AMERICAN ACADEMY *of* ACTUARIES

Proposed New Risk-Based Capital Method for Separate Accounts that Guarantee an Index

Presented by the American Academy of Actuaries' Life Capital Adequacy Subcommittee to the National Association of Insurance Commissioners' Life Risk-Based Capital Working Group

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The following report was prepared by a work group (chaired by Luke Girard) of the Life Capital Adequacy Subcommittee. The work group is made up of various members of the subcommittee as well as Jerry Holman.

The current "Overview and Instructions" states that, "Indexed separate accounts are invested to mirror an established securities index that is the basis of the guarantee. Consequently, indexed separate accounts are relatively low risk; the risk-based capital (RBC) factor is the same as class 1 bonds." Class 1 bonds have a (C-1) factor of 0.4 percent. Since the formula was developed, it has become clear that in many instances companies that guarantee an index do not follow an investment strategy that tracks as closely as this factor implies. Since the number of possible investment and index strategy combinations is very large, tabular factors and a standardized modeling approach do not appear to be accurate.

This document outlines the approach proposed by the Life Capital Adequacy Sub-Committee of the American Academy of Actuaries. The approach distinguishes between two different categories of strategies and proposes different RBC treatment for each strategy.

Class I Strategies: Under the first class of strategies, the company invests deposits made into the separate account much in the same way as it would for deposits in the general account. The characteristics of the asset strategy would include investment grade and below investment grade corporate bonds, private placements, commercial loans, and various alternative investment strategies that are normally associated with general account investing. If the guaranteed index obligation is not similar in nature to a traditional general account fixed annuity, the company will transform the financial characteristics of the obligation, using an overlay strategy, to those characteristics that are similar to a traditional general account fixed annuity. For this class of strategies, the Look-Through Method would apply, that is, the general account C1 factors would apply.

Example 1: The company guarantees a return equal to the Standard & Poor's (S&P) 500 total return plus a small margin. Using an overlay strategy involving over-the-counter swap contracts and financial futures, the guarantee is transformed to a floating interest rate obligation. The deposits received under the contract are invested in fixed income securities similar to the manner in which the general account is invested. If these fixed income instruments are not floating rate instruments, the fixed income is transformed to a floating rate basis using over-the-counter (OTC) swap contracts or financial futures.

Example 2: The company credits a return equal to the three-month London InterBank Offered Rate (LIBOR) interest rate plus a small spread. The company invests most of the deposits in highly liquid AAA floating rate bonds and bank loans, with a small portion invested in hedge funds. The investment strategy can be considered riskier than the company's overall general account strategy, but it is very similar. As a whole, over the long term, it is expected to produce a return that exceeds the crediting rate on deposits.

Class II Strategies: Under the second class of strategies, the company does not follow a traditional general account investment strategy when investing deposits. Under this strategy, the company is buying securities that are either included in the underlying index or are highly correlated with these underlying securities. Alternatively, a mix of strategies that are market neutral[1] in aggregate or that are not normally associated with

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[1] For market neutral strategies we mean investment strategies can be generically defined as being designed to produce returns, commonly by holding offsetting positions, which

general account investing could form the core investment strategy. This strategy may be combined with an overlay strategy that transforms the returns to the guaranteed index. The frequency of valuation for the second class is much more frequent and can be daily, weekly, but not less often than monthly. The range of possible approaches precludes the use of tabular factors to determine an appropriate level of capital. For this class of strategies, the Tracking Error Method, which measures actual experience, would apply. This method will produce similar factors to the current factor for strategies with little credit, duration or basis risk but much higher factors if the strategy has significant performance tracking error risk.

Example 3: The company provides an enhanced S&P 500 total return. Using an overlay strategy involving over-the-counter swap contracts and financial futures, the guarantee is transformed to a floating interest rate obligation. Deposits received under the contract are invested in a mix of strategies that include total return oriented and non-traditional approaches (relative to the General Account) that are market neutral in aggregate.

Example 4: The company guarantees a return equal to the Lehman Gov/Corp Bond Index total return plus a small margin. The company invests a significant portion of deposits it receives in risky publicly traded securities such as high yield bonds. The strategy is an actively managed style that is expected to produce a total return exceeding the return of the index over a long horizon.

Note that the index returns mentioned in the examples are either the S&P 500 or the Lehman Gov/Corp Bond. These and other index return combinations are certainly possible.

Below is a high level summary of the Look-Through and Tracking Error Methods.

