**Life Actuarial (A) Task Force/ Health Actuarial (B) Task Force**

**Amendment Proposal Form\***

1. Identify yourself, your affiliation and a very brief description (title) of the issue.

**Identification:**

Hedging Drafting Group of LATF

**Title of the Issue:**

Reflect all future hedging strategies in VM-20 and VM-21. Revise hedge modeling to increase E factor (VM-21) or residual risk (VM-20) when future hedging strategies are not clearly defined.

2. Identify the document, including the date if the document is “released for comment,” and the location in the document where the amendment is proposed:

VM-01, VM-20 Section 6.A.1.b, VM-20 Section 7.E.1.g, VM-20 Section 7.K, VM-20 Section 7.L, VM-21 Section 1.D.2, VM-21 Section 4.A.4, VM-21 Section 4.D.4.b, VM-21 Section 6.B.3.a.ii, VM-21 Section 6.B.3.b.ii, VM-21 Section 6.B.5, VM-21 Section 9, VM-31 Section 3.C.5, VM-31 Section 3.D.6.f, VM-31 Section 3.D.14.a and 3.D.14.b, VM-31 Section 3.E.5, VM-31 Section 3.F.8, VM-31 Section 3.F.12.c, VM-31 Section 3.F.16.a and Section 3.F.16.b

January 1, 2022 NAIC Valuation Manual

3. Show what changes are needed by providing a red-line version of the original verbiage with deletions and identify the verbiage to be deleted, inserted or changed by providing a red-line (turn on “track changes” in Word®) version of the verbiage. (You may do this through an attachment.)

See attached.

4. State the reason for the proposed amendment? (You may do this through an attachment.)

1. Consistent definition of CDHS for use in VM-20 and VM-21.
2. Add a definition for “future hedging strategy,” consistent with the definition for CDHS and the current VM-01 definition of “derivative program”, which VM-01 notes includes hedging programs.
3. Add a definition for “hedging transactions,” taken from the APPM but modified slightly to be consistent with Valuation Manual terminology.
4. Reflect all of a company’s future hedging strategies, but reflect the additional error (VM-21) or residual risk (VM-20) that is presented by a future hedging strategy not being clearly defined.
5. Remove optionality for liquidating currently held hedges if not modeling a future hedging strategy.
6. New hedging strategies (<6 months experience) have an E factor of 1.0 for VM-21. For comparison, the current draft VM-22 only allows modeling hedges after they have been in place for 6 months. When only CDHS were modeled in VM-21, new hedging strategies with no experience had E factors as low as 0.5 even without meaningful analysis. This treatment was much too lenient for new hedging strategies.

\* This form is not intended for minor corrections, such as formatting, grammar, cross–references or spelling. Those types of changes do not require action by the entire group and may be submitted via letter or email to the NAIC staff support person for the NAIC group where the document originated.

NAIC Staff Comments:

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**VM-01**

* The term “clearly defined hedging strategy” (CDHS) means a future hedging strategy for which the following attributes are clearly documented:

1. The specific risks being hedged (e.g., cash flow, fee income, policy interest credits, delta, rho, vega, etc.).
2. The hedging objectives.
3. The material risks that are not hedged (e.g., variation from expected mortality, withdrawal, and other utilization or decrement rates assumed in the hedging strategy, etc.).
4. The financial instruments used to hedge the risks.
5. The hedging strategy’s trading rules, including the permitted tolerances from hedging objectives.
6. The metrics, criteria, and frequency for measuring hedging effectiveness.
7. The conditions under which hedging will not take place and for how long the lack of hedging can persist.
8. The group or area, including whether internal or external, responsible for implementing the hedging strategy.
9. Areas where basis, gap or assumption risk related to the hedging strategy have been identified.
10. The circumstances under which hedging strategy will not be effective in hedging the risks.

**Guidance Note:** For purposes of the CDHS documented attributes, “effectiveness” need not be measured in a manner as defined in *SSAP No. 86—Derivatives* in the AP&P Manual.

* The term “future hedging strategy” is a derivative program undertaken by a company to manage risks through one or more future hedging transactions, including the future purchase or sale of hedging instruments and the opening and closing of hedging positions.

