RISKS and REWARDS

The Newsletter of the Investment Section of the Society of Actuaries

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Exploring C1 Risk

by Thomas Merfeld

Editor's Note: This is part one of a two-part article. The second part will run in the next issue of Risks and Rewards.

Most of us consider insurance companies to be expert risk managers. One of these risks reflects the possibility that their investments perform poorly. We call this C1 risk.

I've spent years wondering how to articulate the possibility that investments perform poorly. Is an investment that you mark-to-market on the statutory filing riskier than if you could hold it at historical cost? Are private placements riskier because they don't enjoy a ready market? Are derivatives risky? Are stocks riskier in the short run than over long investment horizons? How do you isolate C1 risk from C3 risk? What is a sufficient asset reserve? Should product managers care if returns fall short of pricing assumptions? Are bond defaults worse than other causes of bond value declines? Should a P&C company own commercial mortgages? How much risk is enough? Does the character of return—income versus capital appreciation—matter? Should stocks back reserves? How bad can things get?

(continued on page 4)

CIA Task Force on Segregated Fund Investment Guarantees

excerpt from the Canadian Institute of Actuaries

Editor's Note: The CIA Task Force on Segregated Fund Investment Guarantees was founded in 1999 and charged with developing recommended approaches for the use of stochastic techniques to measure the obligations created by segregated fund investment guarantees (i.e., where an underlying level of investment performance is guaranteed by an insurer). The Task Force issued a 64-page report in August 2000 and recommended that Canadian actuaries use stochastic techniques to establish liabilities for these guarantees. The following passage on investment return models is excerpted from Section 2 of the report, and should be of particular interest to readers of this newsletter. The full report is available at the CIA Web site as accession number 20020. Also see the announcement on page 34 of this issue for the 2001 Symposium on this subject.

Policy liabilities for segregated funds, as for other policy liabilities, should be based on a prospective analysis of asset and liability cash flows. Because of the uncertainty of the underlying investment returns on which the liability costs and revenues are based, a stochastic approach is required to estimate these values.

(continued on page 9)

In This Issue

Editor's Column...

Taking Stock

by Dick Wendt

Many important activities are now in progress in the U.S. political arena. Although *Risks and Rewards* is a nonpolitical publication, we're not able to ignore these activities. In the years to come, there could be significant changes in the U.S. financial environment due to today's decisions on budget surpluses, tax level, Social Security and debt refinancing. The choices could affect the economy for years, if not decades, to come.

Sadly, actuaries have not been in the forefront of the public view, because either politicians are not interested in actuarial expertise or actuaries have not attained sufficient public visibility. The prime example of actuarial invisibility is the recent formation of George Bush's Social Security Commission. Actuaries and even the public would probably be surprised to learn that actuaries, known to be experts on Social Security, are totally absent from the panel.

Dick Wendt

Although our readers may think that Social Security discussions belong in the *Pension Section News*, any revision of the benefits or financing provisions will affect the entire investment environment, perhaps in unexpected ways. Actuaries need to move on two fronts: expand their public visibility and credibility in these important areas and consider how these potential changes may affect their expectations for inflation, interest rates and economic growth.

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Chairperson's Corner

Looking Toward 2001

by Peter D. Tilley

At the time this issue went to press, your council had recently completed a conference call, and I am pleased to have the opportunity to bring you this update.

Our recruiting for the sessions in Toronto and Dallas went very well. As always, the council greatly appreciates the enthusiasm of our members for volunteering to speak at these sessions and share their expertise.

While the annual meeting in New Orleans probably hasn't made it onto your planner yet, rest assured that the council has been working on it for several weeks. The investment sessions can now be found in the meetings section of the Society's Web site, and speaker recruitment is under way. We are sponsoring ten sessions, including a hot breakfast (free to Investment Section members!) and many other "hot" sessions to whet your appetite for the latest topics in our field.

In my February column, I said that credit risk would prove to be an important topic in 2001. If anything, I feel more strongly about this as we get further into the year. The credit risk seminar promised in the last column has been tentatively scheduled for the first week in December. We expect it will last one and a half days with four or five speakers. Watch the Society's Web site for updates.

If you haven't been out to our section's Web pages lately, you might be surprised to see all of the additional information that has recently been added by our Web liaison, council member Charles Gilbert. Any suggestions on our Web page would be welcomed by Charles.

In our annual Section elections, we will have another excellent slate of candidates running this summer for the three positions opening up on the council.

The council met in Toronto on June 19th to discuss plans for research projects and funding for the balance of 2001 and 2002. We encourage you to let us know of any particular topics that would benefit the Section's members. We'd also like to get your input on session topics for next year's spring meetings — believe it or not we'll be planning them soon.

Peter Tilley

Now, my "bully pulpit" feature. In this issue, I'd like to personally thank Tony Dardis for all of the work he has done over the years for the members of the Investment Section (and other sections). Tony has worked as editor on many issues of this newsletter, and he has been a key part of the continuing education of investment actuaries by organizing and speaking at several SOA meetings and symposiums. Tony's work is taking him out of North America for a while, and I know his contributions will be missed. Thanks again, Tony, and hurry back!

"In my February column, I said that credit risk would prove to be an important topic in 2001. If anything, I feel more strongly about this as we get further into the year. Watch the Society's Web site for updates."

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Exploring C1 Risk

continued from page 1

I think I understand how to answer these questions in a generalized asset risk model. I'll draw heavily from investment theory and pension fund management, applying these to an insurance general account. This article has two parts. The first part, contained in this issue of Risk and Reward, describes the basic C1 model itself. The second part discusses various implications of the basic C1 model, especially related to managing the company's investment portfolio.

Stylized Facts

Here are some assertions that I take to be true:

Portfolio variance is a good measure of risk. Portfolios are comprised of components we call asset classes; classes are comprised of individual issues. Issues within an asset class respond in substantially similar ways to economic stimuli. So asset classes are more interesting than individual issues for C1.

The investment literature characterizes asset classes by the moments of their return series. Think of returns as the sum of periodic interest or dividend payments and the change in market value. This is usually called "total return" in the investment literature. So a series' mean represents its expected value and its variance represents its risk.

