used in Baseline Annual Default Cost Factors

The current process to determine the recovery rate is as follows:

1. Obtain the most recent Moody's report on Recovery Rates (e.g., Moody's 2008-02-11 Special Comment - Corporate Default & Recovery Rates 1920-2007).

2. Extract historical annual data on recovery rates (e.g., the All Bonds column from Exhibit 22 - Annual Average Defaulted Bond and Loan Recovery Rates, 1982-2007).

3. Determine the mean and CTE 70 of the annual sample observations for each of the different lien position categories as well as for the All Bonds category.

In subsection F below,

1. Table E1 shows a sorted version of "Exhibit 22 - Annual Average Defaulted Bond and Loan Recovery Rates, 1982-2007," and develops the CTE 70 Recovery Rates and the implied Margin.

   Table E1 develops Mean and CTE 70 Recovery Rates for All Bonds as well as for Senior Bank Loans and five bond lien position categories that make-up the All Bonds statistics. Implementation will be facilitated if VM-20 uses one recovery rate based on All Bonds rather than using all six lien position categories. Using the more detailed data would require either companies or the SVO to assign each asset to one of the categories.

   Table E1 also illustrates that bonds that are more senior in the issuer's capital structure tend to have higher recovery rates than bonds that are subordinated.

2. Table E2 shows the final Recovery Rates that vary by PBR credit rating. This table was determined by assuming CTE 70 applies for Ba3/BB- and below, Mean applies for Baa1/BBB+ and above, and interpolated recovery rates apply for ratings that are between Ba3/BB- and Baa1/BBB+. This approach recognizes that investment grade bonds are more likely to be senior in the issuer's capital structure, and below investment grade bonds are more likely to be subordinated. Differentiating by actual seniority position of each bond was not considered practical. In addition, since recovery rates and default rates are not 100% correlated, and the cumulative default rates were set at CTE 70, use of the mean recovery rate at least for the higher quality bonds helps to avoid overly conservative prescribed default costs for those bonds.

D. Illustrative Current Market Benchmark Spreads

Current market benchmark spreads published by the NAIC are intended to represent average market spreads at the valuation date for public non-callable corporate bonds and interest rate swaps. They are used to establish the initial spread environment in the cash flow model for purposes of modeling reinvestment assets and disinvestment and for modeling prescribed default costs. Section 9.F calls for both spreads and default costs to grade from initial to long-term conditions by the start of projection year four. Ultimately, the NAIC will need to publish current market benchmark spreads on a website on a quarterly basis. The current process to determine current market benchmark spreads is as follows:

1. Extract valuation date Investment Grade bond index spread data by ratings category and maturity bucket (e.g., download JULI (JPMorgan US Liquid Index) Interpolated Spread over Treasury data for All Industries).

2. Extract valuation date Below Investment Grade bond index spread data by ratings category (e.g., download JPMorgan Domestic High Yield Index Spread to Worst data by Rating Tier), and assume that the Below Investment Grade spread curve is flat across maturities.

3. Transform the data into a matrix that varies by rating notch (e.g., Aaa, Aa1, Aa2, Aa3, A1,…, Caa2, Caa3, Ca) and maturity (1, 2, …, 30) using an algorithm to ensure that in the new matrix: (a) the rows are monotonic by rating, (b) the investment grade columns are monotonic by maturity, and (c) the columns on the borderline between investment grade and below investment grade (Baa3/BBB-) is interpolated between Baa2/BBB and Ba1/BB+.

In subsection F below,

1. Table F shows Current Market Benchmark Spreads as of 9/30/2009 for Investment Grade bonds.

2. Table G shows Current Market Benchmark Spreads as of 9/30/2009 for Below Investment Grade bonds.

E. Long-Term Benchmark Spreads

Long-term benchmark spreads published by the NAIC are the assumed long-term average spreads for non-callable public bonds and interest rate swaps. They are used to establish the long-term spread environment in the cash flow model for purposes of modeling reinvestment assets and disinvestment. They are also used as the normative spreads when calculating the spread related factor in the asset default cost methodology. Ultimately, the NAIC will need to publish these spreads on a website. The current process to determine mean benchmark spreads is as follows:

1. Extract daily Investment Grade bond index spread data for the prescribed observation period by ratings category and maturity bucket (e.g., download JULI (JPMorgan US Liquid Index) Interpolated Spread over Treasury data for All Industries).

