



## Editor's Notes

by G. Thomas Mitchell

Spring is in the air, and the confusing and perhaps not so gentle aromas of fair value accounting, derivatives, risk management and equity linked contracts are intermingling in the atmosphere. See Tom Campbell's update on AICPA happenings, including FAS133, and Hans Wagner's letter to the editor. David Becker's treatise on proper ways to look at management of surplus is repeated from the *North American Actuarial Journal* because of its importance. His ideas have considerable interconnections with the aforementioned issues.

This issue also includes the second half of Glyn Holton's review of Value At Risk (VAR), focusing on practical modeling considerations.

US regulatory developments continue at a rapid pace. Harold Forbes returns to the COLIFR Corner, and Larry Gorski offers suggestions on implementation of determining select mortality valuation factors for term insurance and related products under the US (NAIC) new guideline XXX.

Steve Patzman offers the interesting results of a survey of management reporting practices by actuaries.

Your Section has been active, particularly in helping shape the development of the new Society of Actuaries examination system (Larry Gorski reporting on this also); and more well-received seminars globally. Ed Robbins reports on the Buenos Aires seminar from late 1998.

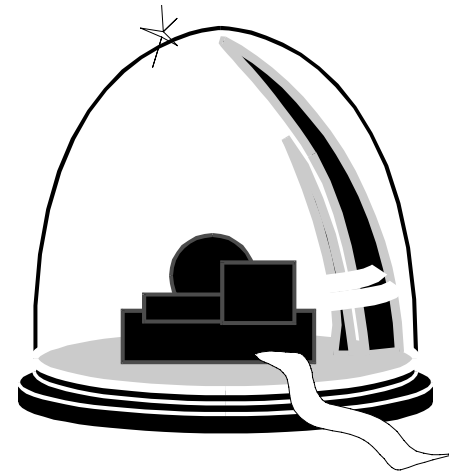
The best news of all for your editor is that Tom Nace has agreed to succeed me in that position. I have enjoyed the responsibility, but a total of eight issues is enough. Tom will assist me in the next issue, and I will reciprocate on the following issue, then retire. The Section is very pleased with Tom Nace's decision. The one regret is the total inability of the Section to find an editor not named Tom (this makes three in a row).

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## AICPA Non-Traditional Long-Durations Contracts Task Force—A Status Report

by Thomas Campbell

The Non-Traditional Long-Duration Contracts Task Force (Task Force) of the American Institute of Certified Public Accountants (AICPA) is in the process of developing a proposed Statement of Position (SOP) that will provide guidance on the GAAP accounting, reporting and disclosure for many of the innovative insurance products that have hit the market in recent years. The Task Force, which is a subcommittee of the AICPA's Insurance Companies Committee (ICC), includes representatives from the insurance industry and from public accounting firms. This report will outline the efforts of the Task Force.



### Statement of Position

Many of the new products in today's marketplace provide new twists to traditional insurance products. One example is an equity-indexed annuity, which includes elements of a traditional fixed annuity (e.g., a guaranteed interest rate) with a contingent additional return based on an external index, such as the S&P 500. Most companies account for these new products by applying existing GAAP accounting standards, such as FASB Statements No. 60 or 97. Unfortunately, most of these new products did not exist when these standards

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## AICPA Non-Traditional Long-Duration Contracts Task Force

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were developed, creating inconsistent GAAP accounting and reporting among different insurance companies.

The new products the Task Force has been focusing on include:

- variable annuities with minimum guaranteed death benefits (MGDBs)
- variable annuities with guaranteed living benefits
- equity-indexed life and annuity products
- bonus interest rates and persistency bonuses offered with life and annuity products
- modified guaranteed life and annuity products (i.e., products with market value adjustments) and
- synthetic GICs

Further complicating the accounting for these products is the fact that some contain elements of both general account and separate account products. For instance, variable annuities with MGDBs are written in a separate account, but the MGDB is typically guaranteed by the insurer's general account. Further, some products, such as equity-indexed annuities, can be written as either a general account or a separate account product.

In order to address this issue, the SOP is expected to include guidance for the classification and valuation of separate account assets and liabilities, including the treatment of seed money. In particular, the SOP will address the application of paragraph 54 of FASB Statement No. 60, which states (note that para-

graphs 45-51 referenced below provide guidance for valuing assets of the insurance enterprise's general account): *Investments in separate accounts shall be reported at market except for separate account contracts with guaranteed investment returns. For those separate accounts, the related assets shall be reported in accordance with paragraphs 45-51. Separate account assets and liabilities ordinarily shall be reported as summary totals in the financial statement of the insurance enterprise.*

Appendix I summarizes the GAAP accounting topics which are expected to be addressed in the SOP.

The Task Force is currently focusing efforts on developing conclusions to these issues and creating a draft SOP. Once it is completed, the SOP will need to be reviewed and approved by the ICC and the Accounting Standards Executive Committee of the AICPA (AcSEC), and ultimately exposed for comment (currently targeted for the fourth quarter of 1999).

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## FASB Statement No. 133 Implementation Issues

In addition to developing the SOP, the Task Force was asked to raise potential issues facing insurers related to the implementation of FASB Statement No. 133, Accounting for Derivative Instruments and Hedging Activities (FASB 133), which was released in June 1998 and is effective for fiscal years beginning after June 15, 1999. Although FASB 133 deals primarily with the asset side of the balance sheet, the FASB's Derivative Implementation Group (DIG) is providing guidance on how FASB 133 should be applied to liabilities for insurance products.

The source of applying FASB 133 to insurance products is contained in Paragraph 12 of the Statement. Paragraph 12 states that contracts (such as bonds, insurance policies and leases) may contain "embedded" derivative instruments, which are defined as "implicit or explicit terms that affect some or all of the cash flows or the value of other exchanges

required by the contract in a manner similar to a derivative instrument. Such a contract is referred to as a hybrid instrument consisting of an embedded derivative and a "host contract". The Statement requires embedded derivatives meeting certain criteria (which are outlined in Paragraph 12) to be accounted for separately from its host contract as a derivative instrument.

In December, the Task Force forwarded a list of issues regarding the application of FASB 133 to insurance products to DIG for consideration. For each issue, the submission included discussion of and arguments for various positions. Over the next few months, DIG will review the issues (along with several other non-insurance product issues) and recommend a position to FASB.

The seven FAS 133 implementation issues raised by the Task Force are summarized in Appendix II. More detail on the issues and positions is available from the FASB website.

### **GAAP Accounting Topics Being Considered for Draft SOP by the AICPA Non-Traditional Long-Duration Contracts Task Force**

1. Under what criteria should Separate Account (S/A) assets and liabilities be valued at market under per paragraph 54 of FASB 60? Under what criteria should they be valued as if they were in the general account?
2. Under what criteria should S/A assets and liabilities be reported as summary totals in financial statements under paragraph 54 of FASB 60? Should there be a separate summary total for S/A with guarantees that meet this criteria? Under what criteria should they be reported as part of the general account?
3. What disclosures should be made for S/A assets and liabilities?
4. How should S/A seed money be classified and valued?
5. Should a variable annuity with a minimum guaranteed death benefit

- (MGDB) be reported in the S/A? If so, should an additional reserve (above account value) be held in the general account? Is an MGDB considered a guaranteed benefit? How should the benefit be treated for purposes of amortizing deferred acquisition costs (DAC) and testing recoverability of DAC under FASB 97?
6. How should modified guaranteed annuities (MGAs) be reported? Should the liability be reported at book, at market, or at the greater of book and market? Should MGAs written in the S/A be reported differently from those written in the general account?
7. How should bonus interest rates and persistency bonuses offered with life and annuity products (fixed and variable) be expensed? Should bonus interest rates at issue be handled differently from persistency bonuses offered in later contract durations?
8. How should Synthetic GICs be classified and valued?
9. To the extent they are not covered by FASB 133, how should Equity Indexed Annuities and Equity Indexed Life Insurance products be classified and valued?
10. How should the reinsurance of non-traditional products be classified and valued?

### **FASB Statement No. 133 Implementation Issues Raised by the AICPA Non-Traditional Long-Duration Contracts Task Force**

1. Does the conclusion that traditional variable annuity products do not contain embedded derivatives remain valid given the fact that paragraph 200 incorrectly states that the policy holder owns the investments supporting variable annuity products?
2. How is the host contract in a non-traditional insurance or annuity contract determined and is it a debt or an equity instrument? For example, is a variable annuity with a guaranteed

- living benefit a debt instrument with an embedded equity derivative?
3. Pursuant to the fourth bullet of paragraph 200, is a nontraditional payment alternative available with a traditional variable annuity an embedded derivative, required to be accounted for separately?
4. Are the market value adjustment features contained in modified guaranteed annuities "clearly and closely related" (which impacts whether it meets the Paragraph 12 criteria) to the host contract?
5. Does an equity-indexed life insurance contract contain an embedded derivative (as an equity-indexed annuity does), or is it excluded from being subject to FASB 133 because it contains a death benefit provision?
6. For hybrid UL-type contracts, does the requirement to separate the components of the contract into the host contract and derivative apply only for liability valuation purposes, or does it also apply to the application of FASB Statement No. 97 DAC amortization and loss recognition?
7. With respect to insurance and annuity contracts having embedded derivatives, if the sum of the value of the host contract and the embedded derivative is less than the contract account value, should the aggregate liability be increased to the account value, as required by FASB Statement No. 97?

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# A Framework for Managing Surplus

by David N. Becker

The historical focus of actuaries has been the liabilities. In more recent times it has expanded to include asset/liability management. The last frontier is surplus and, while some might not think surplus to be in the actuaries' province, there are significant advantages to utilizing the holistic, integrative and value adding skills of actuaries in the management of surplus. This is especially true when the actuaries have added finance and investment expertise to their already extensive knowledge base concerning the identification, assessment and management of risk. Such expertise can be gained from the education curriculum for the Chartered Financial Analyst designation granted by the Association for Investment Management and Research and the curriculum developed by the Society of Actuaries for its speciality in finance and investment at the Fellowship level. This paper presents a comprehensive framework for the management of the surplus of an insurance enterprise that is built from these knowledge bases.

The role of surplus is to provide the insurance enterprise a source of funds for growing new business, protection against adverse liability market experience (obligation risk), protection against adverse capital market experience and protection against business environmental risks, changes in tax laws or the competitive playing field. To do this, surplus needs its own risk/return requirements and appropriate diversification. Although surplus is a single concept on the balance sheet, it is not often that simple in the real world. As many companies have segmented asset portfolios to support specific liability portfolios, the tendency is to associate a portion of surplus with each liability portfolio. This lack of a unified surplus portfolio can have significant downside implications, specifically economic suboptimization and operational suboptimization.

When surplus assets are spread into many portfolios and, typically, combined

with assets supporting liabilities, economic suboptimization can result from less diversification. This is due to inability to accurately control exposure to different asset classes, sectors and individual security names that are maintained in many different portfolios instead of a single portfolio. It makes it difficult, if not impossible, to have an investment strategy for surplus. In such a fragmented environment there usually isn't an investment strategy for surplus but, instead, there are many strategies that may default to investing each of the "surplus's assets" similarly to the strategy used for the liabilities the surplus supports. This last possibility is clearly suboptimal, as investment strategies for liability portfolios should reflect the liability's liquidity needs, return requirements for competitiveness, profitability, liability crediting strategy and asset/liability management requirements. Other suboptimizations include potential for lower returns, higher transaction costs and higher credit risk.

Operational suboptimization occurs from the higher cost structure for financial management, financial reporting confusion and score keeping errors, greater difficulty in accurately rebalancing portfolios, potentially inconsistent treatment for handling defaulted securities and using surplus as the hidden shock absorber for liability portfolio mistakes.

