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Investment Considerations under Principle-Based Approaches for ULSG Reserves

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Principle-based approaches for reserves are fundamentally different from methods currently used to calculate most life insurance reserves. The reserve calculation relies chiefly on own company experience, and, notably, incorporates investment returns on existing and projected assets backing the policy liabilities. This entails:

1. Allocating existing assets in the amount of the reserve as of the valuation date.

2. Developing expected investment returns, net of defaults.

3. Modeling purchased and divested assets together with policy liabilities under many economic scenarios.

The investment strategy of the company is essential to modeling these asset and liability cash flows. The amount of reserve ultimately held will be sensitive to the chosen strategy. We will consider some of the modeling considerations for assets, as well as illustrate results for a typical ULSG product under various scenarios.

REGULATORY REQUIREMENTS

The regulatory requirements for reserves calculated under this new principle-based approach are found in the Valuation Manual referenced in the Revised Standard Valuation Law. The portion of the Valuation Manual dedicated to life insurance valuation is Chapter 20 (VM-20), Requirements for Principle-Based Reserves for Life Products (PBR). The reserve is the greatest of three calculations: (1) a net premium reserve, (2) a deterministic reserve, and (3) a stochastic reserve. The stochastic reserve requires explicit modeling of assets with the lia-

CONTINUED ON PAGE 8

bilities over a range of economic scenarios. The interdependency of asset cash-flows and liability cash-flows over the different market scenarios should be captured within the model as well as the optionality of both the liabilities and assets. For each scenario, the greatest present value of "accumulated deficiencies" is calculated and added to the starting asset amount at the valuation date which results in the scenario reserve. The reserve is then determined as the average of the worst 30 percent or CTE 70 of all the scenarios reserves. One can think of each scenario reserve as the amount of money needed today to pay the future obligations of the liability by taking into account all related liability and asset cash-flows for that particular scenario. We are interested in examining the role that investment strategy plays in this determination.

Certain aspects of invested asset returns are prescribed in VM-20. Section 9 of VM-20 addresses assumptions used for PBR. Part F of this section pertains specifically to asset assumptions. Default assumptions for both starting and purchased assets, and investment spread assumptions for purchased assets are specified here. Starting assets are those that exist and are allocated to current policies in force as of the valuation date. Per Section 7, Part F, "Cash Flows from Invested Assets," the gross investment income and principal repayments are to be modeled consistently with the contractual provisions of the assets. Purchased assets are those added during the projection period based on policy cash flows or asset maturities.

Spread assumptions

The NAIC monitors and publishes current and long-term spreads (over Treasuries) for non-callable public corporate bonds by weighted average life (WAL) and credit quality. Current spreads are updated on a quarterly basis. Long-term spreads are reviewed by the NAIC annually and updated as necessary.

Spreads for purchased assets in the first year of the valuation projection are equal to current spreads. Current spreads are assumed to revert to long-term spreads over a three year period with purchased assets in the fourth year of the valuation assumed to earn a long-term spread. Purchased asset spreads in years two and three should grade linearly between the current and long-term spreads.

Notably, no margins were incorporated in the spread data. This is because it was not clear whether increasing or decreasing the spread would produce a margin, as the direction of the margin would depend on whether the model was selling or purchasing assets.

Default assumptions

Assumed default cost varies by asset and is the sum of three components: (1) baseline factor, (2) spread related factor, and (3) maximum net spread adjustment factor. The baseline factor and spread related factor apply to all assets, both starting and purchased assets. The maximum net spread adjustment factor only applies to starting assets. These components are summarized below with more detail provided in the Appendix.

> Given that modeled invested asset cash-flows are a central component of the stochastic reserve calculation, it is apparent that the investment strategies will impact the reserves and the reserve movements.

1. Baseline default cost assumptions are published and will be updated annually by the NAIC. Default costs vary by WAL and credit rating. The baseline default cost assumption applies to both starting and purchased assets.
2. A spread related factor dynamically adjusts default costs based on the difference between the current spread at the valuation date and the long-term spread. The spread related factor applies to both starting and purchased assets.
3. The maximum net spread adjustment factor adjusts the default cost for starting assets only. This adjustment does not apply to purchased assets.