A future hedging strategy may be dynamic, static or a combination thereof. A strategy involving the offsetting of the risks associated with products falling under the scope of different requirements within the *Valuation Manual* (e.g., VM-20, VM-21, or VM-22) does not qualify as a future hedging strategy.

* The term “hedging transaction” means a derivative(s) transaction which is entered into and maintained to reduce:
  1. The risk of a change in the fair value, the value on a statutory, GAAP, or other basis, or cash flow of assets and liabilities which the company has acquired or incurred or has a firm commitment to acquire or incur or for which the company has a forecasted acquisition or incurrence; or
  2. The currency exchange rate risk or the degree of foreign currency exposure in assets and liabilities which the company has acquired or incurred or has a firm commitment to acquire or incur or for which the company has forecasted acquisition or incurrence.

**VM-20 Section 6.A.1.b**

A company may not exclude a group of policies for which there is one or more future hedging strategies supporting the policies from SR requirements, except in the case where all future hedging strategies supporting the policies are solely associated with product features that are determined to not be material under Section 7.B.1 due to low utilization.

**VM-20 Section 7.E.1.g**

Notwithstanding the above requirements, the modeled reserve shall be the higher of that produced by the modeled company investment strategy and that produced by substituting an alternative investment strategy in which the fixed income reinvestment assets have the same weighted average life (WAL) as the reinvestment assets in the modeled company investment strategy and are all 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 3 (Aa2/AA).

Policy loans, equities and derivative instruments associated with the execution of future hedging strategies supporting the policies are not affected by this requirement.

**VM-20 Section 7.K**

K. Modeling of Derivative Programs

1. When determining the DR and the SR, 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 future hedging strategies supporting the policies, as well as 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.
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 future hedging strategies supporting the policies, 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. VM-21 Section 1.B Principle 5 applies as a general principle for the modeling of future hedging strategies.

1. In circumstances where one or more material risk factors related to a derivative program are not fully captured within the cash-flow model used to calculate CTE 70, the company shall reflect such risk factors by increasing the SR as described in Section 5.E.
2. In circumstances where documentation outlining the future hedging strategies is incomplete, the company shall reflect the future hedging strategies not being clearly defined by increasing the SR as described in Section 5.E. To support no increase to the SR, there should be very robust documentation outlining each future hedging strategy. In particular, the SR shall be at least as great as the SR that would result if a future hedging strategy were not reflected in the SR, if the documentation is materially incomplete for any of the individual CDHS attributes (a) through (j), as listed in VM-01.

Any increases required to the SR to reflect that documentation is not available to support that the future hedging strategies are clearly defined shall be in addition to increases to the SR pursuant to Section 7.K.3 above.

**Guidance Note:** Section 5.E requires that the company "Determine any additional amount needed 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." In the case of a derivative program that is a future hedging strategy, Section 7.K.3 requires such an increase for disconnects between the hedge modeling and the future hedging strategy, while Section 7.K.4 requires such an increase for disconnects between the loosely defined future hedging strategy and what may actually take place.

**VM-20 Section 7.L (Remove entire Section 7.L)**

**VM-21 Section 1.D.2 (Delete entire definition and renumber subsequent sections VM-21 Section 1.D.3 and VM-21 Section 1.D.4)**

**VM-21 Section 4.A.4**

Modeling of Hedges

1. For a company that does not have a future hedging strategy supporting the contracts:
2. The company shall not consider the cash flows from any future hedge purchases or any rebalancing of existing hedge assets in its modeling, since they are not included in the company’s investment strategy supporting the contracts.
3. Existing hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the starting assets.
4. For a company with one or more future hedging strategies supporting the contracts, the detailed requirements for the modeling of hedges are defined in Section 9. The following paragraphs are a high-level summary and do not supersede the detailed requirements.
5. The appropriate costs and benefits of hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the projections used in the determination of the SR.
6. The projections shall take into account the appropriate costs and benefits of hedge positions expected to be held in the future through the execution of the future hedging strategies supporting the contracts. Because models do not always accurately portray the results of hedge programs, the company shall, through back-testing and other means, assess the accuracy of the hedge modeling. The company shall determine a SR as the weighted average of two CTE values; first, a CTE70 (“best efforts”) representing the company’s projection of all of the hedge cash flows, including future hedge purchases, and a second CTE70 (“adjusted”) which shall use only hedge assets held by the company on the valuation date and no future hedge purchases. These are discussed in greater detail in Section 9. The SR shall be the weighted average of the two CTE70 values, where the weights reflect the error factor (E) determined following the guidance of Section 9.C.4.
7. The company is responsible for verifying compliance with all requirements in Section 9 for all hedging instruments included in the projections.
8. The use of products not falling under the scope of these requirements (e.g., equity-indexed annuities) as a hedge shall not be recognized in the determination of accumulated deficiencies.