We characterize portfolio risk by component asset class risks and their interactions. If classes comprising most of the portfolio respond in similar ways to economic stimuli, then the portfolio risk is almost equal to the weighted average of component variance. If component classes respond dissimilarly, then some component variability nets with other component variability and portfolio variance is less than the asset class weighted average. Write:

portfolio variance is less than the asset class weighted average. Write:

$$\sigma_p^2 = \omega'_p * \Sigma * \omega_p \qquad [1]$$

where ω' denotes the transpose of the vector ω,

N = number of asset classes in the universe,

ω = vector of portfolio weights of the N classes and

Σ = covariance matrix of the N classes.

C3 risk measures the harm associated with a change in the basic cost of money in the economy. C3 variability measures the degree to which the fair values of assets and liabilities change in response to interest rate changes. Most invested assets—especially bonds and mortgages—have identifiable C3 variability. Many insurance liabilities also have it. The right amount of asset variability neutralizes liability variability. If you have the right amount, a change in the cost of money in the economy causes no residual harm. If you do not have the right amount, then you have C3 risk.

The NAIC and private rating agencies provide measures of capital adequacy that include a C1 risk component. The algorithms they use map their impressions of the potential for investment loss into asset class capital loads. An "adequately capitalized" company has more assets left over after reflecting these loads than an inadequately capitalized company.

These impressions of risk have deep roots in industry lore but a more tenuous grip on reality. Nevertheless, they represent an important boundary condition and must be reckoned with.

The Basic Model

I begin by removing C3 variability from the scope of my C1 concern. This is fundamental. Asset class returns vary around their means because the basic cost of money in the economy changes from period to period; this is C3 variability. And whether or not I am matching C3 asset variability with C3 liability variability, in either case it is independent of C1 and outside my C1 concern.

Asset class returns also vary around their means because the market risk premium—the market spread—changes from period to period; this is C1 variability for an asset class. High quality asset classes have almost no residual variability when you've removed the C3 variability. Low quality and equity-like classes retain almost all of their variability.

Asset class returns are the means of the risk premia themselves. Let's call this "excess return." These returns have distributions that are nearly normal. Furthermore, individual asset class excess return series are correlated in various degrees to each other.

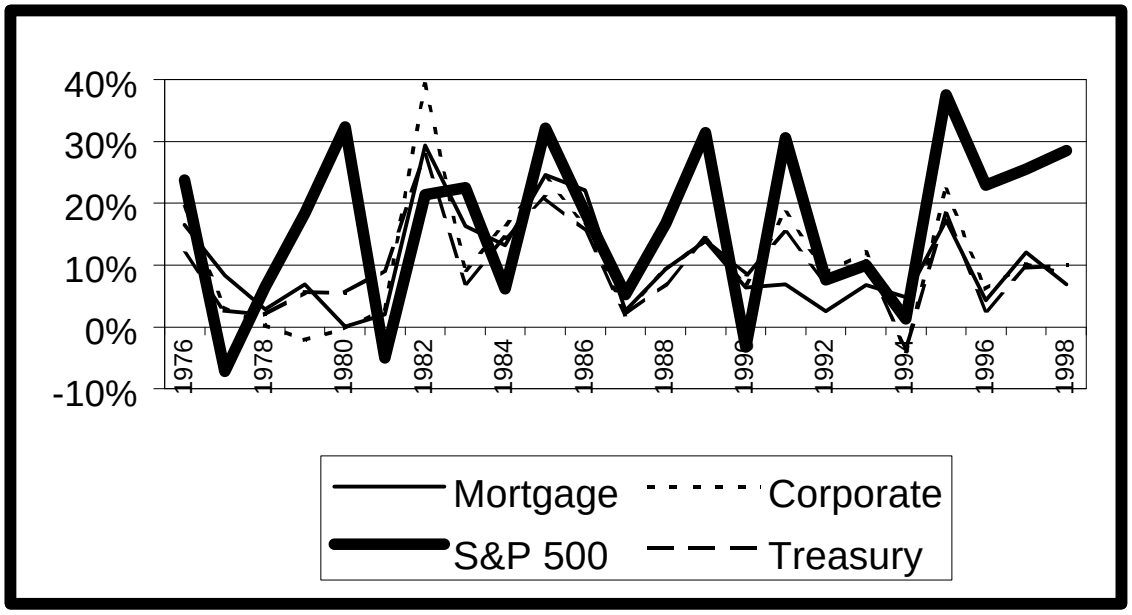
So now I have all the elements—C1 excess return series with two moments and correlations between them—that a Markowitz portfolio has. And then my articulation of C1 risk is almost trivial.

Under normal circumstances, C1 risk is a measure of the variability of portfolio returns due solely to changes in market risk premia from period to period.

A Simple Example

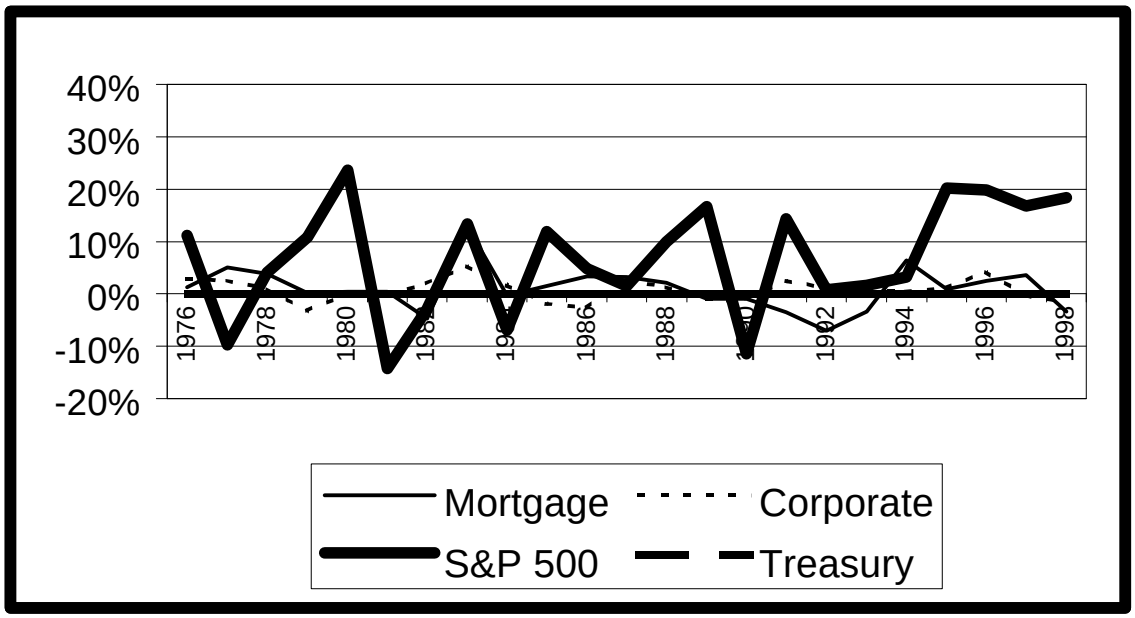
Imagine that a company's investment portfolio consisted of diversified portfolios within four asset classes: U.S. Treasuries, investment grade corporate bonds, commercial mortgage loans and common stock. Consider their total returns over a recent 23-year period.[1]