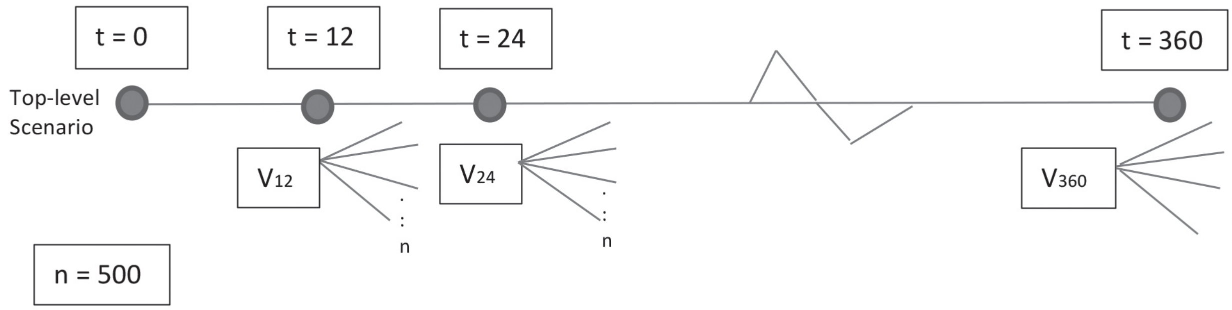
Given that modeled invested asset cash-flows are a central component of the stochastic reserve calculation, it is apparent that the investment strategies will impact the reserves and the reserve movements. To assess this impact, we developed a model to illustrate these effects.

DESCRIPTION OF THE MODEL

To illustrate differences in stochastic reserve results under various investment strategies, we developed a model for a typical universal life policy with a lifetime secondary guarantee (ULSG) based on minimum premiums. We used a single model point for an issue age 65-year-old female, for one year of new business. The model calculates a stochastic reserve as of the valuation date, and further calculates future reserves annually for a "top level" planning economic scenario.

The reserve projection is depicted in Figure 1 below. A single year of new business policies are assumed to be issued on Jan. 1, 2014 (t=0, where t is in months) and projected forward along the top level planning scenario to the first valuation date (t=12

Figure 1



or Dec. 31, 2014), where a stochastic reserve is calculated based on 500 interest rate scenarios. The policy values and in force are again projected forward one year (t=24) based on the top level planning economic scenario, and a projected stochastic reserve is calculated as of one year hence. This process is repeated for a projection period of 30 years. In the end, we have a 30-year projection of stochastic PBR reserves, for a given planning scenario.

We chose three top-level planning scenarios for this exercise. In each case, the starting yield curve is the Treasury yield curve as of Dec. 31, 2014. That yield curve is shown in Figure 2 below. For reference purposes, the 10-year Treasury yield as of year-end 2014 was 2.17 percent.

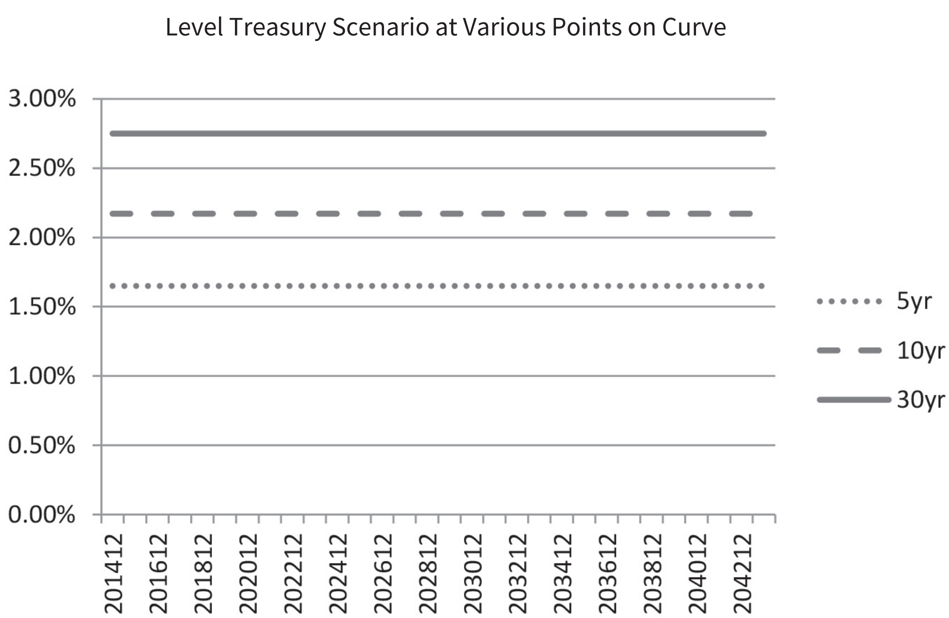
Figure 2

UST	1yr	2yr	3yr	5yr	7yr	10yr	20yr	30yr
201412	0.25%	0.67%	1.10%	1.65%	1.97%	2.17%	2.47%	2.75%

Three representative "top-level" planning economic scenarios were chosen to illustrate projected stochastic reserves. They can simply be described as Level, Decreasing, and Increasing interest rate scenarios.

