

The Financial Reporter

September 2006 Issue No. 66

The Newsletter of the Life Insurance Company Financial Reporting Section

Implementation Issues Arising from SOP 05-1

by Andy Ferris and Patricia E. Matson

Editor's Note: This article represents the views of the authors, and should not be interpreted to represent the views of their firm.

In September 2005, the AICPA issued SOP 05-1, *Accounting by Insurance Enterprises for Deferred Acquisition Costs in Connection with Modifications or Exchanges of Insurance Contracts*. The SOP provides accounting guidance for DAC on internal replacements of insurance and investment contracts other than those specifically mentioned in FAS 97. This SOP becomes effective in fiscal years beginning after December 15, 2006, with earlier adoption encouraged. The purpose of this article is not to summarize or present the SOP itself, as that has already been well done by others. Instead, this article attempts to summarize the various implementation issues many companies are currently facing with respect to implementing this new requirement. The common implementation issues fall into four broad categories:

- Interpreting the criteria used to define an internal replacement,
- Interpreting the criteria used to define a substantial change,
- Implications on DAC, and
- Administrative challenges associated with implementation

Interpreting the Criteria Used to Define an Internal Replacement

The SOP uses a very broad definition of internal replacement, which is more encompassing than one might expect. It defines an internal replacement as any of the following:



- A change in benefits, features, rights, or coverage that occurs by the legal exchange of one contract for a new contract,
- An amendment, endorsement, or rider that is added to an existing contract, or
- The election of a benefit, feature, right or coverage within a contract.

Modifications resulting from the last bullet above, where the contract holder makes an election that was in the original contract, would not be considered an internal replacement as long as the election meets specific conditions specified in paragraph 9 of the SOP. Paragraph 9 will be discussed in more detail below.

Additionally, the SOP introduces the concepts of integrated and nonintegrated contract features. Integrated contract features are those for which the benefits provided by the feature can be determined only in conjunction with the account

continued on page 3 >>

The Financial Reporter

September 2006 Issue No. 66

*Published by the Life Insurance Company
Financial Reporting Section of the Society
of Actuaries*

475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
p: 847.706.3500
f: 847.706.3599
w: www.soa.org

This newsletter is free to section members. A subscription is \$15.00. Current-year issues are available from the communications department. Back issues of section newsletters have been placed in the SOA library and on the SOA Web site (www.soa.org). Photocopies of back issues may be requested for a nominal fee.

2005-2006 Section Leadership
Darin G. Zimmerman, Chairperson
Henry W. Siegel, Vice-Chairperson
Jerry F. Enoch, Secretary
Richard H. Browne, Treasurer
Errol Cramer, Board Partner
Kerry A. Krantz, Council Member
(Web Liaison)
Mike Leung, Council Member
Raymond T. Schlude, Council Member
Yiji S. Starr, Council Member
Vincent Y.Y. Tsang, Council Member

Rick Browne, Newsletter Editor
KPMG LLP
303 East Wacker Drive • Chicago, IL • 60601
p: 312.665.8511
f: 312.275.8509
e: rhbrowne@kpmg.com

Jerry Enoch, Associate Editor
e: Jerry_F_Enoch@LafayetteLife.com

Carol Marler, Associate Editor
e: carol.marler@ge.com

Keith Terry, Associate Editor
e: keith_terry@farmersinsurance.com

Joe Adduci, DTP Coordinator
e: jadduci@soa.org
p: 847.706.3548

Meg Wer, Director, Section Services
e: mueber@soa.org

Jeremy Webber, Project Support Specialist
e: jwebber@soa.org

Facts and opinions contained herein are the sole responsibility of the persons expressing them and shall not be attributed to the Society of Actuaries, its committees, the Life Insurance Company Financial Reporting Section or the employers of the authors. We will promptly correct errors brought to our attention.

Copyright ©2006 Society of Actuaries.
All rights reserved.
Printed in the United States of America.

What's Inside

1 Implementation Issues Arising from SOP 05-1

A look at some of the issues insurance companies are facing as they implement this new SOP, effective in fiscal years beginning after December 15, 2006.

Andy Ferris and Patricia E. Matson

7 Chairperson's Corner—Evolution

Darin G. Zimmerman

8 Simplifying Actuarial Foundations: Life Insurance Financial Reporting Based on Free Cash Flows

A generalized financial reporting structure based on a free cash-flow model.

Alfonso P. Gonzales, III

14 Implications of Economic Capital for the Financial Reporting Actuary

What is Economic Capital and why is it important for financial reporting actuaries in the United States?

Matthew D. Clark

16 RBC C3 Phase II: How Did Companies Fare at December 31, 2005?

A survey that looks at the issues companies encountered when implementing the new Risk Based Capital C3 Phase II requirements.

Don P. Wilson and Patricia E. Matson

24 What's Outside

References to articles published elsewhere that may interest our readers.

value or other contract-holder balances related to the base contract. Nonintegrated contract features are those for which the determination of the benefit provided by the feature is not related to or dependent upon the account value or other contract-holder balances related to the base contract. That is, the election of a nonintegrated contract feature alone does not change the existing base contract. Such benefits are typically accounted for as separately issued contracts and not considered an internal replacement. Election of integrated contract features requires the insurer to further consider the SOP's requirements.

A first implementation step for many companies has been to identify a set of transactions that the SOP considers to be internal replacement transactions. In defining such transactions, some of the "gray" areas that have arisen in trying to interpret the language of the SOP include:

- Whether the election of a benefit feature (that does not meet the criteria in paragraph 9 of the SOP) by some, but not all, certificate holders in a group insurance policy is classified as an internal replacement under the SOP.

As outlined in paragraph A-29 of the SOP, the facts and circumstances of the specific situation should be evaluated to determine whether the SOP applies at the group level or the certificate level. For example, if the contract did not have individual participant underwriting, the SOP would likely be applied at the group level. If this were the case, an assessment would need to be made as to whether the election of the feature by a portion of the certificate holders is material enough to result in an internal replacement for the contract as a whole. If instead, the facts and circumstances result in the SOP being applied at the certificate level, a portion of the certificates would be considered internal replacements and a portion would not. Therefore, the accounting treatment would be different for the certificates considered internal replacements. This is clearly an area that involves significant judgment and could result in a wide range of practice among companies.

- Whether revisions to contract language could limit the extent to which contracts are classified as internal replacements when policyholders elect optional benefit features on variable annuity contracts.

Most variable annuity contracts are designed to allow the policyholder to add death or living benefit riders subsequent to issuance of the original contract for an additional charge. Election of such features is becoming increasingly common. According to paragraph 9 of the SOP, such options would typically result in an internal replacement and likely require an associated DAC write-off.

There appear to be two tactics companies might use to limit the extent to which DAC must be written off upon such elections. Some contracts are written such that the option to add the rider expires annually. The companies with such contracts might elect not to renew the option. However, this may decrease the attractiveness of the contract to the policyholder and increase lapsation.

Alternatively, some companies might include specific provisions in the original contract regarding the terms of the optional rider, including pricing. Additionally, if the rider election did not require underwriting, the only remaining hurdle to overcome is the requirement to account for the election of the option from the original issue date of the contract. Depending on the nature of the option, it would be accounted for under either SOP 03-1 or FAS 133. To the extent expected utilization of the option is a small proportion of the overall block of business for a given issue year, reserves may not be required based on materiality.

As previously stated, in most cases election of death or living benefit riders would likely be classified as an internal replacement. However, there may be some contractual changes companies can make such that election of these options would not be considered an internal replacement.

- Whether the sole fact that an existing contract is terminated and a new contract is immediately issued results in an internal replacement under the SOP.

The exceptions to being classified as an internal replacement outlined in paragraph

continued on page 4 >>

9 of the SOP only apply to modifications “that result from the election by the contract holder of a benefit, feature, right, or coverage that was within the original contract.” A literal read of this language would imply that any instance of a contract being terminated and replaced by another contract is automatically an internal replacement. However, paragraph A-4 of the SOP states that the substance, rather than the legal form, of the transaction should drive the accounting treatment. In light of this, it appears that there could be situations in which a contract exchange that is in substance the same as a contract modification meeting the exclusion criteria of paragraph 9 of the SOP would not be considered an internal replacement.

For example suppose a simple equity-indexed annuity did not offer multiple buckets of investment options but simply applied to all funds a specified interest crediting strategy based a specified index. Many of these types of EIA contracts allow the contract holder to elect at the end of the term an option to earn a fixed rate of interest declared by the company on the entire account value and forever discontinue participation in the index. If such option were elected by the policyholder, the insurance company might issue a supplemental contract or entirely new stand-alone contract to credit interest at a fixed rate going forward. In this instance, even though a new contract would be issued, if the “substance over legal form” instruction were applied, the event might not create an internal replacement as defined by the SOP.