Chart 1 - Total Returns



Now consider the same series after adjusting for C3 variability.

Chart 2 - Excess Returns



A few features of the return series are apparent:

- Means of the excess return series are lower than the total return series as a result of the C3 variability adjustment. They fall by the total return of a duration matched treasury instrument. That is why the mean of the treasury series falls to zero. Means of other series represent their risk premia.

- All excess return series are less volatile than their total return series. That is, the basic cost of money in the economy—and its change from period to period—explains some of the total return of every asset class. Indeed, by definition, it explains the entire treasury return. That is why the variance of the treasury series falls to zero. Other series retain some variability in response to spread dynamics.

(continued on page 6)

Exploring C1 Risk

continued from page 5

- All excess return series are less correlated than their total return series. If you remove one factor that affected each of them, then they will be less correlated with one another. Indeed, treasury excess returns have no relationship to the excess returns of any other asset class.

Table 1 contains summary statistics of the excess return series.

Table 1

	Expected Returns	Standard Deviation	Correlations			
			Treasuries	Bonds	Mortgages	Stocks
Treasuries	0%	0%	1			
Bonds	0.73	2.41	0	1		
Mortgages	0.93	3.80	0	0.03	1	
Stock	6.30	14.05	0	0.17	-0.03	1

Table 2, using Table 1 figures, assumes some portfolio weights and provides asset class weighted average risk. It also estimates actual portfolio risks by equation 1. The portfolio effect of mixing less correlated asset classes removes about 38% of the weighted average risk. The portfolio will earn an expected premium of 126 basis points per year plus or minus 229 basis points at one standard deviation. Alternatively, if you assume a treasury expected total return of six percent, then this portfolio would have an expected total return of 7.26% and the C1 component of overall risk at one standard deviation would explain total returns of between 9.55 and 4.97%.

Table 2

Class	Portfolio Weight	Expected Returns	Standard Deviation
Treasury	10%	0%	0%
Bond	55%	0.73%	2.41%
Mortgage	25%	0.93%	3.80%
Stock	10%	6.30%	14.05%
	100%		
Weighted Average		1.26%	3.68%
Portfolio		1.26%	2.29%

What Doesn't Matter

Insurance companies balance the needs of several constituents. Flowing from the basic model, here are five issues that, while important to these constituents, have no bearing on C1 risk.

Financial reporting. Statutory reporting assumes risk discontinuities where none exist in reality. It requires that common stocks and NAIC 6 bonds be carried at their market values. This reveals the C1 risk of these assets and makes statutory balance sheet information useful to readers. That is good as far as it goes. But reporting conventions allow performing fixed income classes to be carried at

amortized cost. This presumes that these classes are free of risk, a designation appropriate only for treasuries. The result is that smaller amounts of riskier assets reveal their C1 risk in the balance sheet, but much larger amounts of less risky assets hide their C1 risk.

In fact, C1 risk is present on a continuum across asset classes, but you won't find this in any financial reporting convention recognized by the industry. The way in which assets are reported indicates little about the C1 risk actually borne by a company.

In managing their companies' risk capital, management should try to obtain the highest excess return for the risk it is able and willing to bear. That is, it should diversify its portfolio in an efficient way. Company portfolios are often inefficient because management deploys too much of its risk in classes that appear less risky than they are in reality.

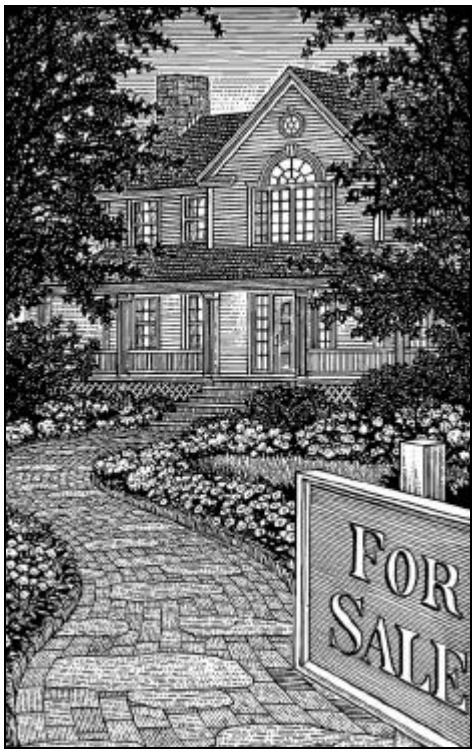
The best argument for attaching importance to financial reporting goes something like this. Regulators, rating agencies and stock analysts prefer smooth earnings and stable reported surplus. Since these constituents significantly affect the company's prospects, the financial reporting convention effectively represents the economic reality of the company.

Ultimately, however, the risk of the portfolio will play itself out, regardless of whether you have distorted risk in your financial disclosures. It will usually show up in the company having either greater than reported risk or an inefficient mix. I am reminded of the famous cave scene in Plato's *Republic*; looking for C1 risk in financial reports is like watching shadows rather than the reality itself.