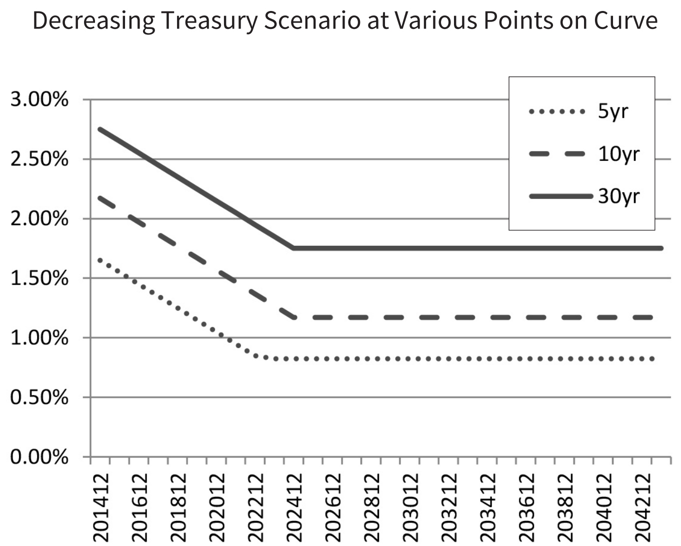
The Level interest rate planning scenario simply assumes that the starting yield curve is unchanged for the duration of the projection period. It is depicted in Figure 3.

Figure 3



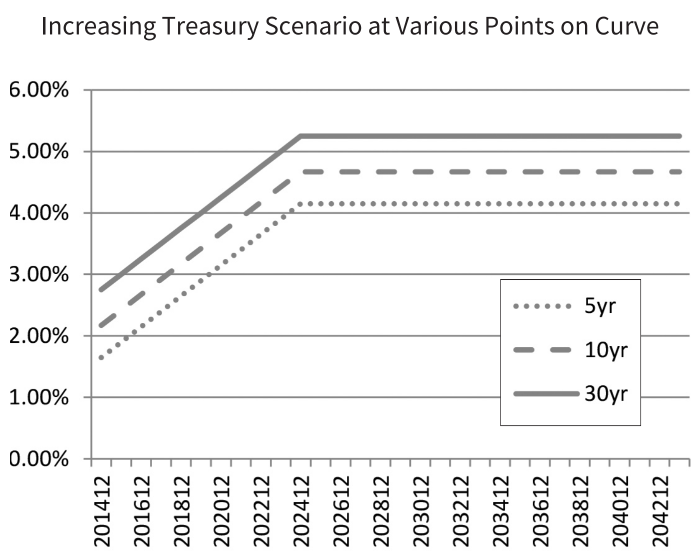
The Decreasing interest rate planning scenario assumes parallel 10 basis points decreases for as many as each of the first 10 projection years, subject to a floor of 50 percent of the starting yield rate. It stays level thereafter. It is shown in Figure 4 below.

Figure 4



Finally, the Increasing interest rate planning scenario assumes parallel 25 basis points increases for each of the first 10 projection years. It stays level thereafter and is shown in Figure 5 below.

Figure 5



We have started with three different planning scenarios. They are typical of the range of scenarios that companies will review in the course of their annual planning and budgeting exercise. We next considered three alternative investment strategies. They can simply be described as Short, Medium and Long duration investment strategies:

(1) Short duration strategy – invest 100 percent of free cash flows into five-year maturity investment grade non-callable corporate bonds;

(2) Medium duration strategy – invest 100 percent of free cash flows into 10-year maturity investment grade non-callable corporate bonds; and

(3) Long duration strategy – invest 100 percent of free cash flows into 30-year maturity investment grade non-callable corporate bonds.