- Whether a specific timeframe should be considered in evaluating whether the termination of one contract and the purchase of another may be an internal replacement.

The SOP does not include any specific criteria regarding the time period that should be used to define whether a contract is a replacement contract as compared to an independent, newly purchased contract. A wide range of interpretations could be used in implementing the SOP. Some companies might require that the termination of one

contract and the purchase of another occur on the same day in order to be considered a replacement and evaluated under the SOP. Others might extend that period to a month or longer to account for administrative delays or delays on the part of the contract holder in deciding which replacement contract to purchase. It is likely that most companies will use a relatively short period, but there is clearly some room for interpretation.

Interpreting the Criteria Used to Define a Substantial Change

Once an internal replacement has been identified, the next step is to determine whether, under the provisions of the SOP, the replacement contract is considered substantially changed from the replaced contract. If an internal replacement occurs and the rights and obligations of the parties to the contract are substantially unchanged from those under the replaced contract, the replacement contract is accounted for as a continuation of the replaced contract. On the other hand, if the internal replacement occurs and results in a replacement contract that is substantially changed from the replaced contract, the replaced contract should be accounted for as extinguished as described in the SOP. This would mean that all unamortized DAC, unearned revenue liabilities, and deferred sales inducement assets from the replaced contract would no longer be deferred in connection with the replacement contract. To qualify as substantially unchanged, the SOP contains six criteria that must be satisfied.

One of the criteria requires that the kind and degree of insurance risk with the contract be not significantly changed. A second requirement calls for no change in the nature of the investment return to the policyholder. These two of the six criteria to be substantially unchanged offer potentially challenging interpretation issues.

In determining whether an internal replacement involves a substantial change, some of the “gray” areas that have arisen in trying to interpret the language of the SOP include:

- How to define “significant” for purposes of determining if there is a significant change in the kind or degree of insurance risk.

This issue is one that commonly arises in the interpretation of GAAP literature. Presumably,

each FAS 97 contract will be subject to some type of significance test at issue to determine whether it is an insurance or investment contract (as required by SOP 03-1). A comparable test could be used for purposes of applying the SOP. A general rule of thumb for significance is a 5-percent threshold. This threshold may be applied as the percentage change in insurance benefits, percentage change in in-force benefits, or percentage change in net amount at risk.

- The extent to which re-underwriting a contract would result in a significant change in the kind or degree of insurance risk.

Paragraph A-27 of the SOP states that “re-underwriting the entire contract would indicate a substantial change in the kind or degree of mortality, morbidity, or other insurance risk. Several of the examples mentioned in appendix B of the SOP use the term “substantive underwriting.” It is unclear exactly what is meant by “entire contract” or “substantive underwriting,” however, it appears that underwriting that is considered to be minor relative to the overall risks of the contract (for example, purely financial underwriting, re-underwriting of a juvenile at age 18 for smoking only) would not be considered a substantial change.

- Whether a change in the guaranteed rate constitutes a change in the investment return rights of the contract.

In many instances, the guaranteed rate has little bearing on the actual rates credited to policyholders. Depending on the facts and circumstances for a given company, a change in the guaranteed rate may result in a substantial change (for example, if there is an expectation that the guaranteed rate will have a significant impact on the credited rates over the life of the contract) and in other cases may not.

- The extent of specificity required in the original contract regarding the price for election of an additional feature to meet the “no additional premium” requirements.

The SOP indicates that any additional charges in excess of those defined in the original contract would be considered a substantial change. In addition, paragraph A-7 of the SOP states

that “contractual provisions that allow the contract holder to elect to add future coverage at then-current rates, subject to a stated minimum and maximum, generally are not specific enough to satisfy [the Section .09] requirement unless the range between the current rates at contract inception and maximum is narrow.” To the extent the charges are defined in some manner in the original contract and are within a “narrow range,” even if the specific price is not defined, it appears that this could be considered substantially unchanged. The interpretation of the term “narrow range” may vary from company to company and will result in diversity of practice with respect to this issue.

Implications on DAC

Once an internal replacement is classified as substantially changed or unchanged, the SOP outlines how DAC should be treated for those contracts. Some of the more challenging implementation issues that have been identified include the following:

- DAC is commonly allocated to cohorts by calendar year with no clearly identified policy-level allocations. Therefore, writing off DAC for a portion of a cohort that is deemed substantially changed may create practical implementation issues. Companies with significant activity will likely need to implement a system flag to identify which policies within a cohort involve internal replacements that are substantially changed contracts, and create coding to lapse the policy from its existing cohort and add it as new to the current quarter’s cohort. An alternative method of addressing this issue would be to apply a ratio to

continued on page 6 >>



DAC balances and EGPs based on the estimated proportion of contracts that undergo a substantial change. Lastly, there may be companies that look to the overall impact of replacement activity, determine that it does not have a materially impact on the aggregate DAC balance, and therefore, do not make any adjustment.

- For a contract deemed to be substantially unchanged, the SOP states that costs (other than renewal commissions) should be treated as maintenance expenses and renewal commissions meeting the deferral criteria of FAS 60 and/or FAS 97 should be deferred and amortized. Some companies have interpreted this to imply that commission on new premiums associated with the contract change should be treated as a maintenance expense rather than an acquisition expense, since these are not “renewal” commissions. However, it appears reasonable that as long as such commissions meet the criteria for deferral under FAS 60 and/or FAS 97, they should be deferred and amortized.
- The application of SOP 05-1 could have a significant impact on how lapses are recorded, and therefore indicate a need for revised lapse assumptions. For example, there may be companies that previously carried over DAC for contracts that are now considered substantially changed under the SOP. These companies may have significantly more “lapses” underlying the DAC assumptions than they did previously, and will need to adjust assumptions accordingly.



Andy Ferris, FSA, CFA, MAAA, is a manager with Deloitte Consulting LLP in Chicago, Ill. He may be reached at anferris@deloitte.com.



Patricia E. Matson, FSA, MAAA, is senior manager actuary with Deloitte Consulting, LLP in Hartford, Conn. She may be reached at pmatson@deloitte.com.

Administrative Challenges Associated with Implementation

Once companies have decided on their approach for implementing the SOP, the next step is to design a method for tracking replacements that occur. This would typically involve assigning a “flag” or indicator in the administrative and/or accounting systems to track internal replacements. The systems issues involved with the implementation of this SOP could be considerable. Some of the systems issues that have arisen so far include:

- There is a complex set of rules outlined in the SOP related to defining an internal replacement, determining whether a benefit feature is integrated, and determining whether an internal replacement involves a substantial change. All of these rules need to be coded in some manner in companies’ administrative systems in order to

appropriately track, which policies’ DAC balances should be retained and which should be written off. In addition, there are numerous combinations of base policies and optional features to be addressed, potentially resulting in hundreds of combinations of contract exchanges and modifications with varying treatment under the SOP. This could result in a significant effort by companies’ actuarial, accounting, and IT departments to implement, and will require careful and detailed communications across functions.

- An internal replacement could result when a policy is lapsed from one legal entity and reissued by another legal entity in the same corporate family. A literal interpretation of the SOP would imply that such a contract would be an internal replacement at the consolidated entity level, and therefore should be evaluated under the SOP. However, it is likely that such action would be very difficult to track across different legal entities with potentially different administrative systems.

Summary

The issues outlined in this article represent only a fraction of those that companies are currently struggling with as they are trying to implement SOP 05-1. In many instances, the interpretation decisions can have a significant impact on the financial results for the company. Additionally, subtle differences in the facts and circumstances from one company to the next could result in very different interpretations and financial results, and therefore must be considered carefully. As with any area of GAAP reporting, consistency of interpretation across contracts and reporting years is critical.

In light of the many issues to be addressed, companies should perform a detailed evaluation of how SOP 05-1 will impact each of their products and the associated administrative requirements as soon as possible (to the extent they have not done so already) in order to be well-prepared when this SOP becomes effective. **S**

Evolution

by Darin G. Zimmerman

The more things change, the more they stay the same. As trite business clichés go, this is as popular as any, but what exactly does it mean?

As my penultimate column, this is my opportunity to strike the existential pose and wax poetic about the fact that human nature has no history. Each generation born harbors the same hopes, dreams, and desires as the generation that preceded it. Following, in no particular order, are some observations related to this insight:

The nature of life (and not just human life) is a series of choices concerning whether to compete or cooperate. We cooperate with our teammates or coworkers to compete against other teams or companies. The insight here is that bad things happen when we confuse these two groups. When we cooperate with competitors, we get convicted for price-fixing. When we compete with teammates or coworkers, our organizations are weakened, leaving us more vulnerable to other competitors. This is as true today as it was when our ancestors lived in caves and teamed up against the mammoths. (Pity the fool who tried to cooperate with the mammoths.)