C3 variability. We often consider C3 variability and duration to be the same thing. But the price variability for an asset can be described by a rich polynomial function, the primary independent term of which is a parallel shift in the treasury yield curve. Other terms include: 1) squared and cubed parallel shifts, 2) curve segment shifts and their squared shifts, and 3) combinations of curve segment shifts. This function is much more general than simple duration and convexity or key rate duration. And it is an important concept for the asset/liability management aspects of spread management.

But none of it matters for C1. Indeed, the residual from this function—the part of asset total return variability not explained by the generalized C3 function—is precisely C1 risk.

Bond defaults and mortgage delinquencies. Since the Hickman studies, groups—including the Society of Actuaries—have estimated historical losses on various fixed income classes. The approach usually nets default and recovery rates. More sophisticated studies use a transition matrix to reflect a time dimension. Some analysts point to municipal bonds and agency-backed residential mortgage securities as low risk instruments because they have low historical loss rates.



For me, focusing on the discrete event of a default loss ignores the continuous information provided by market prices. For example, when the legislature threatens to change the tax law on municipal bond income, municipal bond prices fall. That is risk, but no bond has defaulted. For another example, as a bond transitions down through ratings on its way to default, the market price falls. That, again, is risk, even though no bond has defaulted.

Market prices generally reflect readily available relative value information. Total returns, which reflect periodic changes in market prices, provide superior risk information than simple defaults and foreclosures. Indeed, you could run a bond portfolio without ever experiencing a default—simply sell the bond when its price falls by more than other bonds' prices. Risk would be manifest, but you would have no defaults.

Liquidity risk. For me, C1 risk is a measure of asset class return variability. Liquidity risk is a measure of asset class salability. At the most pure level, the two are not related.

Some asset classes have a great deal of C1 risk, but very little liquidity risk (i.e. large capitalization growth stocks). Other asset classes have very little C1 risk but a great deal of liquidity risk (i.e. highly covenanted private placements). Still other classes have a proportional amount of each (i.e. high yield bonds). But C1 risk and liquidity risk are not related.

Institutional constraints. The insurance industry is laden with constraints from regulatory and rating agencies. Many are established in the name of controlling investment risks. If you bump up against them, you may hear that your portfolio is too risky. Often these constraints bear only sketchy resemblance to true C1 risk. Companies need to live within their constraints; but the constraints themselves are not C1 risk.

I find it most useful to treat these constituent requirements as boundary conditions. That is, I prefer to mix the assets in an economically efficient way, subject to the constraints imposed on management.

(continued on page 8)

Exploring C1 Risk

continued from page 7

What Matters

Here are elements that are important to C1 risk. I give short treatment to some, with greater discussion later.

Variance of excess returns. On a class by class basis, excess return variance is the best estimate of risk. You will find that variance measures are different depending on what time period you measure them. The investment literature is divided over whether variance actually falls with longer measurement periods. You will want to measure the returns over a consistent period for each class. I like to think of measuring them over a period that approximates a class' return cycle and the investor's holding period.

Correlation of returns. You need to complete a correlation matrix to describe how asset classes interact with one another. Correlations change over time, often following an autoregressive process. So if you correlate excess returns across overlapping 60 month periods, you will often detect a pattern that demonstrates some momentum. Filling in the correlation matrix is important and there is more than a little judgment involved.

Crises. During financial crises asset classes become more volatile and they become more correlated to one another. This is why C1 risk increases so much at these times.

Measurement, deployment, barbells, policy and implementation. For many purposes, it is sufficient merely to measure the C1 risk that an investment portfolio has. You can do that by equation 1, after completing the difficult work of estimating class excess return variances and inter-class correlations.

For other purposes, it is useful to ask the next question. That is, given this level of C1 risk, what is the maximum expected excess return the portfolio can achieve? This is now a simple non-linear optimization problem.

> *"You will want to be careful about barbells. Optimization math will lead you to extreme portfolios. These portfolios place too much pressure on a few cells of the correlation matrix. Barbelled portfolios are not adequately diversified, even if the model claims they are."*

You will want to be careful about barbells. Optimization math will lead you to extreme portfolios. These portfolios place too much pressure on a few cells of the correlation matrix. Barbelled portfolios are inadequately diversified, even if the model claims they are. A measure of professional judgment avoids spectacular mistakes.

The next question asks what the right target C1 risk for the company ought to be. It becomes the central investment policy question for the board of directors. I think the board's policy ought to reflect the term of the company's funding sources, its capital position, the broader insurance risk portfolio the company is bearing and the board's attitude toward risk.

The smallest level of question, then, is implementation: capital gains taxes, new money flows, tactical allocations, asset class management expertise. It tends to be where we spend most of our time.

This completes the basic articulation of the C1 model. Part two of this article will expand on various management and governance issues relative to C1 risk.

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Endnote

(1) Returns are for the period 1976 – 1998. Treasury returns are the medium term treasury index. Bond returns are the Lehman intermediate term corporate index. Mortgage returns are the Giliberto-Levy index. And equity returns are the S&P 500. I calculated excess returns by comparing monthly total returns on the risky classes with the monthly return of a duration-matched treasury. Although the empirical duration of the S&P 500 is considerably less, the modified duration of the index is approximated by 1/i. Consequently, in order to better reflect the timing of the cash flows, I related the return on the S&P 500 to the return on a 10 year treasury bond.

Modelling
continued from page 1

Due to the complex nature and diversity of the segregated fund guarantee, there are currently no generalized closed form solutions available to calculate the policy liabilities. A more flexible approach to calculating policy liabilities is to first use stochastic simulation to generate multiple paths of investment returns based on a selected investment return model, and then to evaluate the liability costs and revenues using the generated path set. Each path is also commonly referred to as an investment scenario or a scenario.

In the pages that follow we have separate sections that deal with the investment return models and liability cash flow models, as well as a separate discussion on the modelling of any asset hedging of these features.

2.1 Investment Return Models

A key component of stochastic modelling of the future costs associated with segregated fund investment guarantees is the model(s) used to determine investment return paths.