Look-Through Method:

- For C1 risk, apply the same factors to the asset statement values that are applicable to the general account.
- For C3 risk, the factors will depend on whether or not the company is exempted from the C3 cash flow testing requirement.
- If the company is not exempted, the company is required to perform cash flow testing to determine the amount of C3 RBC, using the same approach that is used for the general account and subject to the same minimum and maximum. For the purpose of determining the minimum and maximum factors, the product is included in the low risk category. Consistent with general account products, the company must submit an unqualified Section 8 opinion, under the revised Standard Valuation Law, to be eligible for a credit of one-third of the RBC otherwise needed.

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are independent of the returns of the market or market sector of those positions. A portfolio is considered market neutral if a material portion of its expected return is from market neutral strategies and it has an expected return (with an acceptable level of volatility) that is not strongly correlated to a given market, e.g., equity or bond market.

- If the company is exempted, the C3 factor will be based on a stress test for a significant upward movement in interest rates. It will be set equal to the greater of the factor applicable to the low risk category or a factor based on a stress test. The stress test is the percent change in the market value of the asset portfolio, derivative positions, and if the guaranteed index is based on interest rates, the liabilities. The stress test is based on the 95th percentile interest rate change over one year. For the five-year constant maturity treasury, this statistic is 197 basis points. (Source: H.15 Release -- Federal Reserve Board of Governors: April 1953 to September 2002). To allow for additional spread risk, this stress test is set at 250 basis points.
- Whether or not exempted from cash flow testing, an additional charge of 0.4 percent is applied to the statement value of the liabilities for potential additional separate account strategy risk attributable to the overlay strategy.

Tracking Error Method (Transform Method):

The method is a linear transformation of the historical tracking error series that preserves the moments of the historical distribution. The method avoids the problem of summing overlapping 12 and 24-month data series, a weakness with the tracking error method that was previously being considered.

The tracking error method converts each monthly tracking error data point into the expected two-year equivalent result, giving due consideration to the nature of the distribution of the observed monthly tracking error data. In this manner, the amount of useful information about the distribution is increased because the transform of each monthly data point to the two-year equivalent becomes an input to the measuring 90 percent Conditional Tail Expectation (CTE) statistic used to derive the RBC amount.

A step-by-step description of the procedure to calculate the charge is found in Appendix A, as it would likely appear in the O&I. Below is a high level summary with comments.

- This RBC charge is for both C1 and C3 risk.
- Determine a monthly series of net tracking errors (fund performance minus guaranteed performance) for the most recent 60 months. This series represents an exact historical fit of the results of the company's strategies. As such, it does not rely on the assumption of normality.
- Convert each monthly tracking error data point into the expected two-year equivalent result using the transform method. That method is described further in Appendix B. As part of that process the transformed standard deviation used to calculate the capital charge is increased by 15 percent.[2] Auto-correlation in the data series may increase or decrease the standard deviation. If it decreases the standard deviation, the decrease is limited to 50 percent of the standard deviation without correlation.

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[2] The 15% load factor provides a margin for three factors; a) statistical sampling error arising from estimation of distribution parameters based on a small sample, b) the inability to know the exact form of the distribution, and c) adequacy of capital at the one-year horizon in addition to the measured two-year horizon.

Similarly, if it increases the standard deviation, the increase is limited to 150 percent of the standard deviation without correlation.

- For start-up funds, where there is less than 30 months of history, a static charge of four percent would apply. This charge is set at a reasonably conservative level, but is not punitive. It would be a temporary assessment until enough history has developed to produce a reliable tracking error measure. Reliance on this static charge would be gradually phased out as the company achieved 60 months of experience and completely phased out when 60 months of data is achieved. In start up situations, the funds involved should be small relative to the size of the entire company; therefore any error should be immaterial.

- For small separate accounts, where the statement value of the separate account is less than 10 percent of company total adjusted capital, the company would be permitted to use the 4 percent static factor, instead of the tracking error method.

- For companies that do not have 60 months of historical monthly data on the effective date of this amendment, a company would be permitted to use the four percent static charge and gradually phase into the tracking error method.

- The resulting RBC factor is subject to a minimum 0.4 percent.
- A separate account that guarantees more than one index may use the entire history of the separate account to calculate its RBC if both of the following two conditions are met. Experience of prior periods is used without adjustment whether a guaranteed index is added or subtracted from the separate account
  1) The investment strategy is a mix of strategies that are market neutral in aggregate and are not normally associated with general account investing.
  2) There must be an identifiable overlay corresponding to each index that is guaranteed in the separate account.

Appendix A
RBC Calculation Instructions

A spreadsheet is available to perform the calculations described below given the monthly tracking error series as data input.

1. Determine the series {X(t)} as actual net tracking error (fund performance minus guaranteed performance) for the most recent 60 months.