A hundred years ago, actuaries knew that if we don't police our industry and ourselves, government is only too happy to hire someone else to do it for us. Ask any accountant if they would prefer to return to the days when they were self-policed, back before the PCAOB, and you will get a gargantuan, "DUH!" (Self-regulation is like the soul: once it is gone, there is no opportunity to reclaim it.)

It doesn't matter whether the insurance product sold is old, like 10-year term, or new, like a variable annuity with 5-percent rollup with a guaranteed lifetime withdrawal feature. Fundamentally, our industry is still in the business of selling promises. We all know the three most important factors in selling real estate are location, location, location. I submit the three most important factors in selling promises are reputation, reputation, reputation. The pursuit of short-term profits at the expense of business fundamentals can only damage our reputation and our industry as a whole.

Technology has increased the speed, power and complexity of our models. There are computers that run

at speeds approaching a teraflop (one trillion calculations per second) and can store the phone numbers of every person in America in a piece of memory the size of a quarter. And yet even with all of these changes we are still unable to predict the future. Some models are useful for providing insights as to what the future may hold. Some models produce results that are very misleading. It is our job to distinguish between the two; however, we must never lose sight of the fact that no model is able to predict a future that is fundamentally different from the past.

For as long as there is capital, we will need (and produce) financial reports. The content of those reports will continue to be dictated by the simple question, "Who's asking?" Regulators want answers to the questions of solvency and fulfillment of promises. Investors and investment analysts want answers to the question of, "How big of a return can I expect from my capital, and how soon can I put it in the bank?" The Taxman will continue to ask, "How much can a take before I kill you?" (Note the absence of the promise to take no more than that amount.) Our accounting systems used to address these questions will continue to evolve in an effort provide evermore useful information to the stakeholders. But don't expect one system to ever satisfactorily answer fundamentally different questions.

Certain personality traits never go out of style such as honesty, integrity, self-discipline, and attention to detail. Rest assured, they never will. §



Darin G. Zimmerman, FSA, MAAA, is a managing actuary with AEGON USA, Inc. in Cedar Rapids, Iowa. He may be reached at dzimmerman@aegonusa.com.

Simplifying Actuarial Foundations: Life Insurance Financial Reporting Based on Free Cash Flows

by Alfonso P. Gonzales, III



Actuaries and students of Atkinson [1] are no strangers to the myriad concepts and ideas used in life insurance financial reporting, whether statutory, GAAP or value-based. Unfortunately the complexity of the actuarial theory of financial reporting does little to bring it in harmony with mainstream financial accounting ideas done somewhat more simply by CFA charter holders and MBA students. This can be a significant hurdle in our profession's quest for growth outside our traditional domain.

It is in this light that I propose an improvement and simplification of our theory of financial reporting by organizing them around the free cash-flow model. As will be demonstrated here, this will lead us to a compact, simple and intuitively elegant model, which captures all actuarial reporting concerns and which also unifies with ideas in mainstream financial accounting. While this idea is already utilized by Atkinson [1] and Girard [3], simpler ways of discussing and analyzing free cash-flow models remains elusive to many actuaries to date. We hope this paper will serve this purpose, thereby providing a good, accessible foundation for the further study of more advanced concepts in both the actuarial and financial disciplines.

The Free Cash-Flow (FCF) Model for Insurance Liabilities

We go back to the basics of the various cash transactions made in life insurance. For $t = 0$ to N , the firm's assets, A_t , increase with the payment of premiums P_t and investment income on assets $II_t = A_{t-1} \cdot i_t$ (excluding interest on cash flows), and decrease with the payment of benefits B_t , expenses E_t , taxes Tax_t and repayments to shareholders CF_t (referred to by Stowe [4] as free cash-flows to equity). In the final year, assume that $A_N = 0$. We summarize these movements in the firm's assets as

$$A_t = A_{t-1} + P_t + II_t - B_t - E_t - Tax_t - CF_t \quad \text{for } t = 0 \text{ to } N.$$

Actuaries are accustomed to this equation through the asset share model, where $CF_t = 0$ and A_t represents the accumulation of assets managed by the firm. In the FCF model, however, we only retain enough assets in the firm to assure solvency and comply with regulation—in essence, assets should at least equal solvency reserves plus required capital. With this, shareholder repayments (or infusions) CF_t now become our balancing item and we get (1), which we immediately recognize as “distributable earnings” in Atkinson [1]. (We utilize the difference notation $\Delta X_{t-1} = X_t - X_{t-1}$.)

$$A_t = \text{Solvency Reserves}_t + \text{Required Capital}_t$$

$$CF_t = P_t + II_t - B_t - E_t - Tax_t - \Delta A_t - I \quad (1)$$

We now construct our financial statements model in the manner done in actuarial literature. In our income statement we compute the firm's net income, Inc_t , as premiums plus investment income minus benefits, expenses, taxes, increase in policy liabilities L_p and increase in deferred tax liability, DTL_t . The role of the latter will be apparent shortly.

$$Inc_t = P_t + II_t - B_t - E_t - Tax_t - \Delta L_{t-1} - \Delta DTL_{t-1} \quad (2)$$

In the balance sheet we define the firm's equity (or net worth), Eq_t , as the value of the firm's required assets, A_t , minus policy liabilities and the DTL .

$$Eq_t = A_t - L_t - DTL_t \text{ for } t = 0 \text{ to } N; \quad (3)$$

$$Eq_N = 0.$$

Pasting the income statement and the balance sheet together is the cash-flow statement where our fundamental identity is

$$CF_t = Inc_t - \Delta Eq_{t-1}. \quad (4)$$

This identity is assured by our construction of equations (1) to (3); we note that

$$\begin{aligned} CF_t &= P_t + II_t - B_t - E_t - Tax_t - \Delta A_{t-1} \\ &= P_t + II_t - B_t - E_t - Tax_t - \Delta(L_{t-1} \\ &\quad + DTL_{t-1}) - \Delta A_{t-1} + \Delta(L_{t-1} + DTL_{t-1}) \\ &= Inc_t - \Delta(A_{t-1} - L_{t-1} - DTL_{t-1}) \\ &= Inc_t - \Delta Eq_{t-1}. \end{aligned}$$

An intuitive interpretation of (4) is apparent when we note that $\Delta Eq_{t-1} = Inc_t - CF_t$; net worth increases with net income and decreases with free cash flows. Alternatively, we can rewrite it as (5), and interpret accounting income as emerging from free cash flows as well as accruals recognized in the balance sheet.

$$Inc_t = CF_t + \Delta Eq_{t-1} \quad (5)$$

In practice the cash-flow statement rarely appears as shown in (4). The different cash flows are rearranged further and classified under operating, investing or financing cash flows. For our purpose here we further write down (4) as

$$CF_t = ACF_t - LCF_t - Tax_t \quad (6)$$

where we introduce our vector of asset and liability cash flows as follows:

$$\begin{aligned} ACF_t &= II_t - \Delta A_{t-1} = A_{t-1}(1+i_t) - A_t; \\ LCF_t &= -P_t + B_t + E_t. \end{aligned}$$

Our formula for ACF_t appears in Girard [3] and is the series of interest and principal payments the firm must receive (or invest) in the process of funding liability cash flows, provisions for adverse deviations and shareholder repayments. Liability cash flows are self-explanatory.

We now turn to the complex issue of corporate income taxes and how it can be simplified. Assume that current income tax equals a fraction T of taxable income, where the latter is equal to the firm's pretax free cash flows, $ACF_t - LCF_t$, plus an accrual based on the tax value of assets and liabilities, which may not necessarily be the same as the book value of assets and liabilities in (3).

$$Tax_t = T(ACF_t - LCF_t + \Delta TVA_{t-1} - \Delta TVL_{t-1}) \quad (7)$$

If we desire current plus deferred income taxes to be proportional to accounting net income, that is,

$$Tax_t + \Delta DTL_{t-1} = T(ACF_t - LCF_t + \Delta A_{t-1} - \Delta L_{t-1})$$

Then we would have to set deferred tax liability as

$$DTL_t = T(A_t - L_t) - T(TVA_t - TVL_t) \quad (8)$$

And our final free cash-flow formulas for life insurance immediately follow:

$$Inc_t = (1-T)(CF_t + \Delta A_{t-1} - \Delta L_{t-1}) = (1-T) \quad (9)$$

$$(P_t + II_t - B_t - E_t - \Delta L_{t-1})$$

$$Eq_t = A_t - L_t - DTL_t = (1-T)(A_t - L_t) \quad (10)$$

$$+ T(TVA_{t-1} - TVL_{t-1})$$

$$CF_t = Inc_t - \Delta Eq_{t-1}$$

This formula trio is a simple, compact, explicit and more intuitively elegant way of presenting distributable earnings in the context of financial accounting. With this, an explicit formula for book return on equity immediately follows:

$$ROE_t = \frac{Inc_t}{Eq_{t-1}} = \frac{(1-T)(P_t + II_t - B_t - E_t - \Delta L_{t-1})}{(1-T)(A_{t-1} - L_{t-1}) + T(TVA_{t-1} - TVL_{t-1})} \quad (11)$$

And we may write our embedded value or appraisal value, MV_t , as follows, given the cost of shareholder capital k_t :

$$MV_{t-1} = \frac{CF_t + MV_t}{1 + k_t} \quad (12)$$

for $t = 1$ to N .