The task force does not support mandating specific models for establishing investment return paths. We can find no precedent for mandating specific models and we believe that such an approach would risk failure because of resistance from the membership. Instead, the task force believes that a framework which requires mandatory calibration of equity based models to specified criteria plus specific guidance/prescription that addresses certain model building items (including assumptions) can acceptably narrow the range of practice and ensure appropriate policy liabilities.

Specifically:

- Guidance is given to narrow the range of practice on setting investment assumptions.

- Investment scenario models used for the generation of equity returns will need to produce investment path results that calibrate to certain statistical criteria that measure items such as dispersion of paths and thickness of the distribution's tail.

2.1.1 Key Considerations in Selection/Development of Investment Return Models

There are a large number of investment return models and no single model can currently be identified as superior to all others. Due to the large amount of research currently going on in actuarial science, finance, econometrics, statistics and mathematics, stochastic modelling is constantly evolving. Also, due to the increasing power of computers, models that were once considered too complex to be practical can now be used. This evolution will surely continue in the future.

Notwithstanding this diversity of models, there are some requirements that need to be met in the context of using stochastic models to calculate the policy liabilities and minimum capital.

a) Random Number Generator

The random numbers generated by computer algorithms are called pseudo-random because they are not truly random. Knowing the algorithm and the seed to the sequence is usually sufficient to predict the next random number that will be generated.

Before using a pseudo-random number generator for stochastic simulation it should be confirmed that the generator does not exhibit any bias. This can be verified by statistical testing. The "periodicity" of the generator is the number of values that can be produced before the sequence repeats or begins to exhibit obvious bias. Some commercial software applications include pseudo-random number generators with a very low periodicity for certain seeds.

Results from stochastic modelling should be reproducible. This would ordinarily be accomplished by priming the random number generator with a "seed" value.

Variance reduction techniques can be used provided it can be demonstrated that they do not introduce any bias. It should be noted that most variance reduction techniques are designed to improve efficiency of an estimate of the mean. Where the objective is a measure of the risk arising from one tail of a distribution, some methods may in fact reduce efficiency relative to straight simulation.

b) Number of Scenarios

To offer some guidance as to the number of scenarios that need to be generated, recall that the standard error of the result can be expressed as a function of the square root of the number of observations. To increase the precision of the policy liability calculation, it may be necessary to increase the number of scenarios quite significantly.

The number of scenarios should be at least 1,000. The exact number to use will depend on how the scenarios will be used (e.g., calculating percentiles will generally require more scenarios than calculating expected values), and the materiality of the results. The actuary should test that the number of scenarios used provides an acceptable level of precision.

c) Frequency

Use of an annual projection frequency is generally acceptable for benefits/features that are not sensitive to projection frequency. The lack of sensitivity to projection frequency should be validated by testing.

Use of a more frequent projection such as a monthly frequency should always be used when product features that are sensitive to projection period frequency are present (e.g., many older age death benefits, most re-set features, etc.).

It is important that the projection frequency of the investment return model be linked appropriately to the projection period in the liability model.

Care must be taken in simulating the fee income as a percentage of the

(continued on page 10)

Modelling
continued from page 9

segregated fund. A difference in the frequency of charging the fee income and the frequency of projection of the fund could lead to an over-appraisal of the fee income.

d) Model

Investment returns would normally be generated on a gross basis: before the application of any fees or consideration of specific product features. The objective is to model the asset returns independently of any product features. However, care must also be taken to assess if total returns (including reinvestment of income) or price returns are required for the specific segregated funds that will be modelled.

There are a large number of potential models available and we do not want to restrict the use of any model that reasonably fits the historical data. The calibration criteria are defined below.

The model should be based on a P-measure (real world experience based valuation) as opposed to a Q-measure (risk-neutral capital markets valuation).

The P-measure approach produces a distribution of outcomes based on a real world view of outcomes for the actual assets/liabilities on the balance sheet. It generally uses historic returns and volatilities for the asset class(es) being modelled to generate investment paths. It is, therefore, consistent with the overall Canadian approach to valuation as this values liabilities in the context of the cash flow outcome on the assets currently being held and anticipated to be held in the future.

The Q-measure is appropriate in the context of financial market pricing but can produce an inappropriate valuation if the intention is not to hedge the risk using capital markets instruments. This is because it values the risk using an external capital markets framework that is independent of the expected outcomes of the actual balance sheet values being held. The Q measure approach is based on a risk neutral return framework and current investment market implied volatilities. These parameters therefore embed a significant market risk premium for absorbing the risk, particularly where there is a thin market in hedging vehicles (e.g., many long duration hedges). In addition, there is generally a lack of appropriate hedging vehicles that efficiently match the risk of many of the common design features embedded in segregated fund guarantees. This makes the derivation of an appropriate market based pricing basis difficult.

As Canadian actuarial practice implies, policy liability calculations should be anchored in the expected costs based on the actual position being held/expected to be held, which implies using a P-measure approach applied to the net exposure. Therefore, this is the basis that the task force is recommending in this paper.

Where hedging strategies are being employed to help mitigate risk, the net exposure itself should reflect the risk mitigation and costs of the hedging strategies. Determination of the costs of hedges should normally be determined using a capital markets framework, even though the P-measure basis applies to measuring the overall risk exposure.

The model should not generate negative stock prices or negative interest rates.

State dependent models relate the change from one period to the next to current market levels or recent market performance. For example, a mean-reverting process is state dependent because the future scenarios depend on how the current market variables relate to long-term historical values. State dependent models are not required, but are acceptable if they are justifiable based on the historical data and meet the calibration criteria.

A related issue that receives a significant amount of discussion is whether the model should explicitly allow dampening of the impacts of recent market experience (e.g., reflect an assumption that following significant appreciation, a higher provision for a correction is appropriate and vice versa). This is another form of a state dependent model so such behavior assumptions are permitted provided they continue to meet the calibration criteria.

e) Stochastic Model Parameters Estimation

Different models may require more or less parameters and refer to different statistical distributions. A typical model should at least have two parameters relating to the drift and volatility of the stochastic process.