For each of the above investment strategies, non-callable corporate bond spreads and defaults were set at the prescribed long-term VM-20 assumptions using a PBR rating of 2 which corresponds to a Moody's Aa1 credit rating. For simplicity, we did not grade from a current spread to long-term, we only used the long-term. Consequently, there was no spread-related adjustment for defaults since the current spread used was equal to the long-term spread. Also, since we are modeling new business, the starting assets were 100 percent in cash, so there was no maximum net spread adjustment factor.

We were interested in how the pattern of projected stochastic reserves would emerge for each of the planning scenarios under each of the investment strategies. Before we share results, now would be a good time to pause and form your own opinion on the likely relationship of reserves between planning scenarios and between investment strategies. It is only by forming a pre-conceived notion of the likely results, and then having it confirmed or refuted by the calculated results, that we begin to develop intuition on stochastic reserves. For instance, given the benefit of perfect foresight, in a level interest rate planning scenario, one would invest long, taking advantage of higher yields at the longer durations and knowing there was no risk of loss due to increases in interest rates. The same would hold true for a decreasing interest rate planning scenario. In the case of an increasing interest rate planning scenario, one may invest short while interest rates are increasing, to take advantage of the ultimate higher yields in the future. Having formed your opinion, let's see what happens.

DISCUSSION OF RESULTS

We first calculated stochastic reserves for the Level planning scenario for each of the alternative investment strategies. The projection period is 30 years. Not surprisingly, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. The results are pictured in Figure 6.

We next calculated stochastic reserves for the Decreasing planning scenario for each of the alternative investment strategies. Again, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. Also, the level of reserves for each of the Decreasing planning scenario investment strategies is higher than reserves for the corresponding strategy in the Level planning scenario. This makes sense, as a lower interest rate environment should generally result in higher reserves. The results are pictured in Figure 7.

Finally, we calculated stochastic reserves for the Increasing planning scenario for each of the alternative investment strategies. The same relationship holds. That is, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. There was no benefit to investing shorter, to take advantage of the increasing interest rate scenario. To understand why, we have to remember how the stochastic reserve is calculated. That is, the stochastic reserve is a 70 CTE calculation. The reserve will be determined by what happens in the 30 percent worst scenarios. If those worst scenarios are decreasing interest rate scenarios (which is the case here), then investing short will not be beneficial and will intuitively result in the highest reserves. The results are shown in Figure 8 (pg. 12).

Was your preconceived notion confirmed or contradicted by the calculated results? With more experience, actuaries will develop more intuition on how stochastic reserves will emerge under certain assumptions, strategies, and circumstances. In order to do so, actuaries will have to consider how cash flows will perform in the worst 30 percent of scenarios—not the average scenario.

FURTHER ANALYSIS

These results suggest many questions for further analysis. For instance, are these results merely a byproduct of the current low interest rate environment? To answer that question, we calculated stochastic reserves under each of the investment strategies for a more "normal" starting yield curve. In this case, we used a starting yield curve with a 10-year Treasury yield of 5.0 percent and a 30-year Treasury yield of 5.6 percent. We found the same relationship. That is, the lowest reserves occurred under the long duration investment strategy. The results are shown in the appendix.

We wondered if stochastic reserves would be more volatile for one investment strategy versus another. We produced results for the three investment strategies for a more volatile planning economic scenario. This scenario starts with the same "normal" yield curve (5 percent at 10-year Treasury and 5.6 percent at 30-year Treasury) with shocks of 100 bps alternating up and down at years that are multiples of five, holding level in between