We may alternatively compute income as free cash flows plus increase in embedded values and get economic income as defined in Brealey [2]:

continued on page 10 >>

$$EconInc_t = CF_t + \Delta MV_{t-1} = MV_{t-1} k_t \quad (13)$$

This model should be sufficient background from which one could understand the demonstration by Girard [3] of the equivalence of the indirect (embedded value) and direct methods of computing the fair value of liabilities; we shall not discuss it anymore.

The FCF Model for Corporate Finance

The FCF model is a core concept in the Discounted Cash Flow (DCF) method used in Corporate Finance, and its construction follows closely what we did for life insurance; see Brealey [2], Stowe [4]. Consider a firm that sells goods and services in the market, manufactures these out of raw materials (inventory) and depreciable fixed assets, and finances its operations through debt and equity. On the income statement, let us define earnings before interest and taxes (EBIT) as sales less the cost of goods sold, operating expenses and fixed-asset depreciation, denoted by $Sales_t$, CGS_t , E_t and Dep_t , respectively.

$$EBIT_t = Sales_t - CGS_t - E_t - Dep_t \quad (14)$$

From $EBIT$ we deduct interest on debt, $DebtInt_t = L_{t-1} \cdot d_t$, and provision for current and deferred income taxes to get our net income.

$$Inc_t = EBIT_t - DebtInt_t - Tax_t - \Delta DTL_{t-1} \quad (15)$$

As suggested by (5), however, every accounting income or expense item has a cash component as well as an accrual component that goes into the balance sheet. Sales, for instance, are made up of cash sales as well as credit sales accrued in the balance sheet as an accounts-receivable asset, Rec_t :

$$Sales_t = Cash Sales_t + \Delta Rec_{t-1} \quad (16)$$

For cost of goods sold the basic formula for year-end inventory $Inv_t = Inv_{t-1} + Purchases_t - CGS_t$ yields us the cash and accrual components of cost of goods sold as follows:

$$CGS_t = Purchases_t - \Delta Inv_{t-1} \quad (17)$$

Expenses may be written as cash expenses paid plus increase in accounts payable. This is most analogous to life insurance benefit costs being equal to benefits paid plus increase in policy liabilities.

$$E_t = ExpensePaid_t + \Delta Payables_{t-1} \quad (18)$$

Finally, fixed assets refer to property, plant and equipment used by the firm in the production of its goods. The value of fixed assets increases with new fixed asset purchases and decreases with depreciation expense, hence we have $FA_t = FA_{t-1} - Dep_t + FA Purchase_t$. From this, we write down depreciation as:

$$Dep_t = FA Purchase_t - \Delta FA_{t-1} \quad (19)$$

We then consolidate all accrued items in the balance sheet as done in (20) and (21). First of all, we define net working capital as receivables plus inventory net of payables:

$$NWC_t = Rec_t + Inv_t - Pay_t \quad (20)$$

Net worth consists of net working capital and fixed assets minus long-term debt and the DTL.

$$Eq_t = NWC_t + FA_t - L_t - DTL_t \quad (21)$$

Applying the formula $CF_t = Inc_t - \Delta Eq_{t-1}$ and inspecting the resulting terms should convince us that, indeed, CF_t describes free cash flows received by shareholders:

$$CF_t = Inc_t - \Delta Eq_{t-1}$$

| | |
|------------------------------------|-----------------------------------|
| (22) $F_t = (Sales_t - Rec_{t-1})$ | Cash sales, (16) |
| $- (CGS_t + \Delta Inv_{t-1})$ | Purchase of goods sold, (17) |
| $- (E_t - \Delta Pay_{t-1})$ | Expenses paid, (18) |
| $- (Dep_t + \Delta FA_{t-1})$ | Fixed asset purchase, (19) |
| $+ (L_t - L_{t-1} - DebtInt_t)$ | Cash raised from (repaid to) debt |
| $- Tax_t$ | Current income tax |

In actual financial statements, however, there exist far more transactions than the ones outlined here, some not being as clear-cut as those implied by our equations. Further elaboration of the accounting model may be needed for this purpose.

Once again, we face the issue of current income taxes being based on tax books rather than accounting books:

$$Tax_t = T [EBIT_t - DebtInt_t - \Delta(NWC_{t-1} + FA_{t-1} - L_{t-1}) + \Delta(TVA_{t-1} - TVL_{t-1})] \quad (23)$$

Setting current plus deferred taxes equal to

$$Tax_t + \Delta DTL_{t-1} = T(EBIT_t - DebtInt_t)$$

we immediately derive our deferred-tax liability formula as well as our final free cash-flow formulas for corporate finance, closely following the life insurance format:

$$DTL_t = T(NWC_t + FA_t - L_t) - T(TVA_t - TVL_t) \quad (24)$$

$$Inc_t = (1 - T)(EBIT_t - DebtInt_t) \quad (25)$$

$$Eq_t = (1 - T)(NWC_t + FA_t - L_t) + T(TVA_t - TVL_t) \quad (26)$$

$$\begin{aligned} CF_t &= Inc_t - \Delta Eq_{t-1} \\ &= (1 - T)(EBIT_t - DebtInt_t) \\ &\quad - (1 - T) \Delta(NWC_{t-1} + FA_{t-1} - L_{t-1}) - T \Delta(TVA_{t-1} - TVL_{t-1}) \end{aligned} \quad (27)$$

The firm may be valued by discounting free cash flows to equity at the shareholder's cost of capital as in (12). The preferred approach in corporate finance, however, is to first appraise the value of the firm's assets as the present value of free cash flows to the firm, (28), before deducting the value of the firm's liabilities. Details on this process can be found in many corporate finance textbooks.

$$ACF_t = (1 - T) EBIT_t - \Delta[(1 - T)(NWC_{t-1} + FA_{t-1}) + T \cdot TVA_{t-1}] \quad (28)$$

$$CF_t = ACF_t - (1 - T) DebtInt_t + \Delta[(1 - T) L_{t-1} + T \cdot TVL_{t-1}]$$

A Discussion of Our Results

The life insurance FCF model provides a way of unifying our scattered financial reporting concepts—statutory, GAAP, tax and value-based—into a single financial statement model common to mainstream finance. This simplification is accomplished by a number of re-interpretations of mainstream actuarial ideas as follows:

- “Free cash flows” are now interpreted in the context of asset or capital requirements rather than in the context of (statutory) earnings, hence clearing up the rather mixed-up definition of “earnings” in Atkinson [1] and confining it to the GAAP-based interpretation preferred by

financial analysts. Divorcing “free cash flows” from earnings is analogous to MBA students interpreting “capital expenditures” in the context of investment outlays rather than as “losses.”

- We utilize a convenient formula for deferred tax liabilities that allows us to model and write down explicit formulas to describe any GAAP-type financial statement. It also gives us better appreciation of the nature of deferred taxes.
- Our choice of accounting basis may affect the emergence of net income but not of free cash flows. This gives our model the flexibility to be used for either conventional accounting or fair value appraisal purposes. This also makes the cash-flow statement an important reality check on the validity of balance sheet and income statement results.

Though the model may look simple, the FCF model nevertheless requires the user to properly model the financial statements and understand the underlying assumptions. Among the prerequisites required would be, among others, the rudiments of financial accounting, discounted cash flows, choosing the proper assumptions, and regulatory/capital requirements.

Illustration

We conclude this paper with a demonstration of our model for insurance liabilities and for corporate finance.