These model parameters should be estimated based on historical market data as opposed to recent market performance. Due to the long-term nature of the segregated fund guarantee, as a rule of thumb, historical data should cover at least two times the projection span. However, when historical data are not available or it is not justifiable to use it, then some adjustments may be required.

Generally, market indices should be modelled rather than the specific fund performance. There will be more credible data available for the market index and the specific fund performance can depend on additional factors that may not be consistent over time (for example the fund manager can quit or be replaced).

Parameter estimates for a number of different market indices may need to be included in the generated scenarios so they can be combined to model a specific segregated fund portfolio. When more than one index needs to be projected, it is necessary to allow for correlations between different markets. It is not necessary to assume that all markets are perfectly positively correlated, but it would be appropriate to use correlations other than zero. The actuary should consider that correlations are not stationary, and that they tend to increase during

times of high volatility or negative returns.

If making *ad hoc* adjustments to observed correlations, care should be taken to ensure that the resulting correlation matrix is internally consistent. (Technically, a correlation matrix should be positive semi-definite).

Also, when foreign indices are used to establish the benchmark index, the foreign exchange rate must also be considered. In some situations, it may be appropriate to have separate parameters for the market index and for the foreign exchange rate. The fact that a currency has depreciated or appreciated significantly in the historical period should be scrutinized before assuming that the trend will continue in the future.

If required, these parameters must be adjusted to reflect the skewness and the tail fatness observed in the historical data. This required adjustment is discussed below as part of the calibration process.

The model parameters are not required to be constant over the projection horizon.

f) Selecting Investment Return Assumptions for Specific Funds

To develop investment return paths for a specific fund, an appropriate proxy for the segregated fund must be constructed. The specific fund's investment policy, its asset allocation implied by the fund performance objective, the history of fund performance and trading activities must be examined prior to proxy construction and then reflected in the proxy asset composition.

The proxy may take the form of a linear combination of recognized market indices or economic sector sub-indices or, less commonly, as a well-defined set of trading rules in a specified asset universe. Using combinations of recognized market indices or economic sector sub-indices facilitates using a limited number of well developed and researched data-sets to model a wide range of funds.

The proxy construction process should involve analyses that confirm a close relationship between the investment return proxy and the specific segregated funds.

The specific analyses can include, but are not limited to:

- Comparison of the serial long-term and short-term historical returns of the proxy and the specific fund.
- Analysis of serial correlations between the proxy and the specific fund.
- Comparison of asset composition over time of the proxy and the specific fund.
- Comparison of the systematic risk between the proxy and the specific funds' assets.
- Comparison of the specific risks between the proxy and the specific funds' assets.
- Comparison of the source-of-return attribution between the proxy and the specific fund.
- Comparison of the volatility and risk-adjusted return between the proxy and the specific fund.
- Comparison of the long-term expected asset composition of the proxy and the specific funds.

When sufficient historical information about specific funds' performance is not available, the proxy should be constructed by combining asset classes and/or allocation rules that most closely reflect the expected long-term asset composition of the specific fund. The proxy return-generating process can then be modelled by mapping this asset composition to the historical performance of market indices or economic sectors that most closely reflect the proxy long-term asset composition. Where sufficient historical information for a specific market index or sub-sector does not exist, the return-generating process would reflect the contribution of this component to the specific fund total return by reference to the efficient markets risk-return relationship, as described below.

Investment managers may seek to generate incremental returns by short-term changes in fund allocation to individual assets or asset classes/ sectors. As described below, such incremental returns may only be achieved at an increased level of risk. This risk component must be reflected in the return-generating process of the specific fund.

A well-established tenet of the modern portfolio theory is that, over the long term, additional return can only be achieved by undertaking additional risk. If the specific fund investment policy expects to generate excess return by pursuing active portfolio management, a risk-return relationship must be reflected in the specific fund's return-generating process. This relationship can be captured from efficient frontier construction, the capital market pricing model or arbitrage pricing theory. The final proxy for the return-generating process of the specific fund should conform to this risk-return relationship.

2.1.2 Calibration of Investment Return Models Used for Generating Returns

The calibration tests are to ensure that the model is able to generate scenarios that take into account the tail skewness and/or fatness observed in historical data. The emphasis of these tests is placed on fitting the tail of the distribution as opposed to fitting the entire data set or some other measure such as the mean.

Calibration requirements are included only for equity return models, since this is the primary source of risk with respect to segregated fund investment guarantees.

For equity return models, the model should be calibrated using a prescribed data set. The recommended data set is the TSE 300 Total Return monthly data from 1956 to 1999. Once the model has been calibrated with this data set, the "fitted" model should be used for all indices as described below (in other words, the basic model is only "fitted" once).

(continued on page 12)

Modelling
continued from page 11

For models which are a function of recent history (e.g., market levels, current volatility, mean-reversion process, etc.), calibration tests must be done using the long-term trend of these parameters as recent history. In other words, the model calibration should be done using long-term trends in values for the recent history, and not use the actual history of only the past immediate periods. Once the model is calibrated, the forward projection from today can start with the actual values for the immediate past periods. The task force proposes the following prescribed calibration process for stochastic models of total returns on equity investments.

1. All model calibration for equity return models should be done with a single data-set. The data-set we are proposing is the TSE 300 total return data from January 1956 to December 1999 (end-of-month values). The parameters should be estimated by maximum likelihood techniques or by similar statistical methods. No allowance should be made for expenses in the parameters.

2. The calibration is applied to the total return one-year, five-year and ten-year accumulation factors generated by the asset model. For models which assume correlation between returns in successive periods, the accumulation factors should be calculated using neutral starting values.

3. Table 1 provides maximum returns for the 2.5th, 5th, and 10th percentiles for the accumulation factors (Appendix C provides a description of the analysis undertaken to establish these calibration points). As an example of how to interpret the table, for a five-year holding period, the total return must be -25% or lower at least 2.5% of the time.

Accumulation period	2.5 percentile	5.0 percentile	10 percentile
one-year	0.76	0.82	0.90
five-year	0.75	0.85	1.05
ten-year	0.85	1.05	1.35

4. The model with the initially determined parameters (i.e., uncalibrated parameters) might not satisfy the calibration criteria in Table 1. In this case the parameters may be adjusted until a set of calibrated parameters that meet the calibration criteria are determined. Alternatively, a different model may be selected.