Figure 6

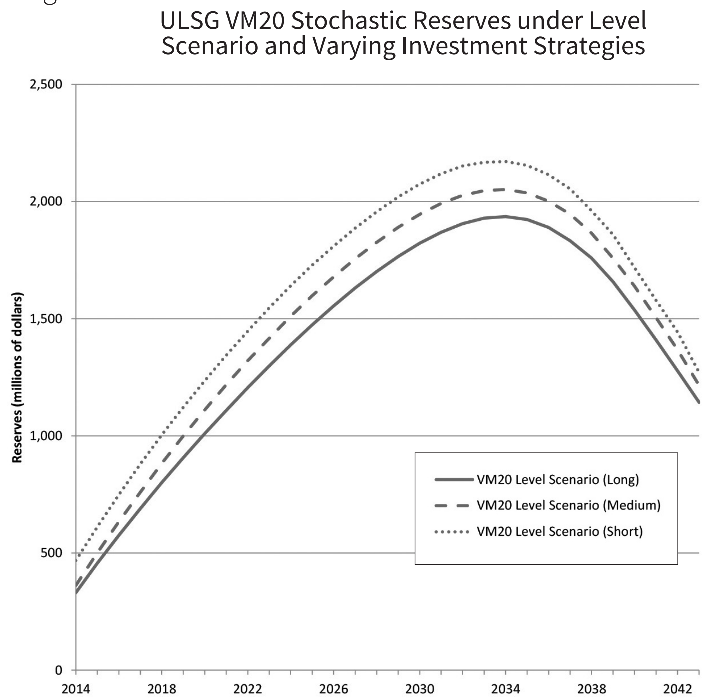


Figure 7

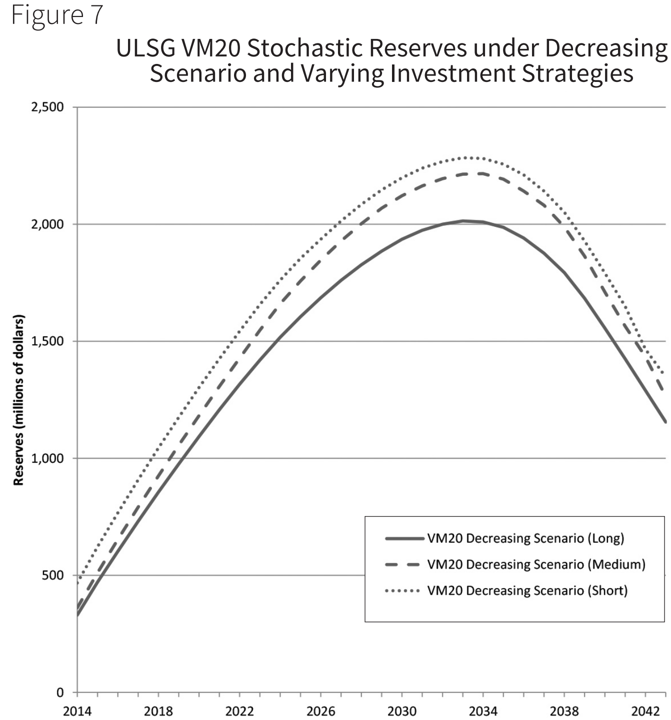


Figure 8

ULSG VM20 Stochastic Reserves under Increasing Scenario and Varying Investment Strategies

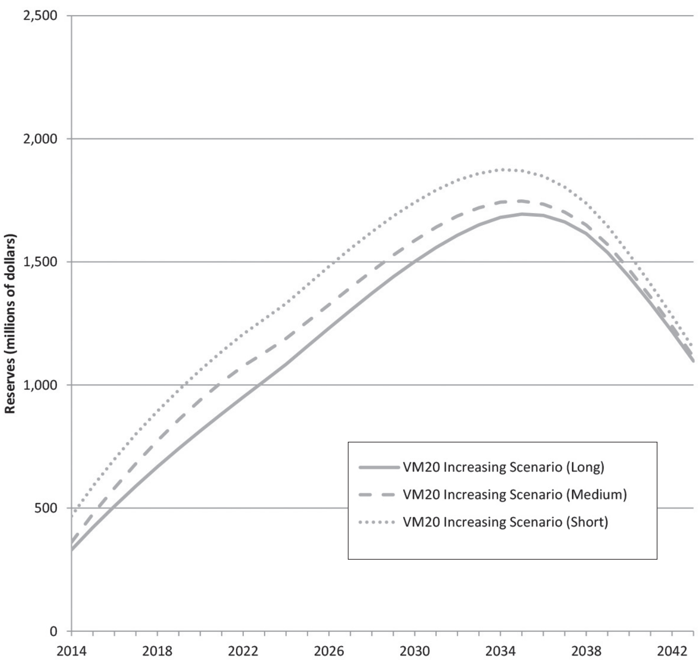
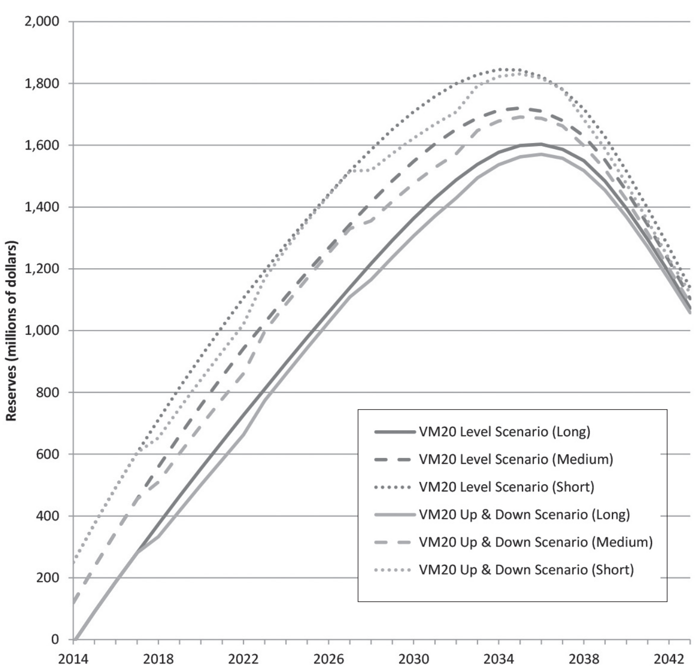