Assumptions for Insurance Liability

1. Product: single premium GIC; benefits plus expenses equal 40 in the first two years and 1,040 in the third year. The net single premium is equal to 959.53, the present value of liability cash flows (LCF) at 5.50 percent.
2. Required Assets equal 105 percent of the present value of LCF at 4.00 percent.
3. Policy Liability basis: Historical cost; i.e., present value of LCF at 5.50 percent.
4. Tax Basis Liability: Present value of LCF at 5.00 percent.
5. Investment income on assets: 7.00 percent
6. Assume that asset book and tax values are equal.
7. Income tax rate: 35 percent.

continued on page 12 >>>

TABLE 1: FCF Model for Insurance Liability

| Year, t | 0 | 1 | 2 | 3 |
|-----------------------------|----------|--------------|--------------|--------------|
| INCOME STATEMENT | | | | |
| Premiums | 959.53 | | | |
| Investment Income | | 73.50 | 73.50 | 73.50 |
| Benefits and Expenses | | 40.00 | 40.00 | 1,040.00 |
| Δ Policy Liabilities | 959.53 | 12.77 | 13.48 | (985.78) |
| Provision for Taxes | | 7.25 | 7/01 | 6.75 |
| NET INCOME | | 13.47 | 13.02 | 12.53 |
| Book ROE | | 15.69% | 17.47% | 20.03% |
| BALANCE SHEET | | | | |
| Assets | 1,050.00 | 1,050.00 | 1,050.00 | 0.00 |
| Policy Liabilities | 959.53 | 972.31 | 985.78 | 0.00 |
| DTL | 4.63 | 3.19 | 1.64 | 0.00 |
| NET WORTH | 85.84 | 74.51 | 62.58 | 0.00 |
| CASH FLOW STATEMENT | | | | |
| Net Income | | 13.47 | 13.02 | 12.53 |
| Less Δ Net Worth | (85.84) | 11.33 | 11.93 | 62.58 |
| Free Cash Flows to Equity | (85.84) | 24.80 | 24.95 | 75.11 |
| Embedded Value at 15% | 89.81 | 78.49 | 65.31 | 0.00 |

Assumptions for Corporate Finance


1. Sales and operating expense projections for the next three years are given in Table 2.
2. Cost of goods sold equals 65 percent of sales.
3. Fixed asset equipment was purchased for 15,000 at the beginning of the project, which is depreciated straight-line for the next three years.
4. Net working capital equals 20 percent of next year's projected sales.
5. Long-term debt: 14,000 borrowed at the beginning of the project; 7.00 percent interest; principal repayment for the next three years equals 2000, 2000 and 10000, respectively. Assume that the debt's book and tax values are equal.
6. Income tax rate is 35 percent. Assume there are no deferred taxes.
7. For pedagogical purposes we re-arrange the cash-flow statement in a manner that will highlight the emergence of free cash flows to firm and equity in the manner discussed in Stowe [4]. 

TABLE 2: FCF Model for Corporate Finance

| Year, t | 0 | 1 | 2 | 3 |
|----------------------------|--------------|--------------|--------------|----------|
| INCOME STATEMENT | | | | |
| Sales | | 30,000 | 40,000 | 50,000 |
| Cost of Goods Sold | | 19,500 | 26,000 | 32,500 |
| Expenses | | 4,500 | 5,000 | 5,500 |
| Depreciation | | 5,000 | 5,000 | 5,000 |
| EBIT | | 1,000 | 4,000 | 7,000 |
| Interest on Debt | | 980 | 840 | 700 |
| Provision for Taxes | | 7 | 1,106 | 2,205 |
| NET INCOME | | 13 | 2,054 | 4,095 |
| Book ROE | | 0.19% | 34.23% | 81.90% |
| BALANCE SHEET | | | | |
| Net Working Capital | 6,000 | 8,000 | 10,000 | 0 |
| Fixed Assets | 15,000 | 10,000 | 5,000 | 0 |
| ASSETS | 21,000 | 18,000 | 15,000 | 0 |
| Long Term Debt | 14,000 | 12,000 | 10,000 | 0 |
| NET WORTH | 7,000 | 6,000 | 5,000 | 0 |
| CASH FLOW STATEMENT | | | | |
| Net Income | | 13 | 2,054 | 4,095 |
| + Debt Interest x (1-T) | | 637 | 546 | 455 |
| - Δ Assets | (21,000) | 3,000 | 3,000 | 15,000 |
| FCF TO FIRM, ACF_t | (21,000) | 3,650 | 5,600 | 19,550 |
| - Δ Long Term Debt | 14,000 | (2,000) | (2,000) | (10,000) |
| - Debt Interest x (1-T) | 0 | (637) | (546) | (455) |
| FCF TO EQUITY, CF_t | (7,000) | 1,013 | 3,054 | 9,095 |
| PV of CF_t at 20% | 8,228 | 8,861 | 7,579 | 0 |

Bibliography

1) Atkinson, D. and Dallas, J. 2000. *Life Insurance Products and Finance*. SOA.
 2) Brealey, R. and Myers, S. 1996. *Principles of Corporate Finance*, 5th ed. McGraw-Hill, Inc.

3) Girard, L. 2000. "Market Value of Insurance Liabilities: Reconciling the Actuarial Appraisal and Option Pricing Models." *North American Actuarial Journal* 4(1). SOA.
 4) Stowe, J. et al., 2002. *Analysis of Equity Investments: Valuation*. Association for Investment Management and Research.

Alfonso P. Gonzales, III, FSA, CFA, is a consulting actuary in the Philippines. He may be reached at apeurope@yahoo.com.

Implications of Economic Capital for the Financial Reporting Actuary

by Matthew D. Clark



Economic capital is everywhere you look in the insurance industry these days. Almost every company is implementing a risk framework, economic capital and new chief risk officer (CRO) appointments are occurring throughout the industry. Many of you might be asking what all of the excitement is about. Should your organization follow the crowd? What is this economic capital thing, after all and how does it affect me?

There are many definitions of economic capital, with many organizations creating their own to suit their specific needs. Perhaps the most basic definition practitioners would agree on is:

“Economic capital is the amount of capital required to cover risk at a desired confidence level over a given time horizon.”

This definition appears to be harmless enough. That is, until you start to discuss the meaning of the key terms—like “amount of capital,” “risk,” “confidence level” and “time horizon.” How one defines these terms and frames them into a framework for risk measurement and management, performance measurement and financial reporting is, to say the least, the nucleus for energetic discussion and debate. The intent of this article is not to get into the nuances of the differences in the methodologies employed, but to discuss the implications to the actuaries in financial reporting roles.

Why Today?

The immediate question is why are we talking about economic capital today? It is important to understand the evolution of economic capital and why it is gaining attention now.

Over the past 20 years, the insurance market has developed a new generation of products that are both compelling to customers and that have inherent risks for insurers. Coupled with economic volatility there is a need for a framework that allows companies to understand the risks they face and to manage their capital—and then report it to regulators, rating agencies and investors. Fundamentally, the market is demanding that insurance organizations understand, manage and communicate their risks in a coherent and comprehensive manner.

Regulators and rating agencies have been pushing for new and different regulatory and disclosure standards that more clearly depict the balance sheet risks inherent in many new insurance products. In the United States, for example, we have seen the introduction of C3 Phase II and the evolving principles-based reserve methodologies.

Finally, companies are looking for opportunities to increase earnings and enterprise value. Enterprise risk management is gaining popularity with economic capital being one of the preferred mediums for measuring and aggregating risk across risk elements and businesses. Risk aggregation that appropriately reflects the diversification of risks on a company’s balance sheet is another motivating factor. Additional catalysts include the need to optimally allocate limited capital as well as reward management for creating value.

Recent Developments

Understanding and quantifying risk—today and in the future—is a global finance and insurance trend. Depending on the specific methodology employed, the appeal of economic capital is the ability to quantify and aggregate risks at the enterprise level across jurisdictions and accounting frameworks, to effectively measure performance on a risk-adjusted basis, allocate risk capital and make risk based business decisions.

The United Kingdom regulators have led the way with the introduction of the individual capital assessment framework introduced by the Financial Services Authority in 2004. The Swiss have followed suit with the Swiss Solvency Test in 2006 and the European Union is preparing Solvency II with an anticipated implementation date of 2010.

The European trend has been toward a market value methodology consistent with the framework presented by the banking industry in Basel II. The required capital is calculated over a one-year time horizon using a market value methodology. In general, the market value of the assets is either observable or easily quantified. The challenge has been in the definition and calculation of the market value of the liabilities. The use of internal models and stochastic techniques are typically required to reflect the value of the options and guarantees found in the insurance contracts.

The regulatory developments in the United States were mentioned above including C3 Phase II and Principles Based Reserving. The development of these frameworks is receiving increasing attention.

The rating agencies have also been active. Recent product development activity has resulted in products and product features that have left the traditional factor based risk based capital (RBC) approach inadequate for assessing capital requirements for many of the newer products.

Standard & Poors has introduced their enterprise risk management assessment, which focuses on the implementation of a risk management framework and internal economic capital models and processes at companies. Fitch Ratings has recently introduced their Prism capital process, which also encourages company generated economic capital models. Both of these initiatives will tend to accelerate the development of economic capital frameworks in the insurance industry.

Impact on the Financial Reporting Actuary

What does the introduction of economic capital framework(s) mean to the financial reporting actuary? It is likely that the financial reporting actuaries will be charged with computing, analyzing and reporting economic capital and related performance measures. The introduction of a new economic based accounting framework, therefore, will require the development of economic income statements and balance sheets as well as the reconciliation of the movement in values. A sophisticated and controlled environment will also be needed.

Traditionally, financial reporting has been focused on the reporting and documentation of current and recent financial conditions and results. With the introduction of an economic perspective, the focus is going to include a prospective look at financial results. An introduction of stochastic analysis will replace the deterministic historic view. Disclosures will include a range of potential financial outcomes and a reconciliation of the movement within the ranges.