The proper management of surplus is facilitated by having a holistic framework for the management of the firm. This top-down analysis provides the structure from which appropriate decisions about managing surplus can be made. Such a top-down analysis requires a metric on which to measure firm results, a liability portfolio rebalancing method (accounting structure), an asset allocation strategy and a monitoring process. The asset allocation strategy is determined using modern portfolio theory.

The metric we use is the value of the firm, i.e., the risk-adjusted present value of the firm's free cash flows. For a U.S. life insurance company, the free cash



flows are the amount that can be paid to shareholders or distributable earnings. Thus it requires appropriate recognition of Statutory Accounting Principles in the United States.

Separate "liability portfolios," i.e., assets supporting a given product line, should be maintained where risk characteristics materially differ. The risk characteristics may be either liability-specific or company/competitor-specific. Examples of the first are: guaranteed cash values, partial surrenders and policy loans; permanent and temporary floor interest rate guarantees; premium flexibility; fund transfer options; target market differences; tax or non tax-qualified liabilities; differing distribution channels; and crediting strategies. Company/competitor examples include investment and disinvestment strategies and the "competitor" interest crediting strategy.

The liability portfolios should be rebalanced monthly. Certain liabilities, such as equity indexed annuities, should be rebalanced more frequently to ensure the proper hedge is maintained. The liability portfolio "book value" equals: statutory reserve, plus liability portfolio interest maintenance reserve, less policy loans, less the net of receivables less payables. The book value of assets supporting the liability should equal the liability portfolio book value. Note that other than incidental noninvested assets (e.g., the net of receivables less payables) the assets supporting the associated liabilities should be

real invested assets. One should not rebalance the portfolio with statutory goodwill, even if it is an admitted asset.

The portfolio structure for an insurance enterprise should consist of the appropriate number of distinct liability portfolios and a surplus portfolio. We recommend that the surplus portfolio should comprise two portfolios. The first portfolio is the main surplus portfolio which may or may not include the asset valuation reserve of the company. The second, and smaller of the two, acts as a cash management account from which the liability portfolios and the first, or principal, surplus portfolio are rebalanced on a monthly basis. Because this second account acts as a cash management account, it should have a "cash management account" investment strategy. From this point on, references to the surplus portfolio refer to the principal surplus portfolio.

An investment policy statement is needed for the surplus portfolio. This will provide the portfolio description, investment objective, a strategic asset allocation strategy, tolerance for each asset

having low or negative correlations. This reduces systematic risk or volatility of the surplus portfolio without negative effects on portfolio return. The choice of many classes may enhance returns in addition to risk reduction. Note that some classes have punitive risk-based capital requirements. These may drag down the performance of the entire portfolio when the cost of holding additional assets for the classes' default risk are considered. The risk reduction potential must be weighed against this burden.

The surplus investment strategy consists of objectives and constraints. The objectives include the return objective and the risk tolerance. The constraints include liquidity needs, time horizon, taxes, legal and regulatory constraints and any special circumstances the company has.

The liquidity constraint can be expressed as a given percentage of surplus, e.g. 5% or 10%. This liquidity serves as a secondary source of liquidity for liabilities, the first being the liability portfolio itself. (Note that the "cash management" surplus account also provides some liquidity.) Other liquidity con-

The tax constraint should reflect federal income taxes, taxes on realized gains and losses, limitations on loss carry-forwards and carrybacks, and applicable state income taxes.

Legal and regulatory constraints include the domiciliary state investment law, including any "basket" provisions and any extra territoriality effects if the company operates in New York.

While there may be many items in the special circumstances constraint, several that apply to insurance enterprises are: minimum desired NAIC risk-based capital (RBC) ratio; capital asset ratios from A. M. Best, Standard & Poor's, Moody and Duff & Phelps; and Standard & Poor's "risky" assets ratio.

One should also be alert for unusually negative biases against a specific asset class held by any of the rating agencies. Management may also have a minimum requirement for current income on the surplus portfolio. Because surplus assets are finite and the assets supporting surplus have their own default risk-based capital requirement, one must specify as

constraints both the total amount of surplus and the amount of surplus that is "free" in that it can be used to cover the risk-

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***"Diversification is achieved only by investing in multiple asset classes having low or negative correlations."***

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allocation class, a tactical asset allocation strategy and a list of any constraints.

The strategic asset allocation strategy represents the base line investment strategy (i.e., an asset allocation strategy that company management would be comfortable holding throughout an entire business cycle). This strategy should be reviewed on a periodic basis or whenever client conditions or capital markets experience significant change. The tactical asset allocation strategy indicates temporary deviations from the strategic asset allocation that are allowed due to changed conditions in the then-current capital markets. The allocations under tactical management are subject to the tolerance limits established as part of the investment strategy.

There is a need for a wide array of asset classes. Diversification is achieved only by investing in multiple asset classes

constraints might be having liquid A. M. Best assets greater than or equal to some percentage of surplus. The same is true of liquid Standard & Poor's assets. Given that implementing a new investment strategy may require significant shifts in asset allocations, there might be limitations on the allowable increase or decrease in an asset class. These limits may be based on the yearly production rate or disposal rate for each class, respectively. (The presence of the production/disposal limits may mean that it might take more than one year to move from a given asset allocation to an optimal asset allocation.) Finally, there might be a constraint against shorting any asset class.

The time horizon constraint for surplus should be the decision of management with due input from the investment professionals. The horizon should reflect management's risk tolerance.

based capital requirements for the assets backing the surplus portfolio. (The part of surplus that is not "free" surplus is set equal to the risk-based capital requirements for all of the liabilities and their supporting assets.) The more "free" surplus the surplus portfolio has, the more risk-based capital intensive the entire surplus portfolio can be. This would mean the more risky and, therefore, supposedly higher returning assets could be chosen for the surplus portfolio than would be the case if "free" surplus were smaller.

The typical risk measure is the standard deviation of portfolio total returns. A more sophisticated (but more difficult) measure is the portfolio's semi-variance or second lower partial moment. This measure captures only the downside variation of portfolio returns from the expected value or a specifically chosen floor return level. The risk tolerance is linked

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to the time horizon and should consider at least a "minus two sigma" event's impact on both the market value of surplus and the book value of surplus. The risk tolerance must be chosen by management with due input from the investment professionals.

The return objective must be chosen by the client. With due regard for the client's constraints and risk tolerance examples of different return objectives are to maximize:

1. after-tax total return on invested assets;
2. after-tax total return on invested assets subject to a floor on current income;
3. current income on invested assets subject to a floor on after-tax total return; and
4. current income; and
5. net risk-adjusted spread (please see Appendix A for description).

Again, each of these are subject to the client's constraints and risk tolerance.

The goal is to find the efficient portfolio that satisfies the client's constraints and meets the client's investment objectives. This can be done by finding the optimal asset allocation based on the investment objective for each of several levels of portfolio risk, which is computed as the standard deviation or volatility of the portfolio's total return. This will require quadratic programming as the portfolio risk is a second-order relationship with the risk characteristics of each asset class. The asset class opportunity set must be defined. For each member of the set the expected total returns ( $\mu_i$ ), standard deviations or volatilities ( $\sigma_i$ ) of total returns and correlations ( $\rho_{ij}$ ) between total returns must be specified. Output should be examined for sensitivity to these input values.

The expected returns, volatilities and correlations should be determined on an ex ante basis, i.e., they should be based on future expectations, not on an ex post or historical basis. In practice,

recent historical estimates for volatilities have been found reasonable for use on an ex ante basis, historical correlations are somewhat less reliable, and use of historic estimates for means has been poor.

The means of total return and standard deviations or volatilities of total returns for the fixed income asset classes reflect a "view" of the interest rate environment over the time frame of the projection since changes in market value are part of total return. When the equity classes are considered, these analogous values represent a view of the equity market returns and volatility. The correlations reflect the joint volatility of fixed income and equity markets. The portfolio standard deviation reflects the volatility of the market value of the portfolio. Using standard deviation as the measure of portfolio risk for each of the choices of objective function named previously (whether or not the objective involves total return), places limits on the change in market value due to volatility in the debt/equity markets when considered along with the expected total return of the portfolio resulting from the optimized asset allocation.

It is tempting to include as a constraint the durations and convexities of the various asset classes. But care must be taken so that the duration and convexity values are consistent with expected total returns and their volatilities as the latter two values reflect the investment professionals view on how the debt markets might move due to interest rate changes.

In the quadratic programming model, each constraint is reflected in a specific inequality. For each level of risk, the following information is computed:

1. a vector of asset allocations for the asset class opportunity set;
2. expected after-tax total returns;
3. current income;
4. Sharpe ratio (ratio of excess portfolio expected return over risk-free rate to the portfolio's standard deviation of expected return);
5. after-tax return on equity;

6. after-tax operating return on equity; and
7. surplus levels for one, two and three sigma events.

From this output, management can make a decision as to the risk/return trade-off and choose the optimal asset allocation strategy.

Two computational issues that might arise are sensitivity of optimization software and the "knife-edge" problem. The first issue involves the need to be aware of any limitations in the software's ability to solve the quadratic programming problem. Some software programs have more superior solution algorithms than others. Later generations of the same program may have significantly increased capabilities. The knife-edge problem can cause the vector of asset allocations to change dramatically for small changes in the level of risk. This can also cause the model to excessively emphasize certain asset classes. The model must be reviewed for robustness and modified by judgement in the event of this type of problem.

Once the strategic asset allocation strategy has been identified, tactical asset allocation decisions can be made if the investment advisor has confidence in a special view of the capital markets at a given time. The ability to make tactical asset allocation decisions must be allowed by the investment policy statement and such tactical decisions can be evaluated by use of performance attribution techniques. As the surplus portfolio evolves over time, consideration needs to be given to a surplus portfolio rebalancing strategy. Finally, the strategic asset allocation should be reviewed annually or whenever client circumstances and/or capital market expectations change.

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## Appendix A Net Risk Adjusted Spread (NRAS)

Suppose two or more securities are available for purchase by the portfolio manager using available cash in either a liability portfolio or a surplus portfolio. How might the portfolio manager evaluate the securities so as to rank order them by preference? One proposal is the net option-adjusted spread described below.

It is assumed at the outset that any security under review already meets the criteria ("filters") for the applicable portfolio (surplus or liability) according to the portfolio's investment policy statement constraints and its strategic asset allocation and/or the tactical asset allocation based on then current conditions in the capital and liability markets. The net option-adjusted spread (NRAS) is the net reward offered by the security after reflecting several security-specific costs to the insurance enterprise. For a given security define:

### Gross Spread (GS)

For noncallable bonds and mortgages, GS is the difference between the yield on the given bond and a Treasury of similar duration. For callable pass-throughs, collateralized mortgage obligations (CMOs), commercial mortgage-backed securities (CMBSs), collateralized bond obligations (CBOs), asset-backed securities (ABSs), etc., it is the spread-to-Treasuries of similar duration computed without consideration of the impact of the embedded option.

### Cost of Embedded Option (CEO)

A reduction to the GS to reflect the cost of any embedded options, (e.g., call options, prepayment options).

### Default risk cost (DRC)

The cost (in basis points) for expected defaults.

### Liquidity Cost (LC)

An estimate of the liquidity cost of a given asset, (i.e., a function of the bid/asked spread).

### Investment expenses (IE)

The level of investment expenses per unit incurred for a security in that asset class, on a marginal basis.