2. Extract daily date Below Investment Grade bond index spread data for the prescribed observation period by ratings category (e.g., download JPMorgan Domestic High Yield Index Spread to Worst data by Rating Tier), and assume that the Below Investment Grade spread curve is flat across maturities.

3. For the whole letter "A" rated 7-10 year maturity bucket, or nearest similar category, calculate the "85% conditional mean average" by first excluding the 7.5% highest and 7.5% lowest daily observations over the prescribed observation period and then computing the mean of the remaining daily observations.

4. Calculate for each other ratings category and maturity bucket the mean over the prescribed observation period after excluding the observations from the same trading days excluded in step 3. In developing Tables H and I, a 9.25 year averaging period was used, specifically 7/1/2000 through 09/30/2009.

5. Transform the data into a matrix that varies by rating notch (e.g., Aaa, Aa1, Aa2, Aa3, A1,…, Caa2, Caa3, Ca) and maturity (1, 2, …, 30) using an algorithm to ensure that in the new matrix: (a) the rows are monotonic by rating, (b) the investment grade columns are monotonic by maturity, and (c) the columns on the borderline between investment grade and below investment grade (Baa3/BBB-) are interpolated between Baa2/BBB and Ba1/BB+.

Drafting Note: A description of the development of the prescribed interest rate swap spreads needs to be added. The process is similar but the data source is different.

Drafting Note: Two key considerations for the NAIC going forward will be the source of the spread data and the historical observation period. It has not yet been explored whether a source other than JULI (JP Morgan) would be preferable. Ideally the current and long-term benchmark spreads should come from the same source. A seven year observation period was originally chosen because consistent and reliable data was only available back to 2000, and examples were being created based on a 2007 valuation date. It is recommended that the observation period be allowed to lengthen as more years of data are available, and that ultimately a rolling average of a maximum numbers of years be established such as 10 years or 15 years.

In subsection F below,

1. Table H shows Long-Term Mean Benchmark Spreads as of 9/30/2009 for Investment Grade bonds.

2. Table I shows Long-Term Mean Benchmark Spreads as of 9/30/2009 for Below Investment Grade bonds.

3. Table J shows Long-Term Benchmark Swap Spreads

F. Tables

Table A. Prescribed Baseline Annual Default Costs (in bps) using Moody's Data as of February 2008