The basis for the current financial reporting environment is comparability. The financial market is run by the ability to compare the results across companies with consistency. With the introduction of internal economic capital platforms comes the challenge of process control and transparency. The modeling platform will require dynamic and static assumptions, risk distributions and parameters, scenario generators, and robust models. Consistent with the Canadian and United Kingdom markets where internal models are employed, external validation will be required.

The old principal of “no pain, no gain” still holds true. The preparation of these new and different financial results will require a significant increase in human and technology resource requirements. There will be a need to transform the financial reporting and actuarial modeling frameworks. We have already seen increased activity in this area. Organizations are recognizing the need to redefine the processes to be both more efficient and to meet the increased needs of the evolving regulatory requirements.

The presentation and focus of financial statements will undergo a significant change. The movement to an economic capital framework will focus attention on movement in the value of the total organization. The traditional balance sheet presentation will need to reflect the attribution of the change in enterprise value.

Conclusion

It would be difficult to overstate the depth and breadth of change in the insurance industry today. Boards and regulators—as well as investors—are asking insurance company CEOs and their CROs to help them understand past as well as future performance, to view the risks they face in multiple dimensions. Economic capital, and other principles-based views, are here to stay. The big winners among insurance companies will be those that view these changes as opportunities, not distractions. There are opportunities to lead the crowd, not just to follow it. §



Matthew D. Clark works with the Medical Protective Company in Fort Wayne, Ind. He may be reached at matthew_clark@ge.com.

RBC C3 Phase II: How Did Companies Fare at December 31, 2005?

by Don P. Wilson and Patricia E. Matson

In the March 2006 issue of *The Financial Reporter* we reported the results of an industry survey performed by Deloitte Consulting LLP regarding the application of the new Risk-Based Capital (RBC) C3 Phase II requirements. Since the survey was performed when companies were still in the midst of complying with these regulations for the first time, we decided to revisit the topic now that the initial dust has settled.

Adopted by the NAIC on October 14, 2005, the new RBC C3 Phase II requirements were effective for year-end 2005. The regulation requires either a factor approach (the "Alternative Method") or a stochastic modeling approach (subject to a minimum "Standard Scenario" requirement) for determining the C3 component of risk-based capital for variable annuities. The C3 component covers both equity risk and interest rate risk. The requirements are complicated, involving stochastic modeling, multiple steps and various modeling and assumption choices. A background summary of the requirements was included in the March 2006 article.

Mindful that the Society of Actuaries (SOA) and American Academy of Actuaries (AAA) had already conducted their own joint survey, we decided to take a different approach. We interviewed the individuals

responsible in their companies for this work, using prepared questions and discussing any issues and concerns that arose. Our end goal was to report some "color" around the multitude of details that comprise the entire process, rather than just provide a series of statistics.

This article summarizes the results of our second survey on this topic. All of the views expressed are our personal views and are not necessarily the views of our employer.

Survey Structure

Our survey was divided into four main areas:

- Results
- Assumptions and Methodology
- Processes and Calculations
- Looking Forward

These four areas were further divided into 19 topics.

A total of 11 companies participated in the survey, all of whom adopted the stochastic modeling approach. A number of the participating companies comprise multiple legal entities, but we chose generally not to count these entities separately. Since companies are required to keep the quantification of their RBC results confidential, we limited the scope of our survey as well as this article to reflect this fact.

Results

1) Overall RBC Results

Only two of the 11 companies we surveyed had an increase in their RBC requirement as of December 31, 2005. Both of these companies were impacted by the Standard Scenario. One of these companies used the smoothing and transition rules to mitigate the increased RBC requirement. However, the other company did not apply the smoothing and transition rules as it could see no theoretical foundation for these rules.

Observation 1: Apparent Drop in RBC Requirement

Prior to implementation of these RBC regulations focus was on rider benefits that require a significantly increased capital requirement when evaluated individually. This may have given the

From Projection to RBC Requirement

The output from the stochastic projections is used to compute a Total Asset Requirement (TAR) for each legal entity. The TAR is calculated by taking the average of the worst 10 percent of all of the scenarios' asset requirements, otherwise known as the 90 percent conditional tail expectation (CTE) or CTE 90. The asset requirement for each scenario is calculated as the negative of the lowest present value of accumulated surplus at each projected year end plus the starting assets. The Standard Scenario, which utilizes a prescribed set of assumptions, is also run to determine a comparable asset requirement. If this amount is larger, it is used in place of the TAR. The RBC requirement is calculated as the excess of the TAR (or the asset requirement from the Standard Scenario if higher) over the statutory reserves. This amount could be subject to a tax adjustment and/or have smoothing and transition rules applied.

The projection model may be developed to cover both equity market risk and interest rate risk and, if this is the case, the calculated requirement must be split into its separate components for reporting in the RBC workbook.

impression that a company's overall capital requirements for variable annuity business would generally increase. This does not appear to have been the actual outcome as of December 31, 2005.

2) Smoothing and Transition Rules

Our survey revealed that the smoothing and transition rules caused considerable confusion. Four companies interpreted these rules as required since they had no Clearly Defined Hedging Strategy (CDHS) in place. One company used the first set of published rules (with NAIC approval) because they made more sense than the subsequently amended set. One company wanted to smooth the results and was therefore required to implement the transition rules. One company did not use the rules because it couldn't figure out how to apply them. This particular company found that applying different interpretations of the rules produced very different results. One company used the rules to avoid a large drop in RBC requirement while another (impacted by the Standard Scenario) used them to avoid a large increase.

3) Standard Scenario

Some of the companies we surveyed performed the calculations for multiple legal entities. Six entities from the companies in our survey were impacted by the Standard Scenario, while the other 10 entities were not. The main reasons given for being impacted were:

- Standard Scenario rules not allowing for policy design,
- Significant volumes of GMDB rollups/ratchets,
- No allowance for dynamic hedging made in the Standard Scenario.

It was also pointed out that the Standard Scenario captures only delta risk (the risk of a market drop).

4) Disaggregating Equity Market and Interest Rate Risk

Four out of the 11 companies used an integrated model approach to calculate equity market risk and interest rate risk. Two of them used the old factor-based approach for interest rate risk and calculated market risk by subtraction. One company determined market risk by subtracting the old factor-based approach for interest rate risk from the overall risk, subject to a floor of zero. Any remaining amount was the interest rate risk. The fourth company used the C3 Phase 1 approach for interest rate and calculated market risk by subtraction.

For the seven companies that did not use an integrated approach, one used a separate projection model to calculate interest rate risk, three used the old factor-based approach, one used the C3 Phase 1 approach, one used a mix of these two approaches for their various legal entities, and one had no interest rate risk to model.

5) (Peer) Reviews

Companies had a variety of reviews performed, only one of which could be termed a formal peer review. Reviewers varied between external consultants, auditors, corporate actuarial, "internal" and co-operation between the software provider and the company. Few companies have firm plans in place for future reviews. One company commented it wanted to get into better shape first—"there's no point in getting someone to say what needs fixing when you know it already."

Assumptions and Methodology

Stochastic Projections

The stochastic projections involve three main components:

- A data model of each block of business covered by the regulations,
- A stochastic generator that generates a large number of alternative real world scenarios for a range of equity and bond market returns and for interest rates, with distributions of outcomes that meet specified calibration criteria,
- A projection model that projects the accumulated surplus for the block of business for each scenario, according to Prudent Best Estimate (PBE) assumptions.

According to the regulations, "a PBE assumption would normally be defined by applying a margin for estimation error to the "best estimate" assumption ...[where] the margin for error should be directly related to uncertainty in the [assumption]."

6) Data Compression

We asked companies about their approach to data compression in their stochastic model. One company, with a relatively small in force portfolio, opted for a seriatim (policy-by-policy) approach. After compression, the ratio of policies to model cells ranged from 7:1 to 100:1. The company using a 100:1 compression performed stochastic in stochastic calculations. The mean ratio for the companies

continued on page 18 >>

The fact that market returns and interest rates are not correlated in the AAA's scenarios appears to give a seal of approval to generators that lack this correlation.

(excluding the company using a seriatim approach) was approximately 35:1.

After compression, total data cells in the models varied from 4,000 to 170,000, though the latter is for a company with a number of distinct legal entities.

Four companies verified the accuracy of their compression against a stochastic run using the seriatim data and three tested the model against a Standard Scenario run (which is required to be seriatim). Three commented that the compressed data resulted in a worse (higher) RBC requirement. One company included a specific provision for modeling error. The remaining companies were satisfied with consideration of the compression rules and/or gaining comfort from the fact that the data model is used for other work.