### Risk-based Capital Cost (RBCC)

The risk-based cost of capital (CoC) for that security, i.e. if the CoC is the firm's cost of capital, RFR is the risk-free rate and X is the RBC requirement (e.g. NAIC, A. M. Best, Moody, Standard & Poor, Duff & Phelps) as a decimal, then  $RBCC = (CoC - 0.65 \times RFR) \times X$ . (RFR is used as a simplifying assumption where the added assets to support RBC are assumed to be invested in Treasuries.)

$$Net\ Risk\ Adjusted\ Spread\ (NRAS) = GS - CEO - DRC - LC - IE - RBCC.$$

Many insurance companies evaluate an asset on the basis of gross spread without adjustment for the embedded option less expected defaults. This ignores the facts that (1) the security may contain embedded options whose presence may cause the gross spread to be overstated relative to other securities; (2) one security may have a higher expected default than another and thus have a higher spread; (3) different asset allocation classes have different expense levels, and failure to reflect such level may lead to incorrect comparisons; and, (4) some assets carry high RBC penalties and the excess return may not fully compensate for the additional capital consumed.

There are circumstances when the cost of embedded options term may be reduced. For example, if the proposed asset for purchase supports a liability with flexible interest credits, in which credits could be reduced in the event of a decline in interest rates (where a bond would be called or mortgage-backed security prepayed thus reducing portfolio yield), then a part or all of the cost of embedded options could be ignored.

When evaluating alternative securities for purchase, the NRAS enables a

quantitative comparison among them that simplifies the decision. Recall that this assumes that each of the securities is acceptable from the perspective of an appropriate investment for the liability portfolio or meets the surplus portfolio asset allocation strategy, respectively.

The quantity, GS - CEO, equals the option-adjusted spread (OAS) where such spread may be computed from an option pricing model based on default free Treasury securities. For some securities it is easier to directly measure the OAS. (The Treasury rate is that for a Treasury security of the same option-adjusted duration as the given security. If duration matching is the specified asset/liability management strategy, then the option-adjusted duration is equal to the target duration of the liability portfolio that the asset is to support or the target duration for the surplus portfolio if one has been specified. For a liability portfolio, the duration of the security may differ from the target duration either by conscious decision or if the actual duration of the portfolio is to be adjusted by means of the purchase of a security with a different option-adjusted duration.)

As a result, the net option-adjusted spread may be restated as:

$$NRAS = OAS - DRC - LC - IE - RBCC.$$

The cost of purchasing a new security (as opposed to a trade) should be omitted unless there is a significant difference between the various alternatives. Note: there is some indication that instead of the Treasury of similar duration one should use the swap curve.

## Issues Relating to Trades

The following is an initial list of issues that should be considered when trading assets within either a liability portfolio or the surplus portfolio. It is assumed that any trade would be within the strategic asset allocation and current tactical asset allocation guidelines for the portfolio.

1. Differences in gross spread
2. Differences in cost of embedded options
3. Differences in expected default costs

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4. Differences in asset class specific expenses
5. Differences in RBC requirements
6. Cash flow differences between the two securities
7. Transaction costs
8. Capital gains tax implications
9. Impacts on interest crediting rates, if applicable. There is also the issue of who (i.e., policyholders or shareholders) should benefit from the transaction, and to what degree.
10. Impact on interest maintenance reserve (IMR) and any applicable statutory accounting considerations
11. Impact on GAAP accounting results  
Note that realized gains in liability portfolios go to GAAP surplus and do not remain within the liability portfolio. For example, realizing gains on assets supporting a fixed liability effectively advances the timing of GAAP operating income but changes its character into net income instead of operating income. The future GAAP operating income will be lower and the margins in the GAAP reserves will be lower. If the realized gains are too large, then the liability portfolio has negative GAAP margins that would result in loss recognition. This is the worst situation, because not only has the future operating income been converted into net income, but the realization of gains beyond the point of a zero margin results in negative operating income via the loss recognition.
12. Rating agency issues, if any.

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# Value-at-Risk—*an Overview*

## (Part Two of Two)

by Glyn Holton

*(Editor's Note: Issue 38 of The Financial Reporter, January 1999 contains Part One of this article, dealing with a definition of VAR, a simple model of it, key factors in VAR and discussion of linearity and non-linearity aspects.)*

### Simulating VAR

**F**aced with non-linear portfolios, we must discard the linearity and normality assumptions of delta-normal VAR and consider alternative approaches to estimating VAR. The basic problem of estimating VAR, however, remains the same. We consider a set of key factors whose behavior we can describe statistically. We have a portfolio price function that relates those key factors to the portfolio's price. Somehow, we must translate these two pieces of information into an estimate of the portfolio's VAR. In this section, we consider the problem as one of solving an integral equation.

Suppose we wish to estimate 95% VAR for a portfolio. The portfolio's VAR is the bound on a 95% confidence interval for  $\Delta P$ . As suggested by Exhibit 1, this can be expressed as an integral:

$$95\% = \int_{-VAR}^{\infty} p \, d\Delta P \quad [21]$$

where  $p$  is the probability density function for  $\Delta P$ .

In [21] we are not actually solving for the value of the integral. Instead, we are solving for the value VAR that makes it 95%. If no closed form solution exists for [21], we consider numerical methods of integration. In doing so, we face a problem called the "curse of dimensionality." This arises because, although [21] is presented as a one-dimensional integral, it is in fact an  $m$ -dimensional integral—both  $p$  and  $\Delta P$  are functions of the  $m$  key factors.

$$\{V_k\}_{k=1}^m$$

Most techniques of numerical integration entail dividing the area of integration into subparts, performing some simple calculations on each subpart, and summing the results.

A problem in multi-dimensions is that, as the number of dimensions grows, so does the number of (multi-dimensional) rectangles used. For example, in the one-dimensional case, the area of integration  $[a,b]$  might be divided into 100 subparts. In the two-dimensional case, the area of integration has the form  $[a,b] \times [c,d]$ . If both the intervals  $[a,b]$  and  $[c,d]$  are divided into 100 subparts, there are going to be  $100^2 = 10,000$  rectangles to evaluate.

In the 50-dimensional case, that number grows to  $100^{50}$ . Reducing the number of subparts into which each interval is divided does not help. In the 50-dimensional case, if each interval were divided into just two subparts, this would translate into  $2^{50} = 1,125,899,906,842,620$  rectangles.

This is the "curse of dimensionality." It is a problem that causes most techniques of numerical integration to fail when applied to high-dimensional problems. It is an issue with VAR because many portfolios are exposed to tens or hundreds of key factors—each one adding a dimension to the problem.

Monte Carlo simulation is a form of numerical integration that avoids the curse of dimensionality. Using the numerical approach outlined above, the integral is approximated as:

$$\int f(x) dx \approx \sum_{i=1}^{z^n} A_i \quad [23]$$

where  $z^n$  is the total number of rectangles, and  $A_i$  is the area (volume) of the  $i^{\text{th}}$  rectangle. Because of the sheer number of rectangles involved, we do not directly calculate this sum. Instead, we note that



[23] can be rewritten:

$$\int f(x)dx \approx z^n \left( \frac{\sum_{i=1}^{z^n} A_i}{z^n} \right) = z^n \text{Avg}(A_i) \quad [24]$$

where  $\text{Avg}(A_i)$  is the average area of all the rectangles.

That average area can be estimated by selecting a sub-sample of the rectangles and computing their average area. The solution of Monte Carlo simulation is to make the selection randomly.

A question that remains is: How many scenarios will be necessary to reasonably estimate an integral using Monte Carlo simulation? In fact, Monte Carlo simulation breaks the curse of dimensionality. It can be shown that, *independent of the number of dimensions to a problem*, the convergence error of Monte Carlo simulation is inversely proportional to the square root of the number of random scenarios used. For example, suppose that a simulation uses 1,000 scenarios and has precision of 8%.<sup>1</sup> The very same analysis would be precise to within 4% if 4,000 scenarios were used. This would be true no matter how many dimensions the problem had.

## A Probability Transformation

When we estimate VAR for a portfolio, there are two broad inputs:

1. Historical data for key factors
2. The portfolio price function

These two inputs characterize the two components of market risk that VAR must incorporate—the two pieces of the VAR “puzzle” that we identified in Section 3. Historical data captures the uncertainty of financial markets. The portfolio price function describes the portfolio’s exposures to that uncertainty.

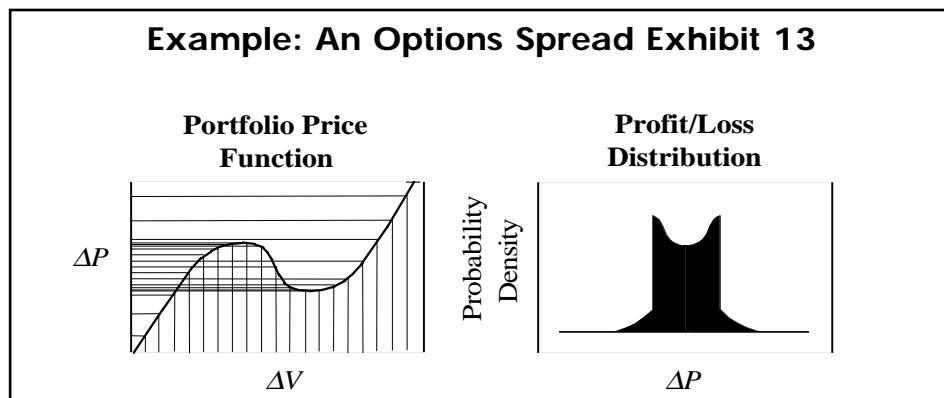
Neither input appears in the VAR integral [21]. The integral depends upon the one-dimensional probability distribution  $p$  for  $\Delta P$ . Somehow we must infer  $p$  from the historical data and the portfolio price function.

Historical data tells us nothing

directly about  $p$ . Rather, it provides information about the  $m$ -dimensional probability distribution for the key factors, which we denote  $q$ .

The portfolio price function also tells us nothing directly about  $p$ . However, as a transformation from the  $m$ -dimensional space of the key factors to the one-dimensional space of the portfolio’s value, it relates  $p$  to  $q$ . If we somehow apply the transformation to the entire  $m$ -dimensional probability distribution  $q$  we will obtain the one-dimensional probability distribution  $p$ .

In attempting this transformation, we face two challenges:



1. Applying the portfolio price function as a transformation to the probability distribution  $q$  is a complex mathematical problem.
2. We don’t even know the probability distribution  $q$ . We have to decide what inferences to make about that distribution based upon available historical data.

As we shall see, Monte Carlo simulation provides a solution to the first problem. The second problem can be addressed in different ways. Monte Carlo VAR and historical VAR are two forms of Monte Carlo simulation that differ only in how they address this second problem.

Starting with the first problem, let’s consider an example. Exhibit 13 describes a portfolio consisting of a long-short options position in a normally distributed underlier  $V$ . The portfolio price function is illustrated on the left, and the probability distribution  $p$  is illustrated on the right.

In the left graph, evenly spaced values for the underlier  $\Delta V$  have been mapped into values of  $\Delta P$ . This illustrates

how the portfolio price function transforms the (normal) distribution  $q$  of the underlier into the more complex distribution  $p$  shown on the right. By observing how values of  $\Delta P$  cluster in the left graph, we can infer the appearance of the probability distribution in the right graph.

Exhibit 13 illustrates in one dimension how complex the task of inferring the probability distribution  $p$  may be. After all, the portfolio price function may have multiple local maxima and minima as well as multiple inflection points. If the portfolio contains exotic derivatives, it may even have jump discontinuities. The task of inferring  $p$  for a

portfolio with thousands of positions exposed to hundreds of key factors is potentially staggering.