PBR credit rating	Moody's\WAL	1	2	3	4	5	6	7	8	9	10
1	Aaa	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
2	Aa1	0.0	0.1	0.3	0.5	0.5	0.6	0.7	0.8	0.8	0.9
3	Aa2	0.1	0.4	0.8	1.0	1.2	1.3	1.4	1.5	1.7	1.8
4	Aa3	0.2	0.9	1.7	2.2	2.4	2.7	2.9	3.1	3.3	3.7
5	A1	0.4	1.7	3.4	4.1	4.5	4.9	5.2	5.5	5.9	6.4
6	A2	0.8	3.3	6.5	7.5	8.1	8.6	9.2	9.5	10.1	11.1
7	A3	2.8	7.0	10.6	11.8	12.6	13.5	14.4	14.9	15.6	16.7
8	Baa1	6.4	13.0	16.5	18.1	19.1	20.4	21.7	22.7	23.5	24.3
9	Baa2	16.3	26.3	32.5	36.9	39.8	40.3	42.4	44.0	44.7	45.2
10	Baa3	42.0	61.4	70.0	76.8	81.0	80.0	80.6	81.4	81.9	81.8
11	Ba1	90.5	123.4	134.7	143.1	148.8	143.9	140.4	138.4	137.2	135.7
12	Ba2	173.5	226.2	243.5	257.9	267.6	253.8	241.0	232.5	228.0	224.1
13	Ba3	262.0	295.0	311.3	328.6	349.6	334.4	321.0	313.1	308.2	305.9
14	B1	436.4	453.8	468.5	480.1	495.0	464.0	441.5	425.5	415.2	409.4
15	B2	621.8	573.8	565.2	560.8	567.4	525.7	492.9	467.1	449.6	436.4
16	B3	1,009.1	832.5	789.8	779.3	788.6	726.3	689.6	663.7	641.2	626.1
17	Caa1	1,440.9	1,095.2	1,004.3	983.8	999.3	922.7	879.6	855.0	840.7	839.5
18	Caa2	2,026.5	1,427.1	1,253.0	1,191.4	1,191.9	1,089.4	1,023.7	982.5	960.8	952.3
19	Caa3	3,974.3	2,806.9	2,385.2	2,269.9	2,316.1	2,090.5	1,942.9	1,850.2	1,809.0	1,815.6
20	Ca	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1	7,090.1

Table B. Default Cost Margin (in bps) included in Table A

PBR credit rating	Moody's\WAL	1	2	3	4	5	6	7	8	9	10
1	Aaa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Aa1	0.0	0.1	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
3	Aa2	0.1	0.3	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9
4	Aa3	0.1	0.6	1.1	1.3	1.4	1.4	1.5	1.6	1.7	1.8
5	A1	0.3	1.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.1
6	A2	0.5	2.3	4.2	4.5	4.5	4.6	4.8	4.9	5.0	5.4
7	A3	1.9	4.9	6.9	7.0	7.0	7.3	7.5	7.6	7.8	8.1
8	Baa1	4.3	9.2	10.7	10.8	10.6	11.0	11.4	11.7	11.8	11.8
9	Baa2	12.4	19.8	23.8	26.2	27.6	26.7	27.4	28.0	28.0	17.6
10	Baa3	24.5	34.2	35.4	36.2	37.4	34.2	32.9	32.1	31.3	34.2
11	Ba1	54.4	71.1	70.9	71.0	72.7	65.6	61.4	58.9	56.8	61.0
12	Ba2	108.7	136.0	137.3	139.8	144.6	129.0	118.7	112.2	108.1	103.7
13	Ba3	154.9	148.9	146.3	153.0	166.2	147.3	134.3	127.9	124.8	124.9
14	B1	258.0	230.2	222.5	227.1	240.0	209.2	189.6	178.9	173.5	173.0
15	B2	348.8	260.2	230.1	222.7	231.4	193.1	165.4	148.4	138.3	133.1
16	B3	587.1	409.8	368.9	371.0	392.0	344.0	320.9	307.4	297.3	294.4
17	Caa1	818.3	513.1	439.6	441.5	475.9	423.6	403.1	393.9	389.7	395.2
18	Caa2	1,095.1	595.6	453.7	416.2	435.6	361.6	317.1	282.1	250.6	224.8
19	Caa3	2,164.5	1,290.9	1,017.4	999.6	1,131.9	987.6	918.2	870.1	841.8	843.8
20	Ca	790.1	790.1	790.1	790.1	790.1	790.1	790.1	790.1	790.1	790.1

Table C. Empirical CTE 70 Default Rates (%) from Moody's Data as of February 2008