7) Economic Generator/Scenarios

Seven of the 11 companies we surveyed used the scenarios/generator provided for this purpose by the AAA. Another company used the AAA interest rate generator in conjunction with its own regime-switching model for market returns. Their primary reasons for using what the AAA provided were that it was both practical and credible. Three companies used existing in-house generators.

Every company used stochastically varying interest rates but only two had these interest rates correlated to market returns; the AAA scenarios are not correlated in this way.

Seven companies used six "proxy" equity and bond funds to measure market returns, two used seven funds, one used eight funds, and one used nine funds. In the data compression, all but one of these companies used a regression analysis to map each separate account to multiple proxy funds. The remaining company used a one-to-one approach but is enhancing its process this year to use a regression analysis and a "many-to-many" approach.

Two of the companies with their own generator found that it took some time to achieve the required calibration criteria. That is, they needed to modify the generator assumptions several times to obtain the required fit. The other two companies, and all those who used the AAA scenarios, had no difficulties.

We asked whether companies had any concerns over the adequacy of the generator they used. Only one company was concerned about the lack of correlation between interest rates and equity returns. One company was concerned over its lack of control when using the AAA scenarios. Another company was concerned about the possibility of needing to build its own generator. The remainder had no concerns.

Observation 2: Dependence on the AAA for an Appropriate Stochastic Generator

Many companies appear to be dependent on the AAA for the appropriate scenarios or stochastic generator for this work. This places responsibility on the Academy to maintain an appropriate generator, and update it as industry and market practice dictates, into the foreseeable future.

Observation 3: Lack of Correlation between Market Returns and Interest Rates

The fact that market returns and interest rates are not correlated in the AAA's scenarios appears to give a seal of approval to generators that lack this correlation. We found no evidence that companies using uncorrelated scenarios had tested that this assumption does not materially understate the resulting capital, as required by the regulations. Complying with this test appears difficult for many companies because they do not have the resources to develop a generator with correlated market returns and interest rates. Therefore, they can only justify their use of uncorrelated assumptions by general reasoning.

8) Prudent Best Estimate Assumptions

We found a wide variety of approaches and degrees of rigor were applied to the determination of PBE assumptions. Thus it is difficult to summarize the PBE findings. To determine the PBE assumptions, companies generally started either from their experience studies, cash flow testing (CFT) assumptions, or pricing assumptions. Most companies took their CFT assumptions as best estimates. However, a number of companies regarded these starting assumptions as prudent, being already loaded for conservatism.

Approaches to determining prudence included:

- Assuming the mortality and lapse rates are binomially distributed and using this distribution to calculate the margin required to achieve CTE 90,

- Debating internally to determine both margin and rationale, and
- Using pricing assumptions directly, deemed to be conservative.

Three companies were satisfied that at least most of their CFT or pricing assumptions were sufficiently conservative so limited additional margins were required. Three companies stated they used best estimate assumptions for base lapses and partial withdrawals. One of these companies commented it had found that the direction of prudence margin for these assumptions was scenario-dependent and therefore difficult to apply.

Where explicit margins for prudence were added, they were generally in the 5 percent to 20 percent range (i.e., the best-estimate assumption was increased or decreased for conservatism by 5 percent to 20 percent). For revenue sharing they were generally assumed to be built into the process by which this assumption was determined.

Most companies did not do formal testing to segment their business according to whether an increase in mortality increases or decreases the capital requirement. Generally, they assumed that increasing mortality is conservative except in the case of GMIB riders. One company commented that this part of the requirements is too rules-based, involving a division into plus and minus segments, getting away from the shift to a principles-based valuation.

One company reported difficulty in complying with the revenue sharing requirements. However, the remaining 10 companies reported no difficulty. That said, many indicated that it was a tedious and time-consuming process, requiring significant involvement from their legal departments. One company raised a concern that the level of the underlying investment fees from which the revenue sharing is derived may itself not be sustainable in the long term.

9) Dynamic Assumptions

As expected, every company we spoke to varied the assumptions for lapses and withdrawals dynamically, depending on the “in-the-moneyness” of the guarantees. Those companies with GMIBs also varied the annuitization rates dynamically. The only allowance made for dynamic fund transfers was where policies have automatic rebalancing. Margins for prudence, to the extent included, were generally added to the base assumptions, not to the dynamic

rules. One company commented the focus should be on sensitivity testing—the more sensitive an assumption, the more prudence is needed, particularly for dynamic assumptions.

10) Sensitivity Testing

Companies performed approximately five to 15 sensitivity tests on their assumptions. Some companies relied on sensitivity tests already done for other purposes. Some companies added more sensitivity tests at a later date for the Actuarial Memorandum. The sensitivity test with the greatest effect was an immediate equity market drop. One company commented a switch in fund allocations could also have a large impact.

Most of the surveyed companies found the sensitivity testing useful in setting assumptions or in confirming the primary drivers that impact the results. For the other companies, the sensitivity testing was not as useful since they were already doing something similar. A number of companies have used their sensitivity testing to report the volatility of future RBC requirements to senior management. Suggestions were made that there should be more guidance on the importance of sensitivity testing and the value of communicating the results to senior management.

Observation 4: Moving Towards a More Uniform Framework for “Prudence”

The interpretations being made of the requirement for “prudence” in the determination of PBE assumptions are currently varied—in magnitude, in the process for determination, in the degree of objective underpinning with hard facts, and in the extent of (sensitivity) testing.

More detailed guidance in this area would be helpful if anything like uniformity across companies is to be achieved. Producing such guidance would be a challenge for the actuarial profession, as it should not be allowed to undermine the central tenet of being “principles-based.”

Maybe contentious, but a way that might pull practice into a more uniform framework, would be to add a requirement that the sensitivity tests should include a “best estimate,” for every significant assumption for which a prudent margin has

Suggestions were made that there should be more guidance on the importance of sensitivity testing and the value of communicating the results to senior management.

continued on page 20 >>

been added. This would immediately provide a quantification of the degree of prudence built into the results, as well as focusing greatest attention on the most critical assumptions.

11) Reinsurance

Of the 10 companies with any reinsurance ceded, two took no credit for this reinsurance, deeming it not to be significant, four did not have any treaty limits, two were able to fully model their treaty limits and two did not fully model the treaty limits (one of these two used a simplified approach at the aggregate level and the other deemed the limits to be insignificant). For two of the companies, the reinsurance was offshore. One had a Letter of Credit in place, and therefore modeled the reinsurance completely. The other ignored the reinsurance in its projections.

Processes and Calculations

12) Projection Software

Only one company in our survey had developed its projection model completely in-house. The other 10 companies used a variety of proprietary packaged software systems. Some companies developed the majority of the coding of the RBC requirements themselves while some relied on the vendors for this aspect. Additionally, some companies were heavily dependent on the vendors for help in implementing the coding for their variable annuity products. A number of companies used a combination of different modeling systems, generally to ease the logistics of implementation.

Every company was satisfied with its projections, though one had a late start and was concerned with the limited time available to validate results.

13) Hedging

Three companies had a Clearly Defined Hedging Strategy in place. That is, the hedging strategy was both formally documented and followed the specified standards. One of these companies did not use the hedging strategy in its projections because of the modeling difficulties, typically requiring stochastic in stochastic projections. One of the companies that used the CDHS had improved results. However, the

other company that used the CDHS had worse results. This was because the cost of the hedging program had a greater impact than the benefits accruing in the CTE calculations.

Two companies could not get the hedging strategy documentation in place in time.

A number of companies suggested including a CDHS may not improve the results, because the hedging is focused either on smoothing earnings or on minimizing the economic cost of the guarantees and uses a market consistent/risk neutral approach. One company suggested that, in view of this possibility, maybe making allowance for existing dynamic hedging strategies should be made mandatory.

14) Logistics

Every company surveyed utilized 1,000 scenarios for the CTE calculations. They all used some form of distributed processing, with the number of processors ranging from 10 to 100 and averaging 45. One company used 400 processors for the stochastic in stochastic run.

Even with these multiple processors, total run times remained significant:

- Less than one day (24 hours)—three companies
- One to two days—four companies
- Two to three days—three companies
- Three to four days—one company.

We also calculated the run time per 1,000 cells per scenario per server. This ranged from 7.2 seconds to 222 seconds and averaged just over 100 seconds. For the two companies using stochastic in stochastic processing, this run time was 237 seconds and 3,927 seconds respectively. However, the first of these times involved only a subset of the business being run in this manner.

All but one company used December 31 data for their projections. The remaining company used September 30 data for one block of business, rolling forward the results using cash values and the smoothing/transition methodology. This company subsequently verified its result using actual December 31 data.