Exhibit 13, however, also suggests a solution. By mapping a range of values for  $DV$  into corresponding values for  $\Delta P$ , we were able to infer the nature of the distribution  $p$ . We can systematize such an approach by selecting a broad sample of scenarios for the and valuing the portfolio under each scenario using the portfolio price function. The histogram of results for  $\Delta P$  will be a discrete approximation to the probability distribution  $p$  from which we can estimate VAR.

If we actually use this approach to estimate VAR for a portfolio, one challenge is deciding how to select the set of scenarios. It is not sufficient to merely select a large number of scenarios. We must make the selection in a manner that will not bias the results—we need a representative selection. One possible solution is to select scenarios that are evenly spaced as was done in Exhibit 13. In higher dimensions, however, this

(continued on page 10, column 1)

## Value At Risk—An Overview (Part Two of Two)

*continued from page 9*

approach succumbs to the curse of dimensionality. An alternative is to select the scenarios randomly. Obviously, this is the solution of Monte Carlo simulation which we developed in Section 8.

Accordingly, in this section and the previous section, we have addressed two fundamental challenges in estimating VAR for non-linear portfolios. For both challenges, a solution has been Monte Carlo simulation. In summary, the two distinct problems that Monte Carlo simulation has solved have been:

1. The curse of dimensionality which we face in numerically solving the integral [21]
2. The probability transformation of applying the portfolio price function to  $q$  to infer  $p$

When we use Monte Carlo simulation for estimating VAR, we can do so in one of two ways:

1. We can draw our scenarios from an  $m$ -dimensional uniform distribution and then weight each scenario to reflect the probability distribution of the key factors, or
2. We can draw the scenarios from the probability distribution of the key factors and weight the scenarios uniformly.

Either approach represents a valid implementation of Monte Carlo simulation. In Sections 12 and 13, we will introduce two different implementations of Monte Carlo simulation for estimating VAR. These are the techniques of Monte Carlo VAR and historical VAR. Both are implemented according to the second of the above two approaches.

### Statistical Error

Because we don't know the probability distribution  $q$ , we must make inferences about it based upon historical data. In the case of delta-normal VAR, these inferences take the form of a set of standard deviations and

correlations. In the case of Monte Carlo simulation, the inferences can take different forms. The end result, however, must be a set of scenarios. Monte Carlo VAR and historical VAR are both forms of Monte Carlo simulation. They differ only in how they utilize historical data in selecting those scenarios to represent  $q$ . Both approaches entail two general types of error:

1. **Error arising from how scenarios are selected:** We must select scenarios in a manner that reflects the characteristics of the distribution  $q$ .
2. **Error arising from the number of scenarios selected:** We must select sufficiently many scenarios to adequately reflect the distribution  $q$ .

The difference between these is the difference between quality and quantity—selecting the right scenarios vs. selecting enough scenarios. The first type of error arises in different ways, some of which

are unique to either historical VAR or Monte Carlo VAR. The second type of error impacts both historical VAR and Monte Carlo VAR in exactly the same way. It is called convergence error.

We can reduce convergence error simply by using more scenarios. Error relating to *how* we select scenarios, on the other hand, cannot be reduced in this way. If the manner in which we select scenarios has some form of bias, simply selecting more scenarios can not eliminate that bias.

Error relating to how we select scenarios is often a subjective notion. This is because there is no "true" distribution  $q$ . People can have legitimate differences of opinion about the nature of that distribution—and consequently about any bias that may exist in how we select scenarios. Convergence error is more objective. Using statistical techniques, we can usually quantify the convergence error of a simulation.

### Monte Carlo VAR

The approach of Monte Carlo VAR is to

randomly generate scenarios based upon some assumed joint probability distribution for the  $\Delta V_k$ . Historical market data is used to infer statistical characteristics such as standard deviations and correlations for the assumed distribution.

For example, for a given portfolio we might assume that each key factor is lognormally distributed with a mean equal to today's value for that factor. Recent market data would then be analyzed to infer a standard deviation for each key factor as well as a correlation for each pair of key factors.

Once an assumed joint distribution is specified, standard techniques for generating correlated random numbers are used to select a set of scenarios. In this way, the selected scenarios are literally drawn from the assumed distribution. They reflect the statistical characteristics—standard deviations and correlations—inferred from the historical data.

This approach to selecting scenarios entails four sources of error:

1. **Assumed distribution:** The standard distribution we assume for key factors may imperfectly reflect the "true" distribution  $q$ .
2. **Sampling error:** Because we estimate standard deviations and correlations from a limited set of historical data, those "sample" standard deviations and correlations will only approximately reflect the "true" standard deviations and correlations of  $q$ .
3. **Non-stationary:** Because market conditions are non-stationary, the historical data upon which we base standard deviation and correlation estimates may imperfectly reflect today's market conditions.
4. **Imperfect random number generation:** Imperfections in the random number generator we use for selecting scenarios may introduce a bias.

Because Monte Carlo VAR depends upon the inference of standard deviations and correlations from historical data, it is similar to delta-normal VAR. Its sampling error and error from market

non-stationary are identical to those of delta-normal VAR. One can be addressed by using as much historical data as possible. The other can be addressed by using only the most recent data. As with delta-normal VAR, some compromise must be achieved to balance the two.

In addition to error relating to how scenarios are selected, Monte Carlo VAR also entails convergence error. However, there is no theoretical limit to the number of scenarios that can be used with Monte Carlo VAR. Accordingly, this error can be made as small as available computing technology will permit.

We can calibrate a portfolio to determine the number of scenarios required to achieve a desired degree of convergence. For example, suppose an organization wants to simulate the VAR of its portfolio with only 4% convergence error. To find the required number of scenarios, the organization calculates Monte Carlo VAR on the portfolio 50 times, using 1,000 random scenarios in each simulation. The resulting 50 VAR estimates are then gathered and their standard deviation is calculated.

Suppose the standard deviation is 8%. This means that simulation can measure the portfolio's VAR with 8% convergence error using 1,000 scenarios. Because the convergence error of Monte Carlo simulation is inversely proportional to the square root of the number of scenarios used, the same portfolio will require 4,000 scenarios to achieve a convergence error of 4%.

## Historical VAR

Like Monte Carlo VAR, historical VAR must somehow select a set of scenarios to reflect the unknown distribution  $q$ . The approach of historical VAR is to draw scenarios directly from historical data. For each date represented in the historical data, the one-day return for each of the key factors is calculated. A scenario is constructed by applying those returns to today's values for the key factors. This approach to selecting scenarios entails two sources of error. Both arise from market non-stationary:<sup>2</sup>

1. **Non-stationary:** Because market conditions are non-stationary, the

historical data upon which we base standard deviation and correlation estimates may imperfectly reflect today's market conditions.

2. **Distortions from assuming market stationarity:** Distortions occur because historical data is treated as arising from a stationary (fixed) probability distribution as opposed to one that has varied over time.

The first source of error also arose with delta-normal VAR and Monte Carlo VAR. The second is new. Its most obvious effect is that heteroscedasticity (non-constant volatility) is mistaken for leptokurtosis (fat tails to a distribution). For this reason, historical VAR tends to overstate the effects of leptokurtosis. Monte Carlo VAR, by comparison, uses standard distributions such as the normal distribution or lognormal distributions to model  $q$ . Accordingly, it tends to understate the effects of leptokurtosis.

While Monte Carlo VAR and historical VAR introduce different errors in how they select scenarios, their convergence errors behave identically. This is because the two methodologies differ only in how they specify random scenarios—not in how they use those scenarios. For a given portfolio, the number of scenarios needed to achieve a given degree of convergence will be the same irrespective of whether Monte Carlo VAR or historical VAR is used to generate those scenarios.<sup>3</sup> When you calibrate a portfolio for Monte Carlo VAR, the same result applies to historical VAR.

For example, suppose that Monte Carlo VAR is used to calibrate a portfolio to determine that a 8% convergence error can be achieved with 1,000 scenarios. If 2% convergence error were desired, Monte Carlo VAR could achieve that result using 16,000 scenarios. Historical VAR could not match that convergence. If a year (252 trading days) of historical scenarios were used, the convergence error of historical VAR would be 16%. Achieving 2% convergence error with historical VAR would require 63 years of data.

Historical VAR is fairly easy to implement. However, the significant convergence error associated with historical VAR can limit the technique's appeal in many situations.

## Conclusion

Value at risk is a powerful measure of market risk. In theory, it is applicable to all portfolios and all sources of market risk.

The challenge of estimating a portfolio's VAR lies in integrating the market information contained in the standard deviations and correlations of key factors with the portfolio information contained in the portfolio price function. For simple portfolios that exhibit linear price behavior, this can be accomplished using the method of delta-normal VAR.

If a portfolio contains options or other positions that exhibit non-linear price behavior, VAR may be estimated using Monte Carlo simulation. Two particular implementations of Monte Carlo simulation for VAR are the techniques of Monte Carlo VAR and historical VAR.

All three VAR techniques presented here entail error relating to statistical inference. In addition, the simulation techniques Monte Carlo VAR and historical VAR entail convergence error.

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# How is Your Management Quotient?

by Stephen N. Patzman

**T**his article provides some insight into management reporting and documentation process of actuarial items done by actuaries. It will describe the type of reporting the chief actuary's (CA)<sup>1</sup> do to their management—whether board of directors, chairman, president or other senior management. Also, it will provide data on other responsibilities where an actuary provides actuarial certifications.

The data were developed from a survey sent to the CA as identified on the SOA data base. The survey was under the authority of the Committee on Life Insurance Financial Reporting (COLIFR) of the American Academy of Actuaries.

It was originally hoped that there would be adequate data to prepare a practice note for the actuary to utilize. However inadequate data was obtained for this to happen.<sup>2</sup> But the data gathered does provide some insight into what companies do and hopefully this will be an aid to you in the reporting done in your company by providing some insight of other companies.

This article is broken into three parts as to the CAs relationship: (1) To identifying the CA and the CAs relationship to the five certifying actuarial statements<sup>3</sup> in the statutory annual statement, (2) To identify the level of reporting the CA makes to management, and (3) To identify the level of reporting done by each of the five certifying actuary in the company knowing that many of the answers to the survey could be considered proprietary or confidential, the survey was developed to preserve that trust.

Thus the preparers were not privy to the company's name in part 2 and 3 and thus were not able to clarify any responses or comments provided in the survey. Since the purpose is to identify practices that companies use in management reporting, it was felt that actually knowing each company's response was not necessary and the information obtained from the surveys would provide meaningful results.

## Part 1

This part of the survey was to obtain information about the CA and to identify the actuary responsible for certifying many of the actuarial certification in the annual statement. Besides identifying the CA, it identified the other individuals that have been appointed by the companies to perform various actuarial certifications. Part 1 provides a profile of the individual holding this job and a description of the information relevant to the actuarial standards of practice that management receive, and insight or the scope of the documentation.

The table below shows the cross section of responses by company size. More than 50% of the surveys were from companies with more than \$3 billion in assets<sup>4</sup>. Even though large companies were over-weighted in the survey, there seems to be an adequate cross section of companies by size to get a feel of the reporting done.

Of the 66 responses to company size, a good cross-section by company size is as follows.

Asset Size (1996 Year End)	% of companies
less than \$1.0 B**	27%
\$1 - \$10 B	46%
\$10 B or more	27%
Total	100%

In addition, Part 1 found that 85% of the CAs had the title of Vice President or higher and that 91% were FSAs. Service in the CA post ranged from a few months to 18 years.

In Part 1, the CA was asked to identify the actuary in the company who performed the five actuarial certification.