Rating \ WAL	1	2	3	4	5	6	7	8	9	10
Aaa	0.0000	0.0942	0.1884	0.2825	0.3767	0.6800	0.9833	1.2866	1.5899	1.8932
Aa	0.0492	0.2182	0.3873	0.5563	0.7253	0.8800	1.0347	1.1895	1.3442	1.4989
A	0.0583	0.3600	0.6617	0.9634	1.2651	1.6266	1.9881	2.3496	2.7111	3.0726
Baa	0.5481	1.2977	2.0474	2.7971	3.5467	4.1928	4.8389	5.4850	6.1311	6.7771
Ba	2.6013	6.6703	10.7393	14.8082	18.8772	21.0961	23.3149	25.5337	27.7526	29.9714
B	9.9611	16.9257	23.8903	30.8549	37.8196	41.2080	44.5965	47.9850	51.3735	54.7619
Caa	34.5818	41.8637	49.1457	56.4277	63.7096	66.1152	68.5208	70.9263	73.3319	75.7375

Table D. Cumulative Default Rates at CTE 70 derived from Moody's Data as of February 2008

Rating \ Term	1	2	3	4	5	6	7	8	9	10
Aaa	0.0001%	0.0003%	0.0011%	0.0027%	0.0043%	0.0061%	0.0080%	0.0103%	0.0129%	0.0157%
Aa1	0.0007%	0.0048%	0.0151%	0.0313%	0.0458%	0.0639%	0.0834%	0.1046%	0.1288%	0.1571%
Aa2	0.0017%	0.0128%	0.0393%	0.0701%	0.1004%	0.1354%	0.1715%	0.2107%	0.2576%	0.3142%
Aa3	0.0037%	0.0303%	0.0892%	0.1506%	0.2097%	0.2784%	0.3506%	0.4245%	0.5137%	0.6284%
A1	0.0071%	0.0590%	0.1770%	0.2818%	0.3855%	0.5020%	0.6271%	0.7492%	0.9001%	1.0997%
A2	0.0132%	0.1116%	0.3358%	0.5143%	0.6897%	0.8869%	1.0967%	1.2939%	1.5426%	1.8851%
A3	0.0473%	0.2391%	0.5445%	0.8051%	1.0781%	1.3844%	1.7146%	2.0290%	2.3877%	2.8277%
Baa1	0.1096%	0.4463%	0.8470%	1.2374%	1.6245%	2.0842%	2.5796%	3.0748%	3.5658%	4.0844%
Baa2	0.2684%	0.8635%	1.5933%	2.4024%	3.2287%	3.9116%	4.7777%	5.6428%	6.4307%	7.1958%
Baa3	0.6631%	1.9290%	3.2827%	4.7647%	6.2327%	7.3466%	8.5839%	9.8402%	11.0552%	12.1929%
Ba1	1.3735%	3.7110%	6.0086%	8.4083%	10.7897%	12.4098%	13.9960%	15.6215%	17.2477%	18.7890%
Ba2	2.5368%	6.5040%	10.3058%	14.2473%	18.0898%	20.2970%	22.2031%	24.1689%	26.2970%	28.3259%
Ba3	3.6955%	8.1474%	12.6022%	17.2882%	22.3370%	25.1659%	27.6984%	30.3257%	32.9668%	35.6626%
B1	6.1549%	12.3912%	18.5430%	24.4577%	30.3603%	33.3742%	36.2428%	39.0509%	41.9040%	44.8307%
B2	8.7700%	15.5309%	22.0600%	28.0790%	34.1026%	37.0125%	39.6120%	42.0311%	44.5486%	47.0164%
B3	14.2329%	22.1052%	29.8341%	37.2322%	44.5424%	47.7158%	51.1441%	54.4483%	57.3933%	60.3261%
Caa1	20.3231%	28.5079%	36.7603%	44.9831%	53.2154%	56.6807%	60.4333%	64.2277%	67.8897%	71.6386%
Caa2	28.5824%	36.2037%	44.2010%	52.0905%	60.1578%	63.2458%	66.4304%	69.6787%	73.0350%	76.3641%
Caa3	56.0548%	63.5055%	70.7783%	78.6366%	86.1597%	87.7061%	89.3719%	91.1008%	92.9422%	94.8089%
Ca	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%

Table E1. Development of Prescribed Recovery Rates from Moody's Data as of February 2008