**VM-21 Section 4.D.4.b**

Notwithstanding the above requirements, the SR shall be the higher of that produced by the modeled company investment strategy and that produced by substituting an alternative investment strategy in which the fixed income reinvestment assets have the same weighted average life (WAL) as the reinvestment assets in the modeled company investment strategy and are all 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 3 (Aa2/AA).

Policy loans, equities and derivative instruments associated with the execution of future hedging strategies supporting the contracts are not affected by this requirement.

**VM-21 Section 6.B.3.a.ii – Footnote (Footnote at Bottom of Page 21-23)**

1. Throughout this Section 6, references to CTE70 (adjusted) shall also mean the SR for a company that does not have a future hedging strategy supporting the contracts as discussed in Section 4.A.4.a.

**VM-21 Section 6.B.3.b.ii**

Calculate the Prescribed Projections Amount as the CTE70 (adjusted) using the same method as that outlined in Section 9.C (which is the same as SR following Section 4.A.4.a for a company that does not have a future hedging strategy supporting the contracts) but substituting the assumptions prescribed by Section 6.C. The calculation of this Prescribed Projections Amount also requires that the scenario reserve for any given scenario be equal to or in excess of the cash surrender value in aggregate on the valuation date for the group of contracts modeled in the projection.

**VM-21 Section 6.B.5**

Cash flows associated with hedging shall be projected in the same manner as that used in the calculation of the CTE70 (adjusted) as discussed in Section 9.C or Section 4.A.4.a for a company without a future hedging strategy supporting the contracts.

**VM-21 Section 9**

**Section 9: Modeling of Hedges under a Future Hedging Strategy**

A. Initial Considerations

1. Subject to Section 9.C.2, the appropriate costs and benefits of hedging instruments that are currently held by the company in support of the contracts falling under the scope of these requirements shall be included in the calculation of the SR, determined in accordance with Section 3.D and Section 4.D.
2. If the company is following one or more future hedging strategies supporting the contracts, in accordance with an investment policy adopted by the board of directors, or a committee of board members, the company shall take into account the costs and benefits of hedge positions expected to be held by the company in the future along each scenario based on the execution of the hedging strategy, and it is eligible to reduce the amount of the SR using projections otherwise calculated. The investment policy must clearly articulate the company’s hedging objectives, including the metrics that drive rebalancing/trading. This specification could include maximum tolerable values for investment losses, earnings, volatility, exposure, etc. in either absolute or relative terms over one or more investment horizons vis-à-vis the chance of occurrence. Company management is responsible for developing, documenting, executing and evaluating the investment strategy, including the hedging strategy, used to implement the investment policy.
3. For this purpose, the investment assets refer to all the assets, including derivatives supporting covered products and guarantees. This also is referred to as the investment portfolio. The investment strategy is the set of all asset holdings at all points in time in all scenarios. The hedging portfolio, which also is referred to as the hedging assets, is a subset of the investment assets. The hedging strategy is the hedging asset holdings at all points in time in all scenarios. There is no attempt to distinguish what is the hedging portfolio and what is the investment portfolio in this section. Nor is the distinction between investment strategy and hedging strategy formally made here. Where necessary to give effect to the intent of this section, the requirements applicable to the hedging portfolio or the hedging strategy are to apply to the overall investment portfolio and investment strategy.
4. This particularly applies to restrictions on the reasonableness or acceptability of the models that make up the stochastic cash-flow model used to perform the projections, since these restrictions are inherently restrictions on the joint modeling of the hedging and non-hedging portfolio. To give effect to these requirements, they must apply to the overall investment strategy and investment portfolio.