Of the 66 CAs, 57 are the designated company signatory of the Jurat Page of the annual statement. This would indicate that this duty is not normally delegated away from the CA. In the companies where the CA did not sign, there was no

clear indication by title who the signatory was. In all such cases the Jurat signer also signed the Actuarial Opinion and Memorandum (AOM) certification.

Fifty-four CAs had the responsibility of signing the AOM. Every one of these individuals also signed the Jurat page. In only three cases were the Jurat page and the AOM signed by different persons.

The next step was to find out how many CAs also signed state certification for the illustration actuary requirements. Nine companies indicated that they did not have to comply with the requirements. Of the remaining 57 companies, 14 of the illustration actuaries were the CA. In all cases, these CAs were in companies with less than \$7 billion in assets. When not the CA, in almost all of the cases the company delegated this responsibility to a person whose title indicated he/she was a product actuary.

Next, we looked at the individuals who signed the certification associated with the interrogatory question 3 located between Exhibit 8 and 8A in the annual statement for interest sensitive products. Eight companies indicated that they did not have products requiring this certification. Of the remaining 58, 35 used CAs to sign this certification. Of the 17 non-CA signers, 12 also signed the illustration certification. This shows a tie back to the product actuary.

Last, the survey asked about the individual who signed the dividend certification associated with the annual statement's Schedule M. We found that 28 companies reported that this document did not apply. Of the remaining 38 companies, the CA signed 18 of the certifications. Of the remaining, half were the same individual who signed the illustration certification. Again a strong tie back to the product actuary.

From the above, we see that in general the CA of a company assumes a large portion of the additional responsibilities of certifying actuary. In addition, an actuary who has duties to sign the illustration certification will also have

duties associated with interest sensitive product certification and /or dividend certification. In Part 3, more about the reporting responsibilities of these individuals will be investigated.

**ASOP Excerpts**

**ASOP 1 - Redetermination (or determination) of Nonguaranteed charges & /or Benefits for Life insurance and annuity contracts**

No explicit indication that a report need be presented to any particular individual or position (Sec. 6.1—"Whenever an actuary advises, an insurance company, ... a written report should be prepared that documents the advice.")

**7—Performing cash flow testing for Insurers**

No explicit indication that a report need be presented to any particular individual or position (Sec. 6.2—"A written actuarial report is recommended as a means of documenting the assumptions, techniques, and conclusions reached when providing a professional recommendation or opinion.")

**14—When to do cash flow testing for life and health insurance companies**

No explicit indication that a report need be presented to any particular individual or position (Sec.1—"A written actuarial report is recommended as a means of documenting the assumptions, techniques, and conclusions reached when providing a professional recommendation or opinion.")

**15—Dividend determination and illustration for participating Individual Life insurance policy and annuity contracts**

No explicit indication that a report need be presented to any particular individual or position (Sec. 6.1—"Whenever an actuary advises, an insurance company on dividends, ... a written report should be prepared that documents the advice.")

**22—Statutory Statement of opinion based on asset adequacy analysis by appointed actuary for the life and health insurer**

Sec 6.1—"The appointed actuary should provide annually to the board of directors of the company or the board's designee a statement of actuarial opinion ... along with a supporting memorandum."

**24—Compliance with NAIC Life Insurance Illustration Model Regulation**

Sec 6.1—"The illustration actuary should certify annual, as required by the model, stating that the scales used in illustrating non-guaranteed elements are in compliance ..."

**Part 2**

Part 2 was designed to gain insight into the reporting the CA does in complying with the six actuarial standards of practice (ASOP) (See sidebar). Each of the six identified ASOPs requires the actuary to provide some level of documentation or reporting. The CAs were asked to respond for their company about the depth and breadth of the CAs reporting to management as it relates to these six ASOPs. From the responses it is possible to get a feel as to what companies do relative to each of the ASOPs in reporting to various levels of management. It is up to the reader to determine if the actuary is fulfilling the requirements of the ASOP and to what level reporting is being done or needs to be done. It should be remembered that there is no correct amount of reporting, only reporting that meets your company's needs and makes you feel comfortable from a professional point of view.

Part 2 reports on company reporting at a macro level. In all cases below, we have reported the unaltered results from the survey. Since we did not have the ability to go back to the company for clarification, results should not be looked upon as definitive or conclusive.

For each of the ASOPs identified in the sidebar, the survey requested that the CA identify the level of reporting that was done to management defined as: Documentation to file, senior management, the president, the chairman, and the board of directors. For each of these levels of management, the CA was asked to identify the type of reporting done: Written only, oral only, written and oral, and not applicable. In addition, companies were asked about reporting to a parent. However, insufficient responses were received to be meaningful or reportable.

The table below provided the percentages of CAs indicating they report to the different levels of management.

% Reporting to Management					
ASOP	Documentation to file	Senior Management*	President	Chairman	Board of Directors
1	92%	83%	66%	50%	42%
7	97%	89%	80%	69%	72%
14	83%	75%	66%	56%	53%
15	63%	54%	52%	41%	47%
22	98%	92%	86%	79%	86%
24	82%	66%	65%	56%	61%

\* In the survey, "senior management" was not defined

The difference between 100% and the percentage shown reflects the companies that said this type of reporting was not done or was not applicable. In cases where reporting was not done, no reason for the omission was obtained. For example, since ASOP 15 applies only to participating products, about 35 % of the companies indicated that it did not apply to their reporting, presumably because they do not sell these products. For ASOP 24, about 15-25% indicated that as of summer 1997, this type of reporting was not done or did not apply, presumably because companies sell in states that had not enacted the illustration regulation or did not sell a product that fell under the regulation. It could be assumed that this percentage would now be higher as the number of states enacting the regulation has increased.

From the table, we see a falling off of the level of reporting at each level of higher authority. An exception is that there seems to be a higher level of reporting to the board of directors than to the chairman. Since the question was not specific as to what was desired, this may mean that the chairman hears the report for the first time when it is given to the board, rather than being individually briefed in order to determine if the board should be made aware.

From the results it appears that most companies are preparing documentation for each of the appropriate ASOPs for their files but that as the authority level increases, the reporting drops off. Since the survey did not delve into the reporting relationship if the president or chairman has delegated his or her authority to a lower reporting level, these percentages could be significantly inaccurate.

**Part 3**

This part of the survey was designated to obtain additional information about the

## How's Your Management Quotient?

*continued from page 13*

type of reporting done to management. Only one part of the survey yielded a sufficient number of replies to provide meaningful results.

Although there were inadequate replies for the other four surveys, the data collected seems to indicate that similar conclusions could be reached.

### **Actuarial Opinion and Memorandum (AOM) Report as to the adequacy of reserves:**

The results below will give you a flavor of what the survey collected. Since there is no correct answer or amount of reporting, the data provide a range of reporting done by the valuation actuary (VA) responsible for signing the AOM Report. A total of 61 companies provided complete or partial data for the survey.

#### **Written Year-End Report:**

The tabulation of the results shows that in 100% of VAs file a report for the work done. The VAs reported that the full report varies in length from less than 10 pages to as much as 600 pages. In general the majority of the reports were in the 30 to 100 page range. In about 25% of the cases, the VA also prepares an executive summary. While 40% of the time it was 1-2 pages long, most were 3 or more pages in length. The executive summary tended to be a summary of a much a longer report, usually over 40 pages.

Once the report has been prepared, it is communicated to management; in 80-90% of the companies, the VA presents this written report to senior management and to the president. About 40% of the time the report is an executive summary; in general, where the full report is passed on, the report tended to be less than 50 pages.

Each VA was asked about the level of interest in the report shown by management. Based on the VA's perception, it appears that the higher up the chain of authority, the more eyes glaze over. Only about 20% of chairmen have an understanding of the document, and rarely get involved in or provide guidance for the report. However, at the senior management and president levels there seems to

be understanding, involvement, and the providing of guidance for the document.

#### **Table of contents:**

A number of VAs shared the table of contents of their AOM report. As expected, the topics, organization, and content of the AOM reports varied but all seemed to cover assets, investments, interest scenarios, liabilities and assumptions.

#### **Oral Year-End Report:**

At the senior management level, an oral presentation was given in about 75% of the companies. In general 50% of these reports were less than 15 minutes in length. Another 30% were in the 15-30 minute category. About 5% indicated that this oral report exceeded 1 hour.

Very similar percentages were indicated for the oral report to the president. However, only about 50% of the companies reported making oral reports to the chairman and the BOD. At these upper reaches, the report gets shorter in almost all cases and appears normally to be less than 30 minutes.

#### **Regular Non Year-End Reporting:**

About 20% of the VAs indicated that non year-end written reports were provided. However, in the range of 40% of the VAs reported they presented oral reports to senior management and the president during the year. Very few reports were made to the chairman or BOD on a regular basis.

#### **"As needed" Non Year-End Reporting:**

Here 70-75% of the time the VA indicated that reports were given to senior management and the president. In a high percentage of the cases, it was an executive summary. The reporting decreases to about 50% for the chairman and to about 35% for the BOD.

Along with the "as needed" reporting, the VA was asked about reporting of "bad news." About 90% indicated that they reported such matters to senior management. This number went down to about 75% reporting to the president. In the area of 60% of the chairmen and less than 50% of the BODs hear the "bad news" from the actuary.

#### **Authority & Direct Access:**

In over 90% of the time, the VA has authority to go directly to senior manage-

ment in reporting results: About 85% to the president, about 60% to the Chairman and around 45% to the BOD.

#### **Qualifications:**

In virtually every case the VAs stated that they complied annually with the Academy's "Qualification Standards for Public Statement of Actuarial Opinion and Continuing Education." In addition, 75% of the VAs indicated that they rely upon another actuary to perform work for them in preparation for signing the certification and that 75% of these actuaries are members of the Academy. Even though these individuals are not required to meet the continuing education standards (because they are not signing the document to management), about 75% of the VAs require the individual to meet the continuing education requirements.

#### **Understanding by management of the responsibilities of the reporting actuary:**

A specific question was asked of the VAs as to the understanding and knowledge by management of the VA responsibilities. About 80-85% indicated that senior management and the president had been briefed on these responsibilities. In over half the companies, this had been done within the last 3 years. For the chairman and the BOD, similar but slightly lower percentages were seen.

#### **Wrap up:**

It is hoped that this report will be of use to the VA and others actuaries who have signing responsibility in the Annual Statement. Since there is no prescribed level of reporting, it will be up to you to determine if you are doing enough professionally. If you are not doing some of the things cited above, you might want to review the ASoPs once more to better understand your responsibilities.

This survey did not address those companies that use consulting actuaries to provide the above certifications. Maybe a few of the consulting actuaries who do this type of work might share some of their experiences on this subject.

If this article has raised questions as to the level of reporting that should be done in your company, write to the newsletter editor and propose that the Section

do additional research on what companies are doing in specific situations.

*Stephen N. Patzman, FSA, is Vice President and Corporate Actuary, USAA Life Insurance Company, San Antonio, Texas.*

### Footnotes

1) For convenience, this document uses CA interchangeable for the title of Chief Actuary or Corporate Actuary or the senior Actuarial officer completing the report (20% of the

companies indicated there was no designated CA in the company).

- 2) The survey had multiple parts. A total of 86 or partial surveys were returned. Since some companies chose not to provide all of the information requested or not to complete all of the surveys, thus less than 86 companies provided usable data for all categories.
- 3) These five certifying signatures are signing the: 1) Statutory Annual Statement on the Jurat page as the actuary, 2) Actuarial Opinion and Memorandum Report, 3) Illustration

Actuary certification, 4) Schedule M interrogatory certification, and 5) Interest sensitive product certification located between Exhibit 8 and 8A.