Figure 9

ULSG VM20 Stochastic Reserves - Level vs. Up & Down Scenario with Varying investment Strategies ("Normal" Initial Curve)



shocks. Figure 9 compares this Up & Down Scenario with that of the Level scenario for the three investment strategies. Figure 9 shows that the long duration investment strategy not only produces lower levels of reserves, but also reduces the volatility associated with the large interest rate movements.

There is no end to the possibilities for further analysis. Some candidates for additional analysis include:

(1) Is it always better to invest long? Or are we merely approaching an optimal duration for this modeled ULSG product? Is there a duration which would be too long for this product? Under what scenario would investing shorter be more advantageous, if any?

(2) Would we observe the same results for a shorter term product? Would investing long still be preferable? Or is there a shorter duration that is optimal?

(3) How would the reserves emerge for more robust investment strategies such as laddered investment portfolios? Should the investment strategy itself be more sophisticated—adjusting for different interest rate environments? Of course, the programming needed to implement such a strategy would be complex, and a skeptical reviewer may rightly question the ability to execute on such a strategy.

(4) How will the results change if we add more issue years to the projection? How about more products to a projection group? Will the combination of shorter-term and longer-term products have a different pattern of reserves? Will volatility increase or decrease?

Putting a model in place is only step one of being able to answer questions such as these. It is equally important to put the diagnostics and analytics in place in order to understand results. These diagnostics include:

(1) Buy and sell reports for the assets, to understand if cash flow is positive or negative, and how it is being applied or funded.

(2) Portfolio yield rates, to understand how closely the book yields are tracking or lagging the then current market rates.

(3) The 30 percent worst scenarios to understand what is driving the reserve calculation. Are they declining interest rate scenarios or increasing interest rate scenarios? Or are they a combination of extreme low and high interest rate scenarios?

These capabilities are a prerequisite to not only understand the reserve calculations, but to also form strategies that influence the level and volatility of reserves.

CONCLUSION

A principle-based approach to reserves incorporates investment returns on allocated portfolio assets. As we have observed here, the chosen investment strategy will absolutely have an effect on the level and volatility of the calculated stochastic reserve. Companies will be well-served to reevaluate the investment strategy for their life insurance portfolio, including projections of how PBR reserves will emerge over alternative planning scenarios. This will require a capacity to calculate reserves over many scenarios, strategies, and circumstances specific to each company. In the absence of this capability, companies many hold higher reserves than necessary—and not even know it! ■

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APPENDIX:

Figures A1-A3 are synonymous with Figures 6–8 within the report except the figures in the Appendix have a starting yield curve meant to represent more "normal" interest rate levels with 5 percent at the 10-year point and 5.6 percent at the 30-year point:

Figure A1

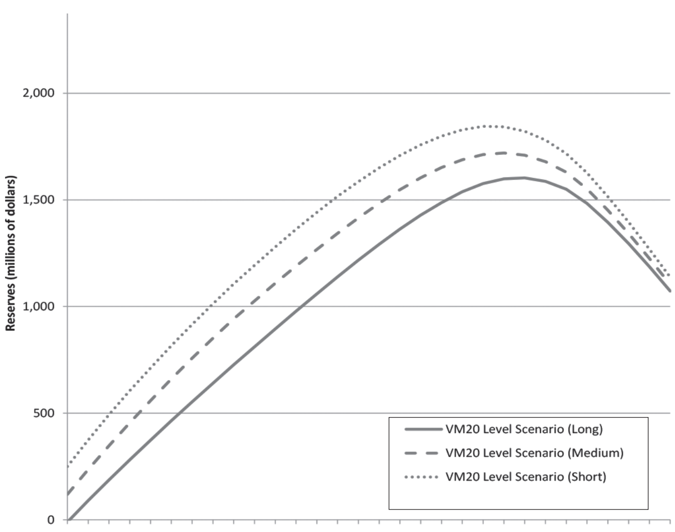


Figure A2

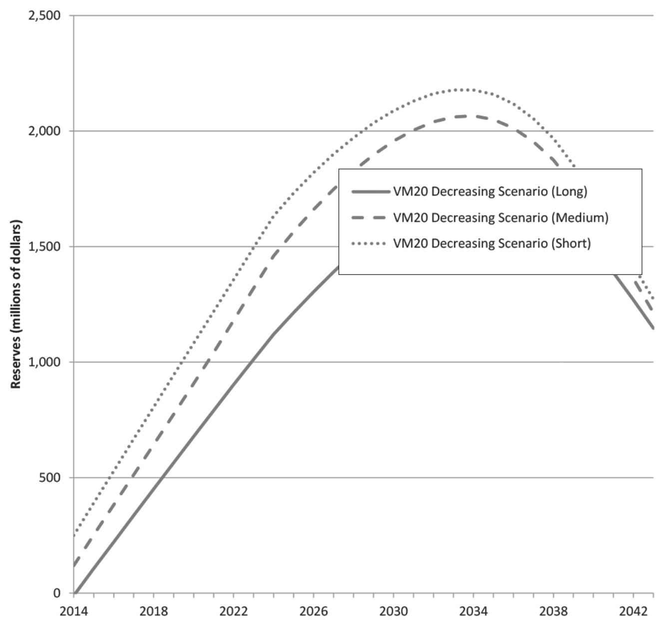
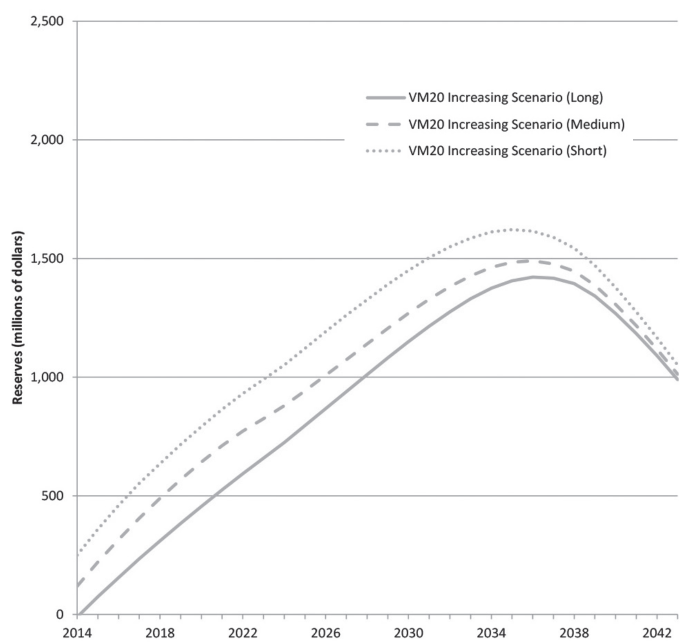


Figure A3



Default cost components:

(1) The default costs were calculated using cumulative default rate and recovery rate data published by Moody's in February 2008. Default rates and recovery rates underlying the default costs were generally estimated at a CTE 70 level. Therefore, the prescribed default costs incorporate margins at around the CTE 70 level.

(2) To calculate the spread related factor in the first projection year, subtract the long-term spread from the current and multiply by 25 percent. This amount can be positive or negative and grades linearly in annual increments to zero by projection year four. The amount is also floored at the negative of the projection year one baseline default cost and can be no larger than twice the same baseline default cost in the first projection year.

(3) The maximum net spread adjustment would be necessary in instances where, and in the amount of, the net spread for starting assets is in excess of the current net spread for purchased assets of Moody's credit rating of Baa2. This amount grades to zero linearly over four years, similar to the spread related factor. ■