5. The final calibrated parameters for the TSE data-set should be extrapolated to other data-sets using the formula that follows. If k(TSE) is the uncalibrated parameter for the TSE data-set, and k1(TSE) is the calibrated parameter, then for any other data-set, the calibrated parameter k1(DATASET) is defined as k1(DATASET) = k(DATASET) + [k1(TSE) − k(TSE)]. This approach should be followed for each fitted parameter.

6. Each of the maximum return criteria must be met. This means that the model used must produce return values for the accumulation factors that are no larger than the appropriate table values, for each holding period/percentile combination.

7. For some models the percentiles may be calculated analytically; if simulation is used care must be taken to avoid bias in the random number generator. A sufficient number of simulations should be performed to ensure that the criteria are met with a high degree of confidence (95% certainty would not be unreasonable).

8. In addition to the percentile criteria in Table 1, the mean of the one-year accumulation factor should lie in the range 1.10 to 1.12. The standard deviation of the annual accumulation factor should be at least 0.175.

Appendix A provides an example of how a common simple fixed volatility lognormal model can be calibrated to meet these criteria.

Other models are equally acceptable, and indeed may be preferable if they do a better job of capturing the characteristics of actual market returns (such as fat tails and time varying volatility). Appendix B provides a brief overview and further references for how other models may be calibrated (e.g., regime switching lognormal, stochastic volatility lognormal, stable model).

You Say You Want a Revolution?

by Bradley N. Buechler

The 2001 Bowles Symposium kicked off May 16 at Georgia State University. The Coming Revolution in Insurance Accounting symposium focused on the development and practical considerations of a new international accounting standard, generally referred to as *fair value accounting.* The new standard will require both assets and liabilities to be 'marked-to-market' in a consistent manner. As long as the fair value of assets and liabilities move in tandem, over time the difference between the two, the fair value of surplus, will be immunized against changes in economic conditions and earnings will be smooth. In the absence of appropriate asset/liability matching, however, earnings can exhibit extreme volatility, since changes in the fair value of surplus are immediately booked as earnings. The symposium drew a diverse panel of experts from the United States, Canada, the United Kingdom, Australia, and the Netherlands who delivered presentations that will help the actuarial profession prepare for the profound changes that the new accounting standard will bring.

The first day began with opening remarks from Don Behan, Ph.D., FSA, director of the Actuarial Science Program at Georgia State University, and a welcome from Carl Patton, Ph.D., president of Georgia State University. They were followed by Bowles Distinguished Lecturer Sam Gutterman, FSA, FCAS (PricewaterhouseCoopers), who provided an overview and description of the issues raised by the proposed international accounting standard. Peter Clark, chartered accountant (International Accounting Standards Board), focused on the IASB's organizational structure, objectives and agenda for developing the new standard, indicating a tentative implementation date of 2005. Mike Grillaert, CPA (KPMG), then performed a detailed examination of the practical considerations of implementation of fair value accounting.

Craig Merrill, Ph.D. (Brigham Young University), and Luke Girard, FSA, FCIA, CFA (Delaware Lincoln Investment Advisors), dedicated the late morning session to addressing methodology issues relating to estimating the fair value of liabilities. Merrill outlined three techniques in common use for accounting for risk in financial valuation and demonstrated that, if applied correctly, they all arrive at the same answer to a given valuation problem. Merrill also addressed the controversial concept of the company's (put) option to default on debt and its relevance to fair value accounting discussions. Girard focused initially on an illustration of the equality of the direct and indirect methods of evaluating the fair value of liabilities and then described the advantages of using a leverage-adjusted cost of capital versus a constant cost of capital or capital spread.

After lunch, Allan Brender, Ph.D., FCIA, FSA (OSFI Canada), provided an overview of the regulatory issues surrounding the use of internal models by Canadian financial institutions in determining company-specific capital requirements and performing insurance valuations. Canada's regulatory structure already provides much of the latitude to the Appointed Actuary that would be necessary under fair value accounting. Terri Vaughan, ASA, ACAS, president-elect of the NAIC and current commissioner of the Iowa Division of Insurance, then commented on what she views as the inherent difficulties in the proposed use of internal models. Harry Panjer, Ph.D., FSA, FCIA (University of Waterloo) rounded out the early afternoon session by describing his involvement with the International Actuarial Association's Working Group on Solvency and its connection with fair value accounting.

Kim Balls, Ph.D. (Allianz Life), began the late afternoon session with a demonstration of the use of replicating portfolios for estimating the fair value of liabilities including useful insights into the development of market value margins. Marsha Wallace, CFA (Transamerica/Aegon), then presented a fair value accounting case study relating to a structured settlement liability. She showed that, to the extent insurers' assets and liabilities are closely matched (duration, key rate duration and convexity), fair value accounting provides a steady stream of earnings relatively immune to changes in economic conditions. However, to the extent insurers' assets and liabilities are not closely matched, fair value accounting means that interest rate/equity volatility translates directly into earnings volatility. Depending upon the degree of the mismatch and the magnitude of the change in economic conditions, this earnings volatility can be severe. Sam Gutterman closed out the first day with a presentation on the role of the actuary in the coming revolution.

The early morning session on the second day dealt mostly with case studies. The presenters were Robert Daly, FIA, FIAA (Tillinghast-Towers Perrin); Doug Doll, FSA (Tillinghast-Towers Perrin); David Sandberg, FSA (Allianz Life); and David Hare, Ph.D., Fellow of the Faculty of Actuaries (Standard Life Assurance Company of Scotland). In the late morning session, Henk van Broekhoven, member of the Dutch Actuarial Society (ING Group) constructed a fair value of liabilities and presented a simple model to calculate a market value margin with an emphasis on mortality risk. Godfrey Perrott, FSA (Milliman USA), illustrated the earnings volatility characteristic of fair value accounting with an SPDA case study, corroborating the work presented by Marsha Wallace the day before. Mark Freedman, FSA (Ernst & Young, LLP), provided commentary on Perrott's presentation using the contrived example of a CFO forced to explain the huge earnings volatility his company suffered under fair value accounting as a result of its asset/liability mismatch. Finally, Mark Tenney (Mathematical Finance Company), observed that as actuaries add more stochastic variables, it will take more scenarios for the results to converge. This led into an illustration of the usefulness of *Low Discrepancy Sequences,* also known as the quasi-random Monte Carlo method, which converge to the correct answer after only one-tenth the number of scenarios required by traditional Monte Carlo simulation for many types of real-world problems.