- 4) Approximately \$3 billion of assets is the breaking point for the largest 100 life insurance companies.
- 5) 8 % of the companies were less than \$500 million and are thus Section 7 companies relative to complying to the Actuarial Opinion and Memorandum regulations and laws.

## News Flash! Keynote Speakers/Entertainment Announced for SOA 50<sup>th</sup> Meeting

*by Cecilia Green, SOA Director of Integrated Communication*



**P**lan now to attend this special meeting, October 17-20, 1999, at the San Francisco Marriott, downtown at 55 Fourth Street. Call now to reserve your room for what is sure to be a sell out: 415/896-1600. The outstanding program includes:

- Keynote speakers William J. Bennett, Ph.D. and Gov. Mario Cuomo, UNICEF Deputy Executive Director Stephen Lewis, and Gen. H. Norman Schwarzkopf
- Outstanding speakers in a full range of continuing education sessions
- 50th Anniversary Gala Dinner (black tie optional) with legendary entertainer Tony Bennett

Registration fees are:

- Members of actuarial organizations worldwide:
  - \$800 for early bird registration (before 9/17/99)
  - \$850 for late registration
- Nonmembers:
  - \$950 for early bird registration
  - \$1,000 for late registration
- Retired members of actuarial organizations worldwide:

\$250 for early bird or late registration

- Guests/spouses:
    - \$150 for early bird or late registration
    - Includes 3 continental breakfasts, opening and closing general sessions, Exhibit Hall, Monday evening reception, Gala dinner
- These events are being supported by 50th Anniversary Sponsors at levels ranging from \$50,000 to \$5,000. Visit [www.soa.org](http://www.soa.org) for details on becoming a sponsor.

Here is the current list as of 4/14/99:

**Platinum: \$50,000**

The Equitable  
LAI Worldwide  
Milliman & Robertson, Inc.  
William M. Mercer, Incorporated  
Swiss Re Life & Health  
Towers Perrin

**Gold: \$25,000**

Aid Association for Lutherans  
Lutheran Brotherhood  
**Silver: \$10,000**  
AEGON USA, Inc.  
ASA, Inc.

Actuarial Careers, Inc.  
AFLAC  
Gerling Global Life Reinsurance Co.  
Hewitt Associates LLC  
Munich American Reassurance Co.  
PolySystems, Inc.  
Security Life Reinsurance  
State Farm Life Insurance Co.  
Teachers Insurance and Annuity Association-College Retirement Equities Fund (TIAA- CREF)

**Bronze: \$5,000**

American United Life Insurance Co.  
Canada Life Assurance Co.  
Erie Family Life Insurance Co.  
Federal Life Insurance Co. (Mutual)  
Gabriel, Roeder, Smith & Co.  
Guardian Life Insurance Co.  
McGinn Actuaries, Ltd.  
Nationwide Financial Services  
Paradigm Partners International, LLC  
The Penn Mutual Life Insurance Co.  
Principal Financial Group  
Robert J. Myers, FSA  
SunAmerica Inc.

# “X” Factor—Modified Select Factor Adjusted Mortality Rates

by Larry M. Gorski

**M**y objectives in writing this article are to discuss three items: (1) the responsibilities of the appointed actuary under the revised NAIC Model Regulation commonly known as Regulation XXX, (2) the significance to the actuarial profession of responding to these new responsibilities, and (3) the analytical tools and procedures available to the actuary to discharge these responsibilities.

## New Responsibilities

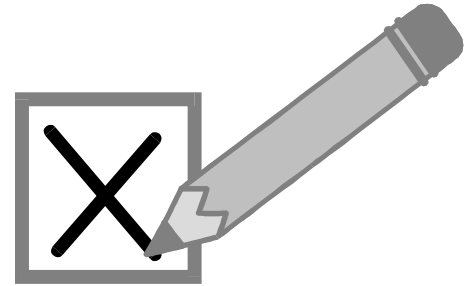
The revised NAIC Model Regulation commonly known as Regulation XXX provides the appointed actuary with the authority to select mortality rates for deficiency reserve purposes. The actuary can choose a set of “X” factors to modify prescribed mortality rates which have been adjusted by 20 year select factors identified in Regulation XXX. Besides having the authority to choose the “X” factors, the appointed actuary has the responsibility to opine on the appropriateness of the “X” factor modified select mortality rates

adjusted mortality rates relative to emerging and expected mortality experience.

Based on language in Section 5 B (3), expected mortality experience is not to reflect mortality improvement beyond the valuation date. Regulation XXX breaks new ground with respect to statutory valuation work. Heretofore, the Standard Valuation Law has defined the method and assumptions that determine minimum reserves for life insurance statutory accounting and reporting purposes. The appointed actuary’s work under the current regulatory framework has been to ensure that the reserves reported by the insurer meet the prescribed minimum standards. Under Regulation XXX, one element of statutory valuation work has been “deregulated.”

## The Challenge

As a regulator, I have heard on many occasions complaints about the artificiality and unnecessary conservatism of the current statutory valuation framework. If the appointed actuary is ever to be freed from



of Reserves of a company selling sophisticated insurance products supported by complex assets. The cash flows of the insurance products are, at best, only dimly understood. The cash flows of some complex assets are also open to speculation. The appointed actuary also has to deal with questions dealing with the number and shape of interest rate paths to use, allocation of expenses, future investment and crediting rate strategies, and numerous other topics.

On the other hand, the challenge given to the appointed actuary in Regulation XXX relates to a single issue, the valuation mortality assumption. The analysis of mortality has always been one of the cornerstones of the actuarial pro-

profession. If the appointed actuary can’t or won’t step up to the plate and discharge this new responsibility using rigorous, statistically valid procedures, we may as well give up our attempt to bring rigorous analy-

***“If the appointed actuary can't or won't step up to the plate and discharge this new responsibility using rigorous, statistically valid procedures, we may as well give up our attempt to bring rigorous analysis to the Asset Adequacy Analysis of Reserves.”***

whenever the actuary chooses an “X” factor less than 100%.

More specifically, Regulation XXX requires the appointed actuary to “opine as to whether the application of X meets the requirements of Section 5 B (3) . . . . It (the opinion) should reflect current expectations of future mortality, taking into account appropriate emerging experience.” Section 5 B (3) of Regulation XXX specifies several conditions the “X” factors must meet and tests applicable to the “X” factor modified select factor

the constraints of the Standard Valuation Law, the appointed actuary must take this new responsibility seriously.

I believe that determining the appropriateness of the “X” factor adjusted select mortality rates is a task amenable to actuarial analysis based on current education and training. In order to get a full understanding of this statement, the appointed actuary’s responsibility under Regulation XXX should be contrasted with the work of the appointed actuary performing an Asset Adequacy Analysis

sis to the Asset Adequacy Analysis of Reserves.

## Tools and Procedures

What tools and procedures should the actuary use when providing the required opinion? Two cases need to be considered. First, in the situation where no experience is available, assessing the reasonableness of the “X” factors in light of expected experience can only be based on actuarial judgement. Without any experience, no other procedure is available.



Exposures (lives)	Mortality Rate
500	.001
500	.0015
500	.002
500	.003
500	.004
1000	.006
1000	.008
1000	.010
1000	.013
1000	.016
1000	.019
1000	.022
1000	.025
1000	.028
1000	.032
750	.036
750	.040
750	.045
750	.050
750	.055
750	.060
750	.065
750	.070
750	.075
750	.080
750	.090
750	.100

For the first year of valuation, the actuary chooses an "X" factor of .5 to be applied uniformly to all mortality rates.

Notice that this case does not include situations involving limited experience.

Once we get past this case, I believe that the appointed can utilize rigorous, statistically valid procedures to support his/her opinion. Whatever procedure is used, it must recognize the available, emerging company experience. This is the key. Hand-waving arguments are not acceptable substitutes for analysis.

Volume XXXII of the *Transactions of the Society of Actuaries* contains a paper titled "Testing for Significant Differences Between Actual and Expected Results." The paper discusses the problem in the context of a standard "hypothesis testing" exercise. The null hypothesis (Ho) is the hypothesis that "The given q's are the correct probabilities of termination."

While the example discussed in the paper comes from the field of disability income insurance, the ideas presented in

the paper are surely applicable to the problem posed in Regulation XXX.

The paper dissects the hypothesis testing problem into five cases. In my view, the case most relevant to the task facing the appointed actuary is case four. Case four considers the situation when at least one q is distinct, the q's are neither all small (< 0.05) nor all large (>.95) and n (size of the population) is large.

Under these conditions, the author suggests to use the Normal Distribution approximation to the sum of n random variables, each distributed Bernoulli (Be[q]).

An alternative approach that I am considering as a benchmark for my review of the work done by the appointed actuary is based on Monte Carlo techniques. This method involves determining the distribution of expected deaths based on the "X" modified select factor

adjusted mortality rates and the actual exposures. The distribution can be determined using Monte Carlo techniques. Once the distribution is determined, the appropriateness of the "X" factors can be determined by rejecting the hypothesis if the actual deaths fall beyond a specified point in the tail of the distribution of expected deaths (the rejection region).

An example will clarify the method that I am suggesting. Assume a population consisting of the following exposures and 20-year select factor adjusted mortality rates as follows:

Monte Carlo techniques enter into the method in the following way. For each age x, select a random number from the Binomial Distribution Bi[Ex,qx]. Call this random number Nx., the number of deaths at age x. Do this for each age x and add all of the Nx to determine S (the number of deaths over all ages). Perform this process a sufficiently large number of times and, finally, determine the distribution of S. Reject the hypothesis (the appropriate "X" factor is 50%) if the actual number of deaths falls in the rejection region of the distribution of expected deaths.

**Results**

The following table below contains the results of applying both procedures to the sample data provided above. I performed the Monte Carlo simulations with k=100,200, 1500 trials.

For this example, the hypothesis testing region using either method is nearly the same and, for the Monte Carlo procedure, is independent of the number of trials. I will be testing the reliability of these observations using different sample populations. I believe that the two procedures will not produce comparable rejection regions in all cases.

Procedure	Quantiles			
	50%	75%	95%	99%
Normal Approximation	380	393	412	425
Monte Carlo (k = 100)	378	394	411	418
Monte Carlo (k = 200)	378	395	413	423
Monte Carlo (k = 1500)	380	393	412	427

Using the data in the table obviously implies that a decision as to a rejection region has been made. I feel that regulators should make this decision. Making this decision is no different than regulators adopting a mortality table with a specified margin. For purposes of completing this example, lets assume that the rejection is set at the 75% quantile. Hence if actual deaths exceeded 393 deaths, the assumed "X" factor of 50% would be rejected.

One question that obviously arises is whether the procedure that I have described adequately addresses the "limited experience" situation. The answer is "yes". The process of generating random outcomes from the population reflects the relative increase in the variance as the population decreases.

The following table below illustrates this point:

Population	Quantiles			
	50%	75%	90%	99%
A.	378	395	413	423
B.	4	5	7	8

Population A. is the sample population used above, while Population B. is the same except that it has been scaled down

## Letter to the Editor...

### GAAP Questions for Equity Linked Products

Dear Editor:

At the September, 1998 Valuation Actuary Symposium (VAS), several sessions dealt with implications of the new GAAP reporting standard SFAS #133 "Accounting for Derivative Instruments and Hedging Activities." While interpretations of this standard are evolving, and the AICPA has a separate task-force addressing "Accounting and Reporting by Insurance Enterprises for Certain Non-Traditional Long Duration Contracts and for Separate Accounts," I wanted to comment on some of the interpretations put forward by several speakers.