2. Convert each value X(t) to a value Y(t) using the formula, Y = (X - m)*K*(1+.15)+24*m

   Where m is the mean of the series {X(t)} and K is an adjustment factor to account for the variance of the distribution Y including serial correlation. Covariance is set to 0 if the corresponding serial correlation is less than 0.20. The sample standard deviation in the terms above is increased 15 percent to allow for sampling error in the data series and to allow for the possibility of a shortfall during the first two years. The sample standard deviation is constrained so that it is not less than 50 percent or greater than 150 percent of the standard deviation calculated without correlation.

3. Order the series {Y(t)} in ascending order. Set any positive values to zero. Average the first six values. Change the sign and the result is the 90^{th} percentile CTE capital for C1 and C3.

4. Where there is less than 30 months of tracking error history the capital charge for C1 and C3 is four percent. If we have 30 months or higher of history, the four percent factor is gradually phased out. For 30 months, actual experience is weighted by the square root of 30/60 and the four percent factor is weighted by one minus the square root of 30/60. For 31 months experience is weighted by the square root of 31/60 and the four percent factor is weighted by one minus the square root of 31/60. This pattern continues up to month 59 when experience is weighted by the square root of 59/60 and the four percent factor is weighted by 1 minus the square root of 59/60.

5. The actual experience based calculation, under step (3) above, needs to be adjusted when there are less than 60 months of experience to gauge the 90 percent CTE. If the number of months divided by 10 is an integral number n, take the average of the first n values after the series is put in ascending order with positive values set to zero. If n is non integral, then set n to the next highest integral number and interpolate, using each average of the of the first n-1 and n values after the series is set in ascending order and positive values are set to zero. For example, if there are 37 values the idea is to identify the worst 3.7 of them. This is done by interpolating, taking 30 percent of the average of the first three values and 70 percent of the average of the first four values.

6. The resulting RBC factor is subject to a minimum 0.4 percent.

Appendix B
Tracking Error Method (Transform Method)

The general form of transforming the monthly net return series X, with mean m, to a two-year horizon net return series Y is given by the formula,

Y = (X -m)*K*(1+.15)+24*m.

The appropriate selection of K in this formula results in a precise appraisal of the nature of the distribution. Specifically,

- Y has the mathematically correct standard deviation that reflects the standard deviation of X and any serial correlation.
- All statistical properties implied by the monthly data series are replicated and no unintended assumptions are made.
- No distributional assumption is made which would fail to fit unanticipated distributions
- The sample standard deviation is increased by 15 percent in the terms above to adjust for the sampling error of the data series and to provide an additional margin for periods of less than two years.
- A minimum serial correlation factor of 0.2 is required to recognize covariance. The general practitioner's rule to filter results with correlations of less than 0.2 as being insignificant was used. Including these less significant results would increase the risk of an inappropriate RBC result with the potential of either over or understatement of an appropriate amount.

For the special case of no serial correlation, the familiar proportionality of standard deviation to the square root of time applies to derive K = square root of (24).

Derivation

The derivation below assumes 60 months of data are available. The RBC Calculation Instructions below, address transitional situations with less than 60 months of available data.

Let $Z = X_1 + X_2 + \ldots + X_{24}$ where the Xi are identically distributed consecutive monthly net returns with mean and standard deviation m and s. Let s' = the standard deviation of Z, reflecting any significant serial correlation between Xi and Xj for all i and j with $i < j$. Let K = s'/s. Serial correlations or covariances, and their role in deriving s' are discussed more fully below. We can see that Y has the same distributional properties as Z described in the three points below. The first point follows by additivity of expected values, while the second and third points follow by tracking the algebra involved in computing those moments.

- Y has the same mean 24*m, as the two-year horizon return Z
- Y has the standard deviation s' by construction as the two-year horizon return Z
- Y has the same 3rd order and higher moments as either the monthly net return X or the two-year horizon return Z

The impact of serial correlation or covariance is seen through the expansion of the variance of Z into terms involving the Xi's which results in Var(Z) = sum{var(Xi): i} + 2* sum{cov(Xi,Xj): i < j}. s' is found by taking the square root of the variance of Z. We can simplify by using the assumption of common distribution of Xi's, and by grouping cov(Xi,Xj) together into groups for i-j = 1, 2, 3, … 23.

Var(Z) = 24 * s^2 + 2 * sum{(24-j)*cov(X_1,X_{1+j}): j = 1 to 23}.

Thus there are 23 covariances to consider. Note, that due to the covariances being sample estimates, there is a small chance that the calculated variance could be negative which would result in an undefined standard deviation s. This is a theoretical impossibility and it is unlikely to occur in a realistic series. The simplest safety measure is to set all covariances equal to zero if this occurs.