Observation 5: The Need for a Quantum Leap in Computing Power

The volume of computations involved in determining the RBC C3 Phase II requirement would have

A number of companies used a combination of different modeling systems, generally to ease the logistics of implementation.

been unheard of (at least in actuarial circles) even a few years ago but is now becoming commonplace. As the requirement extends to VA CARVM and to life business, the technological and quality assurance issues will continue to grow and will involve at least:

- Implementing and maintaining sufficient hardware and software platforms,
- Ensuring the calculations are both accurately coded and adequately tested against each company's detailed product and policy details,
- Working toward a common platform to be used across multiple stochastic processes, in order to reduce resource needs and ensure consistency across applications.

Those companies involved in dynamic hedging programs have already taken significant steps in this direction, but even they have further to go.

15) Some Other Details

Companies generally followed their actual strategy for fixed account crediting rates, where this rate was based on interest rates plus a spread.

Two companies discounted using earned rates to arrive at the present value of minimum surplus while the other companies used either treasury or swap rates.

Two companies, the two that modeled the CDHS, modeled the tax reserves explicitly within their projection models. All of the others used the specified f-factor adjustment approach. However, one company commented that the way this adjustment is positioned in the regulations appears to be in the inconsistent with the positioning of the smoothing and transition rules.

Looking Forward

We ended our survey with a number of additional questions:

16) Do you have any other issues (i.e., other than covered above) that continue to cause you concern?

In answer to this question, one company raised a concern over resources. That is, to do the job properly requires a big investment of time and money. Also mentioned was a need for guidance on how to incorporate general account assets. Gray areas in the Standard Scenario, for instance what to include in net revenue and how/where to include the general

account spread, were also a concern. One company mentioned concern over the depth of the regulatory review of the calculations.

17) If you could change just one element of the current requirements, what would it be?

Six companies voted to eliminate the Standard Scenario. One voted instead to eliminate the aggregation within the Standard Scenario. One voted that the discount rate should be the earned (portfolio) rate, but would otherwise have voted to eliminate the Standard Scenario. One voted to eliminate the requirements for mortality plus and minus segments, since the intent is to be principles-based rather than rules-based. Another company also mentioned this fact, but it was not its number one choice for change. One company voted to improve the clarity in the instructions, also a concern raised by other companies. Three companies did not target the Standard Scenario because it is mild relative to the VA CARVM Standard Scenario. One company did not target the Standard Scenario because it thought it may go away on its own over time.

18) What are the main issues (if any) you need to address and resolve for the introduction of VA CARVM?

This question raised a variety of responses. The complexity of and the lack of firm specifications for the Standard Scenario were mentioned by many companies, notably the proposal to require a market consistent valuation of GMLBs. Also mentioned was the lack of time if the requirement is to be implemented at December 31, 2006.

Companies also had concerns over:

- The amount of work required, resource constraints, and the associated difficulty of meeting quarterly reporting deadlines,
- The building of seriatim models,
- The calculation of tax reserves—both the lack of aggregation and the fact that new rules may only apply prospectively for tax purposes,
- Reinsurance issues—how to determine the treaty-by-treaty reserve credits when there are multiple reinsurance treaties (not related to the guaranteed benefits) for which the reserves are calculated in aggregate.

Those companies that previously did relatively little stochastic modeling are finding more of an immediate benefit to their wider financial management of this business than others that already had defined methodologies in place.

continued on page 22 >>

Observation 6: The Standard Scenario

The RBC C3 Phase II Standard Scenario is widely disliked for a variety of reasons:

- Its “one size fits all” approach,
- Its excessively conservative and unreasonable assumptions, and
- Its necessary run time since it is on a seriatim basis.

This is potentially distracting attention away from the stochastic projections that were intended to be the area of greatest focus.

However, the concerns over the RBC C3 Phase II Standard Scenario are small compared to the concerns over the VA CARVM Standard Scenario as currently proposed as of June 2006.

19) Do you think you can make any use of this work in the wider financial management of this business?

For many companies, the projection model enhancements are already being used more widely. Some companies have started using or are planning to use aspects in pricing and risk management. A number of companies are using the work to communicate to senior management how their financial results might vary in the future. However, some companies commented that they already do this type of work using different metrics.

Observation 7: Adding Value

Those companies that previously did relatively little stochastic modeling are finding more of an immediate benefit to their wider financial management of this business than others that already had defined methodologies in place. The latter companies potentially face the challenge of reconciling differing stochastic metrics, between the CTE measure used for RBC purposes and the measures they have already adopted, both for pricing and for economic capital.

Performance and valuation metrics involving stochastic analysis encapsulate many of the risks of the business better than the use of deterministic assumptions. As actuaries, we must ensure that we develop the ability to communicate their meaning effectively to non-technical audiences who have responsibilities in this area such as senior management, directors, regulators, and rating agencies.

Conclusions

With the possible exception of the Standard Scenario, companies generally accept that the results of the RBC C3 Phase II analysis have provided information that can be helpful in understanding and managing the business. However, implementing a robust ongoing production environment and finding adequate resources to complete the proposed principles-based valuations in a timely manner could prove challenging for many companies.

Our survey showed that companies have adopted diverse practices when setting assumptions and determining the modeling approaches. With the principles-based approach and a number of gray areas in the regulations, it may prove challenging to develop anything approaching uniformity between company methods. At this stage, it is difficult to know what regulators expect. Additionally, the requirement for confidentiality makes it difficult for any company to understand fully what other companies are doing.

As can be seen from our survey, few companies have implemented an external review of their methodologies and results. We believe that such reviews have an important part to play in developing best practices and improving comparability of results in this area. Narrowing the range of practice should produce a more even playing field. Developing some uniformity between companies will result in making the regulators job much easier. More importantly, best practices will help ensure companies are appropriately and comparably capitalized for the risks they assume. §



Don P. Wilson, FIA, is a senior manager and consulting actuary with Deloitte Consulting, LLP in Hartford, Conn. He may be reached at donpwilson@deloitte.com.



Patricia E. Matson, FSA, MAAA, is a senior manager and consulting actuary with Deloitte Consulting, LLP in Hartford, Conn. She may be reached at pmatson@deloitte.com.

ADVANCE NOTICE: New U.S. GAAP Seminar for Actuaries Working in Asia

The Financial Reporting and International Sections are co-sponsoring a three-day, in-depth seminar in Hong Kong for international actuaries wanting to learn how to apply U.S. GAAP to life insurance companies. The seminar will take place at the Hong Kong Intercontinental Hotel from October 24 to 26, 2006. The faculty includes U.S. GAAP professionals currently working in Asia as well as seasoned U.S.-based actuaries who work worldwide.

Please keep your eyes open for the formal announcement from the SOA!

P.S. We are also working on producing similar seminars in Latin America (December 2006) and Central Europe (March 2007).

Preferred Mortality Study Preliminary Results to Be Revealed at Annual Meeting

The SOA is currently sponsoring the largest, most complex and multifaceted mortality study ever undertaken by an actuarial organization. Our initial research, to be unveiled Oct. 15-18 at the SOA Annual Meeting, will reveal the results of experience studies that will support redefinition of reserve requirements for preferred life policies. The likely outcome of this project will be to better reflect preferred mortality in life insurance liabilities while still assuring adequate protection for policyholders and investors. Learn more about this study by going to www.soa.org and searching for “preferred mortality.”

What's Outside

Although the example uses long-term care, this article gives advice on designing and applying a data warehouse to answer the question, “Can you explain why we did not make plans?”—“In Pursuit of the Truth” by Robert J. LaLonde, *Long-Term Care News* (newsletter of the Long-Term Care Insurance Section), March 2006. (A reprint appears in the June issue of the Technology Section newsletter, *CompAct* with the title “Best-of-Breed Data Warehousing.”)

For those who look at health insurance expenses, this article may give some perspective—“Medicare versus Private Health Insurance: The cost of Administration” by Mark Litow, *Health Watch* (Health Section Newsletter), May 2006.

Of interest to those working in the international arena—“SOA International Experience Study Update” by Ronora Stryker and Bill Horbatt, *International News* (International Section Newsletter) March 2006.

Reports on NAIC activity are found in the May 2006 issue of *Product Matters!* (Product Development Section Newsletter) and the June 2006 *Small Talk* (Smaller Insurance Company Section Newsletter). Donna Claire and Ted Schude, respectively, give reports on the March 2006 NAIC Meeting.

On a related note, the Taxation Section looks at the likely federal income tax treatment of Principles-Based Reserves. The lead article of the May 2006 issue of *Taxing Times* is called “The Federal Income Tax Consequences of Adopting a Principles-Based Life Insurance Reserve System” by Joseph F. McKeever, III, John T. Adney and Lori A. Robbins.

For fans of variable annuities with guarantees—“Policyholder Behavior in the Tail: Variable Annuity Guaranteed Benefits Survey Results” by James Reiskytl in March 2006 *Risk Management*.

Last but far from least, a rating agency perspective on the importance of risk management in insurance companies—“Standard & Poor's Enterprise Risk Management Evaluation of Insurers” by David N. Ingram in March 2006 *Risk Management*.