#### Equity-Indexed Annuity Liability Determination

At the VAS, it was hypothesized that the proper bifurcation under FAS 133 at issue would be to subtract the price of the written liability option from the total policyholder premium, and hold the balance as the "fixed" portion liability at issue. The liability would grow from that value at issue to the minimum guaranteed value at the end of the index term, essentially following a FAS 91-style interest method.

A question arises if the product is inadequately priced. Perhaps the interest rate needed to accrue the fixed liability is higher than the current investment climate can support. In the ultimate theoretical case, the option cost could be higher than the total policyholder premium, leading to a negative "fixed" reserve at issue. Should some additional liability be established?

The quick answer (and one I suggested) at the VAS was "no, because these are investment contracts and you don't pre-fund losses on investment contracts." On further consideration, I question the validity of the answer in this case, due to the somewhat arbitrary nature of the bifurcation process. Subtracting the market value of the option written from

the premium leaves us with a remainder analogous to a fixed annuity. For a fixed annuity, we would not normally hold any reserve at issue other than the premium. However, in aggregate, this approach appears to defeat the FASB's goal of having the ineffective part of hedges come immediately through income, with the maximum possible transparency of derivatives.

Another thought-process would be to bifurcate the contract by first discounting the fixed guarantee (at the current matching portfolio rate) to obtain the fixed portion of the liability, with the remainder of the policyholder deposit compared to the cost of the written option. In this thought-process, a "too-rich" written option would show up in a shortfall immediately (of course, a contract priced at a profit would have profits emerge immediately, as well).

Given the alternative thought processes possible, and their potentially very different income effects, it might be prudent to adopt the guidance for when an embedded derivative can not be reliably identified and measured, that is marking the entire contract to fair value.

The impact of fair valuing the unified contract on items such as DAC amortisation is a topic likely to cause headaches, should this approach be adopted.

#### Variable Deferred Annuities with Minimum Guarantees

A different issue arises with this closely related product type. FAS 133 says that an embedded derivative should not be separated from its host contract if the hybrid contract that embodies both the host and the embedded derivative is already measured at fair value with the changes in fair value reported through earnings. Several speakers postulated that minimum guarantees on variable contracts would not need to be separated, as the variable contract has already been fair valued.

While the assets underlying a variable contract have clearly been fair valued, I believe the unit value account

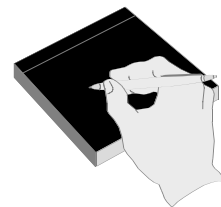
balance of a variable annuity contract is not necessarily the fair value for that contract. This is especially the case if the contract has significant option features which might be "in the money." An alternative that appears slightly more reasonable in defining market values is to floor the "account value" at the underlying guarantee, but this alternative would not work effectively if the guarantee was only present at certain durations, nor work well if the guarantee applied to certain settlement options (such as annuitization or death) but not to cash surrender.

There can be other cases where the account balance of a unit-linked contract is not a good representation of the contract's fair value. In Australia, a type of "unit-linked" contract has been written with a notional account balance, the value of which the policyholder can never fully realize due to the loading structure. Under this contract, the fair value is clearly less than the account balance, an interesting contrast to the account balance "enhancements" popular in the United States.

If we accept that the account value is not the "fair value" for a given variable annuity contract, then we again face the choice of either bifurcation or holding the entire contract at market value. Similarly to EIAs, I suspect that marking the entire contract to market may be the practical solution for the liability, although the DAC issues might be even worse than the volatility experienced by many variable annuity writers today.

*Hans Wagner*

*The opinions expressed above are purely my own, and in no way represent positions of either current or any prior employer.*



# COLIFR Corner

by Harold Forbes

*Editor's Note: This is the sixth installment of "COLIFR Corner." The American Academy of Actuaries' Committee on Life Insurance Financial Reporting (COLIFR) monitors various financial reporting topics of interest to actuaries and is actively involved in several. There have been three meetings since the last installment of COLIFR Corner. The most recent meeting was on March 9 at the Academy offices in Washington. The next meeting will be on June 11 in Chicago.*

## Model Regulation XXX

One of the most significant events since the last report was the rapid revision and passage by the NAIC of a revised XXX Model Regulation. Armand de Palo of The Guardian and Steve Smith of First Colony have been instrumental in moving the revised regulation along and building an industry consensus in support of it. The motivation to adopt the regulation is to reduce marketplace turmoil and provide a more level playing field between companies that operate within states that have adopted the current XXX Regulation and those that have not. Key states indicated that they were willing to support the revisions and it is felt that other states would follow. The revised regulation includes formula based "humpback" reserves based on expected premium patterns, revised mortality levels, and a smoker/nonsmoker distinction. Care was taken during the development so as not to produce a new prevailing mortality table for tax purposes.

## Valuation Task Force

The Academy's Valuation Task Force released its report to LHATF on a Unified Valuation System on December 5, 1998. Work continues in a number of subgroups. In particular, the numerical examples subgroup is working to create a model to demonstrate the before and after impacts on a company of a Unified Valuation System (UVS). Regulators have a number of concerns including compatibility of the UVS with existing state laws, assuring "consistency" among companies in their valuation practices,

and the ability to "produce auditable and verifiable results," among others. Regulators want an early warning on impending problems. The current approach, which allows for the verification of formulas, doesn't provide for trend analysis.

## Other LHATF Items

A new CSO mortality table is under consideration. Preliminary decisions are that the new table layout will be similar to the current tables—Male/Female and Smoker/Non-smoker. There will not be an increase in the number of tables. The actuary will still have to deal with superselect underwriting classes.

The Actuarial Opinion and Memorandum Regulation is still under consideration. Contentious areas relate to the "this state" part of the rewrite. One

ed. Six companies are participating in the testing. The number of interest rate scenarios has been narrowed down from 200 to 50. Items still under consideration are a reduced number of scenarios to be used, in conjunction with a more conservative answer, if a company didn't want to run 50 scenarios, rules on aggregation, new business, volatility, and less onerous tests for liability type products.

## Annuity Developments

The NAIC passed Guideline ZZZ at its December meeting along with a model regulation on separate account funding for minimum benefits under group contracts (synthetic GICs). The exposure period for Guideline ZZZZ (Equity indexed universal life) was extended to May 15.

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***"...The regulation is to reduce marketplace turmoil and provide a more level playing field between companies that operate within states that have adopted the current XXX Regulation and those that have not..."***

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proposal, in order to do a state of domicile opinion, includes asset adequacy testing, disclosure of codification, and prior approval of the Commissioner in the state of filing.

## Risk Based Capital (RBC)

The C3 subgroup of the NAIC's Life RBC Committee has been working to improve on the C-3 risk component. A method that develops the C-3 risk as an offshoot to cash flow testing is being test-

Work continues in the Variable Annuity with Guaranteed Living Death Benefits (VAGLB) Working Group. A major task is to develop a proposed CARVM reserving methodology. The working group has also been asked to propose an interim RBC C-3 factor for use at 1999 year end. Expected costs for VAGLBs generally have a catastrophic type distribution—mostly zero but with very large potential amounts at the extremes. Initial thinking is to use an

(continued on page 20, column 1)

**COLIFR Corner***continued from page 19*

approach for VAGLBs that is similar to that used for GMDBs, possibly using a "keel" method which essentially projects the expected fund value at the bottom 85th percentile value period-by-period. One possibility for determining the C-3 factor is to use a similar approach, but with a 95th rather than an 85th percentile.

**Life Practice Notes**

Life Practice Notes on equity indexed annuities, variable annuities, life illustrations, and three on demutualization have been approved. Other practice notes are in development for XXX and reinsurance. It is expected that these practice notes, along with updated current practice notes, will be available in the future at the Academy's web site ([www.actuary.org](http://www.actuary.org)).

**GAAP Developments**

The AICPA task force on non-traditional long-duration contracts is in the process of developing a proposed Statement of Position that will provide guidance on the GAAP accounting, reporting and disclosure for many of the innovative insurance

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**"A G4+1 position paper describes the purchase and pooling methods of accounting for business combinations,"**

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products that have hit the market in recent years. Currently there is divergent treatment within the industry. The focus is currently on interpreting existing standards. Many existing products were not around when the standards were developed, or are offered through a separate account but contain guarantees.

Highlighted products or product features include variable annuities with minimum guaranteed death benefits of guaranteed living benefits, equity indexed products (life and annuity), bonus interest rates, persistency interest rates, modified guaranteed life and annuity products (products with market value adjustments), and synthetic GICs.

A subgroup of the Committee continues to track developments with the International Accounting Standards Committee'. Current activity relates to the IASCs efforts to develop a set of global

standards for cross-border security filings, including business combinations. A G4+1 position paper describes the purchase and pooling methods of accounting for business combinations, and introduces a third possible method, the fresh start method for special cases. The G4+1 clearly favors the purchase method. This approach appears to be more consistent with the general desire to move toward fair value reporting by the IASC, the FASB, and the SEC.

**Demutualization**

The AIPCA anticipates issuing guidance in 1999 for mutual company reorganizations, including demutualizations and mutual holding companies.

The Committee will continue to follow these and other developments involving financial reporting as they develop. Progress will continue to be reported in future issues of *The Financial Reporter*.

*Harold E. Forbes, FSA, is an actuary at Milliman & Robertson Inc., in Bloomfield, Conn.*

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**"Currently there is divergent treatment within the industry. The focus is currently on interpreting existing standards."**

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**"X" Factor***continued from page 17*

by a factor of 100. I used the Monte Carlo method with 200 trials. The means of the populations are the same but the tail of the each distribution is different. This is reflected in the ratio of the 99% quantile to the 50% quantile.

**Concluding Remarks**

While this article discusses two approaches to justifying the choice of the "X" factor, other equally valid approach-

es undoubtedly exist. If further research is done on this topic, the following issues should be considered:

1. If exposures are measured by units of inforce such as, per \$1000 of insurance, how should the standard deviation of the mortality rates be calculated?
2. Can Monte Carlo studies be based on units of exposure other than lives?
3. Can the existence of reinsurance

and/or the level of reinsurance costs and mortality charges be used to justify the choice of an "X" factor?

4. Should an Actuarial Standard of Practice be developed to address this topic?

*Larry M. Gorski, FSA, is Life Actuary, Illinois Department of Insurance, Springfield, Ill.*

# Education & Examination Redesign—An Update

by Larry M. Gorski

The Educational and Examination (E&E) system of the Society of Actuaries will undergo significant changes effective in 2000. The current system will be replaced with a system that stresses fundamental actuarial principles and actuarial practice that are not nation-specific. The examination structure will consist of eight courses and a Professional Development requirement. The Professional Development requirement will be the mechanism for a candidate to gain knowledge that is either nation-specific or otherwise not included in the syllabi for Courses 1-8, but of relevance to the candidate's practice area. The Fellowship Admissions Course will still be the final hurdle to attaining Fellowship.

## Status Report on Implementation

What is the status of implementing the new E&E system? While Chicago Cub fans can always say "Wait until next year," the SOA doesn't have that luxury since 2000 is almost here.

Course 5 will cover underlying principles and concepts for basic practice concepts such as design, pricing and valuation across a range of practice areas, while Course 8 will focus on advanced actuarial practice in six different areas: finance, investment, health and group life, managed care, individual insurance, and retirement benefits. The description for the Individual Insurance version of Course 8 indicates that its focus will be on "advanced education on product development and design, marketing, pricing, valuation and financial statements for individual coverages including reinsurance of these coverages." Detailed reports are available for all these courses and professional development on the SOA website ([www.soa.org](http://www.soa.org)).