Moody's 2008-02-11 Special Comment - Corporate Default & Recovery Rates 1920-2007							
Sorted Version of Exhibit 22 - Annual Average Defaulted Bond and Loan Recovery Rates, 1982-2007*							
Summary Statistics	Sr. Secured Bank Loans	Sr. Secured Bonds	Sr. Unsecured Bonds	Sr. Subordinated Bonds	Subordinated Bonds	Jr. Subordinated Bonds	All Bonds
	51.40	33.81	21.45	19.82	12.31	7.79	22.21
	53.40	37.98	23.81	20.75	15.94	10.70	25.18
	58.80	39.23	29.69	23.21	18.19	13.50	25.50
	61.13	40.00	35.79	25.64	19.09	15.50	30.18
	66.16	43.00	36.66	26.06	22.60	16.85	32.31
	67.59	46.54	37.01	28.01	24.42	30.58	34.33
	67.74	47.58	37.13	29.61	24.51	36.50	35.53
	68.32	48.14	38.04	30.88	26.36	47.00	35.57
	73.43	48.37	41.63	33.41	29.99	48.50	38.98
	74.67	48.39	41.87	34.30	31.86	62.00	39.65
	75.25	55.40	43.81	34.57	33.77	NA	40.69
	75.44	59.22	45.24	37.27	35.64	NA	41.54
	75.82	62.02	47.60	41.41	35.96	NA	43.08
	76.02	62.05	49.19	41.82	38.04	NA	43.28
	78.75	63.46	49.41	43.50	38.23	NA	43.64
	82.07	69.25	51.02	43.75	39.42	NA	43.66
	87.74	71.00	52.60	44.73	40.54	NA	45.49
	88.23	71.93	52.72	44.81	41.54	NA	45.57
	NA	72.50	53.73	44.99	42.58	NA	45.89
	NA	73.25	54.25	46.54	44.15	NA	48.38
	NA	74.63	54.88	48.09	44.26	NA	49.39
	NA	75.50	55.02	49.40	46.89	NA	50.48
	NA	80.54	56.10	50.16	51.25	NA	53.53
	NA	83.63	60.16	51.91	56.11	NA	55.02
	NA	NA	62.73	54.47	94.00	NA	55.97
	NA	NA	62.75	67.88	NA	NA	59.12
** Issuer-weighted, based on 30-day post-default market prices. Discounted debt excluded.*							
*** Loan recoveries in 2007 are based on 5 loans from 2 issuers, one of the 5 loans is 2nd lien debt*							
# observations	18	24	26	26	25	10	26
1-70 CTE	30%	30%	30%	30%	30%	30%	30%
#obs. for 70 CTE	5.4	7.2	7.8	7.8	7.5	3.0	7.8
low 70CTEestimate	59.7%	40.1%	30.7%	23.9%	18.8%	10.7%	28.3%
high70CTEestimate	60.9%	41.2%	31.6%	24.7%	19.6%	11.9%	29.3%
70 CTE	60.2%	40.3%	31.5%	24.6%	19.2%	10.7%	29.1%
Mean	71.2%	58.6%	45.9%	39.1%	36.3%	28.9%	41.7%
Margin	11.0%	18.3%	14.5%	14.5%	17.1%	18.2%	12.6%

Table E2. Prescribed Recovery Rates from Moody's Data as of February 2008

PBR Credit Rating	Moody's Rating	Recovery Rate
1	Aaa	41.7%
2	Aa1	41.7%
3	Aa2	41.7%
4	Aa3	41.7%
5	A1	41.7%
6	A2	41.7%
7	A3	41.7%
8	Baa1	41.7%
9	Baa2	39.2%
10	Baa3	36.7%
11	Ba1	34.1%
12	Ba2	31.6%
13	Ba3	29.1%
14	B1	29.1%
15	B2	29.1%
16	B3	29.1%
17	Caa1	29.1%
18	Caa2	29.1%
19	Caa3	29.1%
20	Ca	29.1%