B. Modeling Approaches

1. The analysis of the impact of the hedging strategy on cash flows is typically performed using either one of two types of methods as described below. Although a hedging strategy normally would be expected to reduce risk provisions, the nature of the hedging strategy and the costs to implement the strategy may result in an increase in the amount of the SR otherwise calculated. Particular attention should be given to VM-21 Section 1.B Principle 5 for the modeling of future hedging strategies.
2. The fundamental characteristic of the first type of method, referred to as the “explicit method,” is that hedging positions and their resulting cash flows are included in the stochastic cash-flow model used to determine the scenario reserve, as discussed in Section 3.D, for each scenario.
3. The fundamental characteristic of the second type of method, referred to as the “implicit method,” is that the effectiveness of the current hedging strategy on future cash flows is evaluated, in part or in whole, outside of the stochastic cash-flow model. There are multiple ways that this type of modeling can be implemented. In this case, the reduction to the SR otherwise calculated should be commensurate with the degree of effectiveness of the hedging strategy in reducing accumulated deficiencies otherwise calculated.
4. Regardless of the methodology used by the company, the ultimate effect of the current hedging strategy (including currently held hedge positions) on the SR needs to recognize all risks, associated costs, imperfections in the hedges and hedging mismatch tolerances associated with the hedging strategy. The risks include, but are not limited to: basis, gap, price, parameter estimation and variation in assumptions (mortality, persistency, withdrawal, annuitization, etc.). Costs include, but are not limited to: transaction, margin (opportunity costs associated with margin requirements) and administration. In addition, the reduction to the SR attributable to the hedging strategy may need to be limited due to the uncertainty associated with the company’s ability to implement the hedging strategy in a timely and effective manner. The level of operational uncertainty varies indirectly with the amount of time that the new or revised strategy has been in effect or mock tested.

**Guidance Note:** No hedging strategy is perfect. A given hedging strategy may eliminate or reduce some but not all risks, transform some risks into others, introduce new risks, or have other imperfections. For example, a delta-only hedging strategy does not adequately hedge the risks measured by the “Greeks” other than delta. Another example is that financial indices underlying typical hedging instruments typically do not perform exactly like the separate account funds, and hence the use of hedging instruments has the potential for introducing basis risk

1. A safe harbor approach is permitted for reflection of future hedging strategies supporting the contracts for those companies whose modeled hedge assets comprise only linear instruments not sensitive to implied volatility. For companies with option-based hedge strategies, electing this approach would require representing the option-based portion of the strategy as a delta-rho two-Greek hedge program. The normally modeled option portfolio would be replaced with a set of linear instruments that have the same first-order Greeks as the original option portfolio.

C. Calculation of SR (Reported)

* + 1. The company shall calculate CTE70 (best efforts)—the results obtained when the CTE70 is based on incorporating the future hedging strategies supporting the contracts (including both currently held and future hedge positions) into the stochastic cash-flow model on a best efforts basis, including all of the factors and assumptions needed to execute the future hedging strategies supporting the contracts (e.g., stochastic implied volatility). The determination of CTE70 (best efforts) may utilize either explicit or implicit modeling techniques.
    2. The company shall calculate a CTE70 (adjusted) by recalculating the CTE70 assuming the company has no future hedging strategies supporting the contracts, therefore following the requirements of Section 4.A.4.a.
    3. Because most models will include at least some approximations or idealistic assumptions, CTE70 (best efforts) may overstate the impact of the hedging strategy. To compensate for potential overstatement of the impact of the hedging strategy, the value for the SR is given by:

SR = CTE70 (best efforts) + E × max[0, CTE70 (adjusted) – CTE70 (best efforts)]

* + 1. The company shall specify a value for *E* (the “error factor”) in the range from 5% to 100% to reflect the company’s view of the potential error resulting from the level of sophistication of the stochastic cash-flow model and its ability to properly reflect the parameters of the hedging strategy (i.e., the Greeks being covered by the strategy), as well as the associated costs, risks and benefits. The greater the ability of the stochastic model to capture all risks and uncertainties, the lower the value of *E.* The value of *E* may be as low as 5% only if the model used to determine the CTE70 (best efforts) effectively reflects all of the parameters used in the hedging strategy. If certain economic risks are not hedged, yet the model does not generate scenarios that sufficiently capture those risks, *E* must be in the higher end of the range, reflecting the greater likelihood of error. Likewise, simplistic hedge cash-flow models shall assume a higher likelihood of error.
    2. The company shall conduct a formal back-test, based on an analysis of at least the most recent 12 months, to assess how well the model is able to replicate the hedging strategy in a way that supports the determination of the value used for *E*.
    3. Such a back-test shall involve one of the following analyses:

a. For companies that model hedge cash flows directly (“explicit method”), replace the stochastic scenarios used in calculating the CTE70 (best efforts) with a single scenario that represents the market path that actually manifested over the selected back-testing period and compare the projected hedge asset gains and losses against the actual hedge asset gains and losses – both realized and unrealized – observed over the same time period. For this calculation, the model assumptions may be replaced with parameters that reflect actual experience during the back-testing period. In order to isolate the comparison between the modeled hedge strategy and actual hedge results for this calculation, the projected liabilities should accurately reflect the actual liabilities throughout the back-testing period; therefore, adjustments that facilitate this accuracy (e.g. reflecting actual experience instead of model assumptions, including new business, etc.) are permissible.

To support the choice of a low value of E, the company should ascertain that the projected hedge asset gains and losses are within close range of 100% (e.g., 80–125%) of the actual hedge asset gains and losses. The company may also support the choice of a low value of E by achieving a high R-squared (e.g., 0.80 or higher) when using a regression analysis technique.

b. For companies that model hedge cash flows implicitly by quantifying the cost and benefit of hedging using the fair value of the hedged item (an “implicit method” or “cost of reinsurance method”), calculate the delta, rho and vega coverage ratios in each month over the selected back-testing period in the following manner:

i. Determine the hedge asset gains and losses—both realized and unrealized—incurred over the month attributable to equity, interest rate, and implied volatility movements.

ii. Determine the change in the fair value of the hedged item over the month attributable to equity, interest rate, and implied volatility movements. The hedged item should be defined in a manner that reflects the proportion of risks hedged (e.g., if a company elects to hedge 50% of a contract’s market risks, it should quantify the fair value of the hedged item as 50% of the fair value of the contract).

iii. Calculate the delta coverage ratio as the ratio between (i) and (ii) attributable to equity movements.

iv. Calculate the rho coverage ratio as the ratio between (i) and (ii) attributable to interest rate movements.

v. Calculate the vega coverage ratio as the ratio between (i) and (ii) attributable to implied volatility movements.

vi. To support the company’s choice of a low value of E, the company should be able to demonstrate that the delta and rho coverage ratios are both within close range of 100 % (e.g., 80–125%) consistently across the back-testing period.

vii. In addition, the company should be able to demonstrate that the vega coverage ratio is within close range of 100 % in order to use the prevailing implied volatility levels as of the valuation date in quantifying the fair value of the hedged item for the purpose of calculating CTE70 (best efforts). Otherwise, the company shall quantify the fair value of the hedged item for the purpose of calculating CTE70 (best efforts) in a manner consistent with the realized volatility of the scenarios captured in the CTE (best efforts).

c. Companies that do not model hedge cash flows explicitly, but that also do not use the implicit method as outlined in Section 9.C.6.b above, shall conduct the formal back-test in a manner that allows the company to clearly illustrate the appropriateness of the selected method for reflecting the cost and benefit of hedging, as well as the value used for E.

1. A company that does not have 12 months of experience to date shall set E to a value that reflects the amount of experience available, and the degree and nature of any change to the hedge program. For a material change in strategy, with less than 6 months of history, E should be 1.0. However, E may be lower than 1.0 if at least 6 months of reliable experience is available and/or if the change in strategy is a minor refinement rather than a material change in strategy.

The following examples are provided as guidance for determining the E factor when there has been a change to the hedge program:

* The error factor should be temporarily 100% for material changes in hedge methodology (e.g., moving from a fair-value based strategy to a stop-loss strategy).
* An increase in the error factor may not always be needed for minor refinements to the hedge strategy (e.g., moving from swaps to Treasury futures).

1. The company shall set the value of E reflecting the extent to which the hedging program is clearly defined. To support a value of E below 1.0, there should be very robust documentation outlining all future hedging strategies. To the extent that documentation outlining any of the future hedging strategies is incomplete, the value of E shall be increased. In particular, the value of E shall be 1.0 if documentation is materially incomplete for any of the individual CDHS attributes (a) through (j), as listed in VM-01.