Progress has been made in establishing the framework for the Professional Development requirement. The September 1998 Report of the SOA Task Force on Professional Development

thoroughly explains current thinking on several key features of the framework such as the split of the required amount of credits related to traditional educational sources versus the successful completion of a project and the role of the advisor. Information on professional development has been updated and includes guidelines for advisors, and a sample project outline and letter of commitment. This is available on [www.soa.org/eande/prodev.html](http://www.soa.org/eande/prodev.html).

If you have been reading between the lines of this article, you should begin to realize some of the topics you may have studied while on the road to Fellowship won't be covered in Courses 1 through 8. For example, the Standard Valuation Law probably won't be covered in any great detail because it is nation-specific. Similarly, U.S. GAAP accounting will probably be discussed in the context of an accounting system and its impact on the measurement of profitability without exploring all of the details of GAAP.

One should not jump to the conclusion that new FSAs under the revised E&E system will be incapable of calculating CRVM reserves for life insurance products. Achieving Fellowship under the new system will require successful completion of the Professional Development course. As stated above, the Professional Development requirements are sufficiently flexible to meet the goals and objectives the goals of the candidate and relevant to the candidate's practice area.

## Role of the Financial Reporting Section

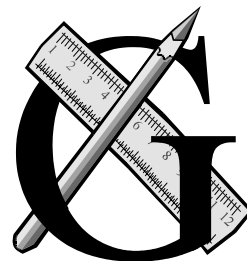
What role, if any, does the Financial Reporting Section play under the new E&E system? The September 1998 Report of the SOA Task Force on Professional Development contains the following statement "For standard practice areas, models developed by the SOA will list a range of courses, seminars, experiences and activities that can be selected to fulfill 35 units." The Life Practice Professional Development Working Group has been formed by the SOA to carry out this

assignment. The Financial Reporting Section Council is represented on this working group. It is expected that many topics will be offered to the candidate through SOA seminars and the Financial Reporting Section will take the lead in planning and presenting many of these seminars.

One thing must be noted about SOA seminars under the new E&E system. Candidates will expect the seminars to be scheduled well in advance and presented on a timely basis in order for them to be of value in setting up a program to meet the Professional Development requirements. Fulfilling this expectation may create greater demands on the Financial Reporting Section Council. Of course, this translates into more members of the Section taking an active role.

While the Financial Reporting Section and other Sections have sponsored seminars and other forms of educational opportunities in the past, the significance of these activities will undoubtedly increase under the E&E Redesign. In effect, Sections will become active participants in the education of future actuaries. The Professional Development component of the new E&E system will prove a success only through the dedicated efforts of the Sections, including the Financial Reporting Section.

*Larry M. Gorski, FSA, is Life Actuary, Illinois Department of Insurance, Springfield, Illinois and a member of the Financial Reporting Section Council.*



## Buenos Aires Seminar a Rousing Success

by Edward L. Robbins

Until 1997 the Society of Actuaries had never held seminars outside the United States. Shirley Shao broke fresh ground in that year with four very successful—and well-attended—seminars in Asia. On her enthusiastic return (Is she ever anything but enthusiastic?), the Financial Reporting Section Council began thinking of other parts of the world in which two items in particular were present: significant interest in North American actuarial financial reporting developments and emerging significant insurance markets. It culminated in a two-day seminar on August 18 and 19 in one of the world's most beautiful cities, Buenos Aires, Argentina. The Council sponsored the seminar and invited the actuarial communities of Argentina, Chile, and Brazil to attend. Much to our pleasant surprise, we had over 200 registrants from those countries, and the seminar was a great success. In addition, there were about 20 attendees from the United States.

The seminar was put together primarily because the Financial Reporting Section felt that there was a need to speak to several subject areas of interest to actuaries practicing in Latin America. GAAP

accounting is necessary for Latin American subsidiaries of US parents. Additionally, GAAP accounting is necessary for any Latin American company that wishes to enter the capital markets in the United States. Cash flow testing, as we are aware in the United States, is a far more comprehensive way to evaluate reserve adequacy and company viability than traditional methodology, primarily because it brings into consideration the asset side of the balance sheet, and it is not a tool that is regularly used south of the border.

It was also felt worthwhile to discuss the major aspects of mergers and acquisitions, due to the significant amount of such activity taking place

over the last few years in South America and the emphasis on embedded value in the acquisition process. Finally, inquiries with local actuaries resulted in a significant perceived need for discussion of actuarial audit techniques.

A second reason to put on the seminar was to foster closer relationships between the actuaries practicing in both these parts of the world. We all gained further insights into actuarial adaptation to our respective markets and economies and the differences between our respective education and examination systems. Beyond that, we started some very strong friendships between our two communities.

The local sponsor of the seminar was the "Professional Council of Economic Sciences for the Capital District of Buenos Aires." The Council has about 40,000 members, consisting of accountants, economists, and actuaries. The Council permanently occupies a modern building in downtown Buenos Aires. The facilities were beautiful and functional, and the seminar was handled



pragmatic insights. This discussion was detailed enough to include, for example, such abstruse concepts as the SFAS 115 "Shadow DAC" and deferred taxes.

Carl Harris covered the appointed actuary's role in the United States and discussed the heavy current emphasis on cash flow testing and the regulatory requirements. Peter Duran then came back on stage and dealt with advanced cash flow testing topics, including uses of the cash flow testing process and how to get significant useful by-product information out of the process.

I was next, as I served the double duty of seminar coordinator and faculty

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***"It was also felt worthwhile to discuss the major aspects of mergers and acquisitions, due to the significant amount of such activity taking place..."***

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in a highly professional manner by the local staff of the Council down to the small details, including excellent simultaneous translation facilities. Dr. Simon Groll, a member of the Board of Directors of the Council, opened and closed the seminar.

The faculty members presenting were all members of the Society of Actuaries: Edward Robbins, Peter Duran, Carl Harris, John Nigh, Antonio Gonzalez, and Camilo Salazar. Several served double duty, presenting more than one session.

Peter Duran and John Nigh spoke on GAAP topics first. Basic GAAP concepts and principles were first covered, followed by the details of the rules, and

member. I covered the actuarial aspects of auditing and the external auditor's perspective on the audit process. I went into excruciating detail on reserve reviewing methodologies and stratified sampling techniques and somehow managed to keep a few people awake during the session. John Nigh then returned to the podium and dealt with a related topic—the actuary's role in the due diligence process.

Camilo Salazar and Antonio Gonzalez wrapped things up with the mergers and acquisitions environment in the United States and Latin America. They gave a brief recent history of acquisitions in this hemisphere and discussed the actuarial appraisal process.

I would like to express my great appreciation to the many people involved who helped make this seminar a success. Coordination between the actuarial communities in four countries is not a simple thing. The faculty, the administrative staff of the local Professional Council, the Society of Actuaries staff, and the many volunteers from the actuarial organizations in Argentina, Brazil, and Chile all deserve our thanks for making this seminar a success.

The Asian and South American experiences have been so positive that the Section Council is contemplating two more foreign-based seminars. One is for the Caribbean actuaries and a second would be for emerging countries in eastern Europe. The local participants and the panel leaders have been so enthusiastic that the Section Council feels mandated to continue riding the rails of the education train on North American life company financial reporting practices.

*Edward L. Robbins, FSA, is Senior Actuary, Zurich-Kemper Life Insurance Companies, Long Grove, Ill., Treasurer of the Financial Reporting Section Council, and an organizer of the Buenos Aires seminar.*

### Picture captions:

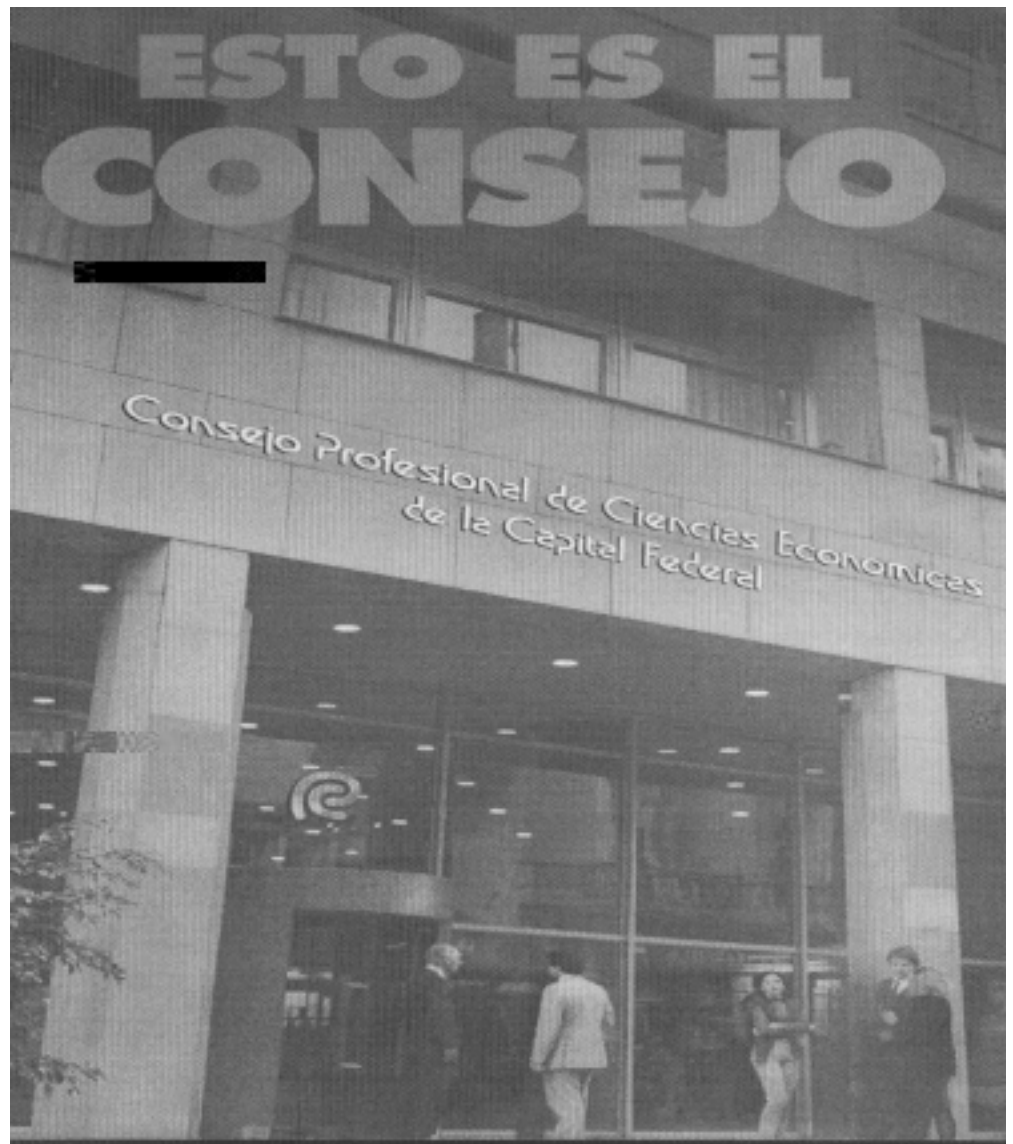
#### Top:

*Entrance to the Professional Council of Economic Sciences for the Capital District of Buenos Aires modern headquarters.*

#### Bottom:

*Hosts, speakers and spouses pose at the banquet. Front center, Marcelo Artana, Chief Administrator of the Professional Council; Back, 3rd from left, Dr. Simon Groll, Sponsor Delegate and a Director of the Council. Back, 1st, 2nd and 3rd from right, speakers Carl Harris, Peter Duran and Edward Robbins.*

## Pictures from Buenos Aires Seminar





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