Table F. Illustrative Current Market Benchmark Spreads as of 09/30/2009 for Investment Grade Bonds

WAL	Investment Grade PBR credit rating and Moody's / S&P Ratings									
(Weighted	1	2	3	4	5	6	7	8	9	10
Average Life)	Aaa/AAA	Aa1/AA+	Aa2/AA	Aa3/AA-	A1/A+	A2/A	A3/A-	Baa1/BBB+	Baa2/BBB	Baa3/BBB-
1	108.9	114.6	120.3	128.6	136.9	145.2	176.6	208.1	239.5	338.7
2	116.4	122.1	127.8	136.1	144.4	152.7	182.8	212.9	243.0	340.4
3	123.9	129.6	135.3	143.6	151.9	160.2	189.0	217.7	246.5	342.2
4	131.3	137.0	142.7	151.0	159.3	167.6	195.0	222.5	249.9	343.9
5	138.8	144.5	150.2	158.5	166.8	175.1	201.2	227.2	253.3	345.6
6	146.2	151.9	157.6	165.9	174.2	182.5	207.2	232.0	256.7	347.3
7	153.7	159.4	165.1	173.4	181.7	190.0	213.4	236.8	260.2	349.0
8	156.6	162.3	168.0	176.3	184.6	192.9	215.8	238.6	261.5	349.7
9	159.5	165.2	170.9	179.2	187.5	195.8	218.2	240.5	262.9	350.4
10	162.4	168.1	173.8	182.1	190.4	198.7	220.5	242.4	264.2	351.0
11	163.3	169.0	174.7	183.0	191.3	199.6	221.3	242.9	264.6	351.2
12	164.1	169.8	175.5	183.8	192.1	200.4	221.9	243.5	265.0	351.4
13	165.0	170.7	176.4	184.7	193.0	201.3	222.7	244.0	265.4	351.6
14	165.8	171.5	177.2	185.5	193.8	202.1	223.3	244.6	265.8	351.8
15	166.7	172.4	178.1	186.4	194.7	203.0	224.1	245.1	266.2	352.0
16	167.5	173.2	178.9	187.2	195.5	203.8	224.7	245.6	266.5	352.2
17	168.4	174.1	179.8	188.1	196.4	204.7	225.4	246.2	266.9	352.4
18	169.2	174.9	180.6	188.9	197.2	205.5	226.1	246.7	267.3	352.6
19	170.1	175.8	181.5	189.8	198.1	206.4	226.8	247.3	267.7	352.8
20	170.9	176.6	182.3	190.6	198.9	207.2	227.5	247.8	268.1	353.0
21	171.8	177.5	183.2	191.5	199.8	208.1	228.2	248.4	268.5	353.2
22	172.6	178.3	184.0	192.3	200.6	208.9	228.9	248.9	268.9	353.4
23	173.5	179.2	184.9	193.2	201.5	209.8	229.6	249.5	269.3	353.6
24	174.3	180.0	185.7	194.0	202.3	210.6	230.3	250.0	269.7	353.8
25	175.2	180.9	186.6	194.9	203.2	211.5	231.0	250.6	270.1	354.0
26	176.0	181.7	187.4	195.7	204.0	212.3	231.7	251.0	270.4	354.1
27	176.9	182.6	188.3	196.6	204.9	213.2	232.4	251.6	270.8	354.3
28	177.7	183.4	189.1	197.4	205.7	214.0	233.1	252.1	271.2	354.5
29	178.6	184.3	190.0	198.3	206.6	214.9	233.8	252.7	271.6	354.7
30	179.4	185.1	190.8	199.1	207.4	215.7	234.5	253.2	272.0	354.9

Table G. Illustrative Current Market Benchmark Spreads as of 09/30/2009 for Below Investment Grade Bonds