Any increases required to the value of E to reflect that documentation is not available to support that the future hedging strategies are clearly defined shall be in addition to increases to the value of E to reflect a lack of historical experience or to reflect the back-testing results, subject to an overall ceiling of 1.0 for E.

D. Additional Considerations for CTE70 (best efforts)

If the company is following one or more future hedging strategies supporting the contracts, the fair value of the portfolio of contracts falling within the scope of these requirements shall be computed and compared to the CTE70 (best efforts) and CTE70 (adjusted). If the CTE70 (best efforts) is below both the fair value and CTE70 (adjusted), the company should be prepared to explain why that result is reasonable.

For the purposes of this analysis, the SR and fair value calculations shall be done without requiring the scenario reserve for any given scenario to be equal to or in excess of the cash surrender value in aggregate for the group of contracts modeled in the projection.

E. Specific Considerations and Requirements

* + 1. As part of the process of choosing a methodology and assumptions for estimating the future effectiveness of the current hedging strategy (including currently held hedge positions) for purposes of reducing the SR, the company should review actual historical hedging effectiveness. The company shall evaluate the appropriateness of the assumptions on future trading, transaction costs, other elements of the model, the strategy, the mix of business and other items that are likely to result in materially adverse results. This includes an analysis of model assumptions that, when combined with the reliance on the hedging strategy, are likely to result in adverse results relative to those modeled. The parameters and assumptions shall be adjusted (based on testing contingent on the strategy used and other assumptions) to levels that fully reflect the risk based on historical ranges and foreseeable future ranges of the assumptions and parameters. If this is not possible by parameter adjustment, the model shall be modified to reflect them at either anticipated experience or adverse estimates of the parameters.
    2. A discontinuous hedging strategy is a hedging strategy where the relationships between the sensitivities to equity markets and interest rates (commonly referred to as the Greeks) associated with the guaranteed contract holder options embedded in the variable annuities and other in-scope products and these same sensitivities associated with the hedging assets are subject to material discontinuities. This includes, but is not limited to, a hedging strategy where material hedging assets will be obtained when the variable annuity account balances reach a predetermined level in relationship to the guarantees. Any hedging strategy, including a delta hedging strategy, can be a discontinuous hedging strategy if implementation of the strategy permits material discontinuities between the sensitivities to equity markets and interest rates associated with the guaranteed contract holder options embedded in the variable annuities and other in-scope products and these same sensitivities associated with the hedging assets. There may be scenarios that are particularly costly to discontinuous hedging strategies, especially where those result in large discontinuous changes in sensitivities (Greeks) associated with the hedging assets. Where discontinuous hedging strategies contribute materially to a reduction in the SR, the company must evaluate the interaction of future trigger definitions and the discontinuous hedging strategy, in addition to the items mentioned in the previous paragraph. This includes an analysis of model assumptions that, when combined with the reliance on the discontinuous hedging strategy, may result in adverse results relative to those modeled.
    3. A strategy that has a strong dependence on acquiring hedging assets at specific times that depend on specific values of an index or other market indicators may not be implemented as precisely as planned.
    4. The combination of elements of the stochastic cash-flow model—including the initial actual market asset prices, prices for trading at future dates, transaction costs and other assumptions—should be analyzed by the company as to whether the stochastic cash-flow model permits hedging strategies that make money in some scenarios without losing a reasonable amount in some other scenarios. This includes, but is not limited to:

1. Hedging strategies with no initial investment that never lose money in any scenario and in some scenarios make money.
2. Hedging strategies that, with a given amount of initial money, never make less than accumulation at the one-period risk-free rates in any scenario but make more than this in one or more scenarios.
   * 1. If the stochastic cash-flow model allows for such situations, the company should be satisfied that the results do not materially rely directly or indirectly on the use of such strategies. If the results do materially rely directly or indirectly on the use of such strategies, the strategies may not be used to reduce the SR otherwise calculated.
     2. In addition to the above, the method used to determine prices of financial instruments for trading in scenarios should be compared to actual initial market prices. In addition to comparisons to initial market prices, there should be testing of the pricing models that are used to determine subsequent prices when scenarios involve trading financial instruments. This testing should consider historical relationships. For example, if a method is used where recent volatility in the scenario is one of the determinants of prices for trading in that scenario, then that model should approximate actual historic prices in similar circumstances in history.