WAL	Below Investment Grade PBR credit rating and Moody's / S&P Ratings									
(Weighted	11	12	13	14	15	16	17	18	19	20
Average Life)	Ba1/BB+	Ba2/BB	Ba3/BB-	B1/B+	B2/B	B3/B-	Caa1/CCC+	Caa2/CCC	Caa3/CCC-	Ca/CC
1	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
2	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
3	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
4	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
5	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
6	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
7	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
8	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
9	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
10	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
11	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
12	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
13	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
14	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
15	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
16	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
17	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
18	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
19	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
20	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
21	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
22	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
23	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
24	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
25	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
26	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
27	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
28	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
29	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9
30	437.8	529.8	596.8	663.9	730.9	876.8	1,022.8	1,168.7	1,314.7	1,478.9

Table H. Long-Term Benchmark Spreads as of 09/30/2009 for Investment Grade Bonds

WAL	Investment Grade PBR credit rating and Moody's / S&P Ratings									
(Weighted	1	2	3	4	5	6	7	8	9	10
Average Life)	Aaa/AAA	Aa1/AA+	Aa2/AA	Aa3/AA-	A1/A+	A2/A	A3/A-	Baa1/BBB+	Baa2/BBB	Baa3/BBB-
1	60.3	68.3	76.3	83.4	90.5	97.6	125.0	152.5	179.9	252.0
2	66.0	74.0	82.0	89.3	96.6	103.9	130.3	156.6	183.0	253.5
3	71.7	79.7	87.7	95.2	102.7	110.2	135.5	160.8	186.1	255.1
4	77.4	85.4	93.4	101.1	108.7	116.4	140.7	164.9	189.2	256.6
5	83.1	91.1	99.1	107.0	114.8	122.7	145.9	169.1	192.3	258.2
6	88.8	96.8	104.8	112.8	120.9	128.9	151.0	173.2	195.3	259.7
7	94.5	102.5	110.5	118.7	127.0	135.2	156.3	177.3	198.4	261.2
8	96.7	104.7	112.7	121.0	129.4	137.7	158.3	179.0	199.6	261.8
9	99.0	107.0	115.0	123.4	131.7	140.1	160.3	180.6	200.8	262.4
10	101.2	109.2	117.2	125.7	134.1	142.6	162.4	182.2	202.0	263.0
11	101.9	109.9	117.9	126.4	134.8	143.3	163.0	182.7	202.4	263.2
12	102.5	110.5	118.5	127.0	135.5	144.0	163.6	183.1	202.7	263.4
13	103.2	111.2	119.2	127.7	136.2	144.7	164.2	183.6	203.1	263.6
14	103.8	111.8	119.8	128.4	136.9	145.5	164.8	184.1	203.4	263.7
15	104.5	112.5	120.5	129.1	137.6	146.2	165.4	184.6	203.8	263.9
16	105.1	113.1	121.1	129.7	138.3	146.9	166.0	185.0	204.1	264.1
17	105.8	113.8	121.8	130.4	139.0	147.6	166.6	185.5	204.5	264.3
18	106.4	114.4	122.4	131.0	139.7	148.3	167.1	186.0	204.8	264.4
19	107.1	115.1	123.1	131.7	140.4	149.0	167.7	186.5	205.2	264.6
20	107.7	115.7	123.7	132.4	141.1	149.8	168.4	187.0	205.6	264.8
21	108.4	116.4	124.4	133.1	141.8	150.5	169.0	187.4	205.9	265.0
22	109.0	117.0	125.0	133.7	142.5	151.2	169.6	187.9	206.3	265.2
23	109.7	117.7	125.7	134.4	143.2	151.9	170.1	188.4	206.6	265.3
24	110.3	118.3	126.3	135.1	143.8	152.6	170.7	188.9	207.0	265.5
25	111.0	119.0	127.0	135.8	144.5	153.3	171.3	189.3	207.3	265.7
26	111.6	119.6	127.6	136.4	145.2	154.0	171.9	189.8	207.7	265.9
27	112.3	120.3	128.3	137.1	146.0	154.8	172.5	190.3	208.0	266.0
28	112.9	120.9	128.9	137.8	146.6	155.5	173.1	190.8	208.4	266.2
29	113.6	121.6	129.6	138.5	147.3	156.2	173.7	191.2	208.7	266.4
30	114.2	122.2	130.2	139.1	148.0	156.9	174.3	191.7	209.1	266.6

Table I. Long-Term Benchmark Spreads as of 09/30/2009 for Below Investment Grade Bonds

WAL (Weighted Average Life)	Below Investment Grade PBR credit rating and Moody's / S&P Ratings									
	11	12	13	14	15	16	17	18	19	20
	Ba1/BB+	Ba2/BB	Ba3/BB-	B1/B+	B2/B	B3/B-	Caa1/CCC+	Caa2/CCC	Caa3/CCC-	Ca/CC
1	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
2	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
3	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
4	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
5	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
6	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
7	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
8	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
9	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
10	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
11	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
12	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
13	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
14	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
15	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
16	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
17	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
18	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
19	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
20	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
21	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
22	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
23	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
24	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
25	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
26	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
27	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
28	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
29	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5
30	324.0	389.7	476.6	563.6	650.5	870.7	1,090.9	1,311.1	1,531.3	1,788.5

Table J. Long-Term Benchmark Swap Spreads

(85% Conditional Mean--July 2000 through September 2009)

WAL	Swap Spread
3 M	29.3
6 M	29.9
1 Y	38.8
2 Y	47.5
3 Y	52.3
4 Y	53.4
5 Y	55.2
6 Y	55.4
7 Y	53.8
8 Y	50.6
9 Y	47.0
10 Y	43.6
11 Y	40.0
12 Y	37.7
13 Y	34.9
14 Y	33.3
15 Y	33.0
16 Y	31.7
17 Y	31.4
18 Y	32.0
19 Y	33.3
20 Y	35.1
21 Y	35.7
22 Y	36.4
23 Y	37.4
24 Y	38.5
25 Y	39.7
26 Y	40.7
27 Y	41.7
28 Y	42.7
29 Y	43.8
30 Y	44.2

Table K. Conversion from NAIC ARO Ratings and NAIC Designations to PBR Numeric Rating

Moody's Rating	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3
S&P Rating	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-
Fitch Rating	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-
DBRS Rating	AAA	AA high	AA	AA low	A high	A	A low	BBB high	BBB	BBB low
RealPoint Rating	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-
AM Best Rating	aaa	aa+	aa	aa-	a+	a	a-	bbb+	bbb	bbb-
NAIC Designation	1	1	1	1	1	1	1	2	2	2
Numeric Rating	1	2	3	4	5	6	7	8	9	10

Moody's Rating	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca
S&P Rating	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC
Fitch Rating	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC
DBRS Rating	BB high	BB	BB low	B high	B	B low	CCC high	CCC	CCC low	CC
RealPoint Rating	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	D
AM Best Rating	bb+	bb	bb-	b+	b	b-	ccc+	ccc	ccc-	cc
NAIC Designation	3	3	3	4	4	4	5	5	5	6
Numeric Rating	11	12	13	14	15	16	17	18	19	20

Appendix 3. Mortality Margin Table

Issue Age	Load	Issue Age	Load
< 40	21%	65	11%
40	21%	66	11%
41	21%	67	11%
42	21%	68	11%
43	21%	69	10%
44	21%	70	10%
45	21%	71	10%
46	20%	72	10%
47	20%	73	10%
48	19%	74	10%
49	19%	75	10%
50	18%	76	10%
51	18%	77	9%
52	17%	78	9%
53	17%	79	9%
54	16%	80	9%
55	16%	81	9%
56	15%	82	9%
57	15%	83	9%
58	14%	84	9%
59	14%	85	9%
60	13%	86	9%
61	13%	87	9%
62	12%	88	9%
63	12%	89	9%
64	11%	90	9%

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