**VM-31 Section 3.C.5**

Assets and Risk Management – A brief description of the asset portfolio, and the approach used to model risk management strategies, such as hedging, and other derivative programs, including a description of any future hedging strategies supporting the policies, and any material changes to the hedging strategies from the prior year.

**VM-31 Section 3.D.6.f**

Risk Management – Detailed description of model risk management strategies, such as hedging and other derivative programs, including any future hedging strategies supporting the policies and any adjustments to the SR pursuant to VM-20 Section 7.K3 and VM-20 Section 7.K.4, specific to the groups of policies covered in this sub-report and not discussed in the Life Summary Section 3.C.5. Documentation of any future hedging strategies should include documentation addressing each of the CDHS documentation attributes.

**VM-31 Section 3.D.14.a and 3.D.14.b**

1. Investment Officer on Investments – A certification from a duly authorized investment officer that the modeled company investment strategy, including any future hedging strategies supporting the policies, is representative of and consistent with the company’s investment policy and that documentation of the CDHS attributes for any future hedging strategies supporting the policies are accurate.
2. Qualified Actuary on Investments – A certification by a qualified actuary, not necessarily the same qualified actuary that has been assigned responsibility for the PBR Actuarial Report or this sub-report, that the modeling of any future hedging strategies supporting the policies is consistent with the company’s actual future hedging strategies and was performed in accordance with VM-20 and in compliance with all applicable ASOPs, and the alternative investment strategy as defined in VM-20 Section 7.E.1.g reflects the prescribed mix of assets with the same WAL as the reinvestment assets in the company investment strategy.

**VM-31 Section 3.E.5**

Assets and Risk Management – A brief description of the general account asset portfolio, and the approach used to model risk management strategies, such as hedging and other derivative programs, including a description of any future hedging strategies supporting the contracts, and any material changes to the hedging strategies from the prior year.

**VM-31 Section 3.F.8**

Hedging and Risk Management – The following information regarding the hedging and risk management assumptions used by the company in performing a principle-based valuation under VM-21:

1. Strategies – Detailed description of risk management strategies, such as hedging and other derivative programs, including any future hedging strategies supporting the contracts, specific to the groups of contracts covered in this sub-report.
2. Descriptions of basis risk, gap risk, price risk and assumption risk.
3. Methods and criteria for estimating the a priori effectiveness of the strategy.
4. Results of any reviews of actual historical hedging effectiveness.
5. CDHS – Documentation addressing each of the CDHS documentation attributes for any future hedging strategies supporting the contracts.
6. Strategy Changes – Discussion of any changes to the hedging strategy during the past 12 months, including identification of the change, reasons for the change, and the implementation date of the change.
7. Hedge Modeling – Description of how the hedge strategy was incorporated into modeling, including:
8. Differences in timing between model and actual strategy implementation.
9. For a company that does not have a future hedging strategy supporting the contracts, confirmation that currently held hedge assets were included in the starting assets.
10. Evaluations of the appropriateness of the assumptions on future trading, transaction costs, other elements of the model, the strategy, and other items that are likely to result in materially adverse results.
11. Discussion of the projection horizon for the future hedge strategy as modeled and a comparison to the timeline for any anticipated future changes in the company’s hedge strategy.
12. If residual risks and frictional costs are assumed to have a value of zero, a demonstration that a value of zero is an appropriate expectation.
13. Any discontinuous hedging strategies modeled, and where such discontinuous hedging strategies contribute materially to a reduction in the SR, any evaluations of the interaction of future trigger definitions and the discontinuous hedging strategy, including any analyses of model assumptions that, when combined with the reliance on the discontinuous hedging strategy, may result in adverse results relative to those modeled.
14. Disclosure of any situations where the modeled hedging strategies make money in some scenarios without losing a reasonable amount in some other scenarios, and an explanation of why the situations are not material for determining the CTE 70 (best efforts).
15. Results of any testing of the method used to determine prices of financial instruments for trading in scenarios against actual initial market prices, including how the testing considered historical relationships. If there are substantial discrepancies, disclosure of the substantial discrepancies and documentation as to why the model-based prices are appropriate for determining the SR.
16. Any model adjustments made when calculating CTE 70 (adjusted), in particular, any liquidation or substitution of assets for currently held hedges.
17. Error Factor (*E)* and Back-Testing – Description of *E*, the error factor, and formal back-tests performed, including:
18. The value of *E*, and the approach and rationale for the value of *E* used in the reserve calculation.
19. For companies that model hedge cash flows using the explicit method, as described in VM-21 Section 9.C.6.a, and have 12 months of experience, an analysis of at least the most recent 12 months of experience and the results of a back-test showing that the model is able to replicate the hedging results experienced in a way that justifies the value used for *E*. Include at least a ratio of the actual change in market value of the hedges to the modeled change in market value of the hedges at least quarterly.
20. For companies that model hedge cash flows using the implicit method, and have 12 months of experience, as described in VM-21 Section 9.C.6.b, the results of a back-test in which (a) actual hedge asset gains and losses are compared against (b) proportional fair value movements in hedged liability, including:
21. Delta, rho and vega coverage ratios in each month over the back-testing period, which may be presented in a chart or graph.
22. The implied volatility level used to quantify the fair value of the hedged item, as well as the methodology undertaken to determine the appropriate level used.
23. For companies that do not model hedge cash flows using either the explicit method or the implicit method, as described in VM-21 Section 9.C.6.c, and have 12 months of experience, the results of the formal back-test conducted to validate the appropriateness of the selected method and value used for E.
24. For companies that do not have 12 months of experience, the basis for the value of *E* thatis chosen based on the guidance provided in VM-21 Section 9.C.7, considering the actual history available and the degree and nature of any changes made to the hedge strategy.
25. The basis for the magnitude of adjustment or lack of adjustment for the value of E chosen based on the robustness of the documentation outlining the future hedging strategy.
26. Safe Harbor for Future Hedging Strategies – If electing the safe harbor approach for a future hedging strategy supporting the contracts, as discussed in VM-21 Section 9.C.8, a description of the linear instruments used to model the option portfolio.
27. Hedge Model Results – Disclosure of whether the calculated CTE 70 (best efforts) is below both the fair value and CTE 70 (adjusted), and if so, justification for why that result is reasonable, as discussed in VM-21 Section 9.D.

**VM-31 Section 3.F.12.c**

CTEPA – If using the CTEPA method, a summary including:

1. Disclosure (in tabular form) of the scenario reserves using the same method and assumptions as those used by the company to calculate CTE 70 (adjusted) as outlined in VM-21 Section 9.C (or the SR following VM-21 Section 4.A.4.a for a company that does not have a future hedging strategy supporting the contracts), as well as the corresponding scenarios reserves substituting the assumptions prescribed by VM-21 Section 6.C.
2. Summary of results from a cumulative decrement projection along the scenario whose reserve value is closest to the CTE 70 (adjusted), as outlined in VM-21 Section 9.C (or the SR following VM-21 Section 4.A.4.a for a company that does not have a future hedging strategy supporting the contracts), under the assumptions outlined in VM-21 Section 6.C. Such a cumulative decrement projection shall include, at the end of each projection year, the projected proportion (expressed as a percent of the total projected account value) of persisting contracts as well as the allocation of projected decrements across death, full surrender, account value depletion, elective annuitization, and other benefit election.
3. Summary of results from a cumulative decrement projection, identical to (ii) above, but replacing all assumptions outlined in VM-21 Section 6.C with the corresponding assumptions used in calculating the SR.

**VM-31 Section 3.F.16.a and Section 3.F.16.b**

* 1. Investment Officer on Investments – A certification from a duly authorized investment officer that the modeled asset investment strategy, including any future hedging strategies supporting the contracts, is consistent with the company’s current investment strategy except where the modeled reinvestment strategy may have been substituted with the alternative investment strategy, and that documentation of the CDHS attributes for any future hedging strategies supporting the contracts are accurate.
  2. Qualified Actuary on Investments – A certification by a qualified actuary, not necessarily the same qualified actuary that has been assigned responsibility for the PBR Actuarial Report or this sub-report, that the modeling of any future hedging strategies supporting the contracts is consistent with the company’s actual future hedging strategies and was performed in accordance with VM-21 and in compliance with all applicable ASOPs.