Special thanks to Sam Gutterman, 2001 Bowles Distinguished Lecturer, for organizing this outstanding symposium and to Anne Shaw, marketing and conference services manager, for making sure everything ran smoothly. Congratulations to Sam Cox who was recognized as the Bowles Chairholder. Papers from the symposium have been submitted for publication in the *North American Actuarial Journal.*

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Recognizing Momentum: A Possible New Twist to Value Management

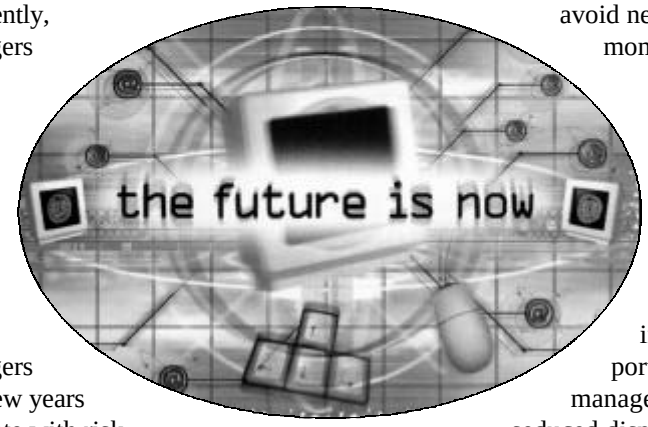
by Nino A. Boezio

Equity investment management is often classified into a number of different styles, the simplest being growth and value. Under a growth style, the manager selects securities that often display characteristics of a good financial story, high stock price potential relative to earnings, abnormally high growth expectations, and new companies or companies in a vibrant or new industry entailing at least some degree of hope.

For a value style, managers select securities that display a solid product line, a reasonable stock price relative to earnings, reasonable to good cash flow, and a price lower than fundamentals would suggest. Companies in this category are often quite mature and well-established.

Either style has its merits and each appeals to different investors. The growth style suggests greater return in exchange for greater volatility (and hence risk). A value style suggests a limited downside, but also would imply a somewhat more limited upside as opposed to growth, both taken together to imply less risk.

Growth style management has been more appealing than value for quite some time, at least until the recent market sell-off. Many years had shown dramatically high returns in the growth category relative to value. A value approach may also be looking for some "reversion to the mean" or relative valuation in prices, perhaps also sparked by a catalyst, whereas a growth approach implies that there is no mean. In market corrections, value managers point out, correctly, that they suffer less decline, since their securities are better tied to fundamentals and reality—not hope. The lack of information or uncertainty that often characterizes growth can allow for valuations to go too far in either direction. Investors still participating in growth during corrections, will often second-guess this aggressive strategy and may be tempted to bail out, given that portfolio declines can be so dramatic.



Until recently, value managers were always perceived to provide less return than growth. Were the returns provided by value managers in the past few years commensurate with risk, and were value managers perhaps missing something? Is there a characteristic in growth management that should also be monitored in value management?

What Was the Major Underlying Theme in Past Years—And the Theme in the Recent Market Sell-Off?

The past several years were marked by impressive equity returns in the United States—double-digit returns for most sectors most of the time. Portfolio managers and pension funds increasingly looked for reasons as to why their equity mix should be tilted higher. It was getting to the point that many individual investors saw no need for bonds in their portfolios (even older investors), and investors even neglected the bluest of blue chips. If one wanted even higher returns, the key was to restrict the number of issues purchased to as few as possible, as long as the issues were the right ones. What many investors were doing (whether implicitly or otherwise) was riding the trend, or what some may term "playing momentum." That is how one can make the most money. Successful portfolio managers, whether they admit it or not, take advantage of positive momentum in their purchases, and in downturns, sell to avoid negative momentum. Momentum is a factor in both up and down markets, but unfortunately too many investors and portfolio managers get seduced disproportionately by fundamentals.

Surprisingly for everyone, including myself, all equity issues were hit badly in the recent market sell-off, and major companies, including the four horsemen of the NASDAQ, got hammered by over 50% declines each. Too much price damage was done in such a short time horizon. The big losers were also the momentum plays where the large returns were mainly achieved the past number of years. One of the really educational elements of the market sell-off was the general psychology of many investors leading up to it. A 20% minimum return was expected annually. Any new idea or product innovation was also quickly packaged as an IPO and lapped up with reckless abandon by an eager public. But why not—it seemed that every time a stock came out as an IPO, its price would double within weeks (especially if it was considered to be one of the new-tech variety). Bonds were simply a bad idea for most people. And anyone taking advantage of this prevailing psychology did get rich. Unfortunately, when the markets began to sell-off this last time, no one really worried, as it happened

over and over again with a happy ending. Investors were conditioned. Any fear of recession would only be temporary and the U.S. economy was invincible.

I would often hear of people who were unwilling to sell a stock with a small decline, now selling at 60–80% losses, and these sales would often be in fairly good companies (the lousy companies declined usually over 90%). It did not even make sense anymore—a good company will come back, just give it some time. However, psychology is a funny thing—it can get you to buy high on hope, and get you to sell low on fear. What we saw was increasingly negative psychology in the recent sell-off.

Ignoring Momentum Ignores an Important Value Component

In a typical equity universe, perhaps one-third of the stocks might be classified as growth, another one-third as value, and the remaining one-third might fall into either category. For those securities that fall into one category but not the other, there could be some desire to bring these securities into the opposite category, but criteria may be specific as to their exclusion.

A high-growth stock may represent some value to a value manager, but because of a high P/E or other fundamental measure, they by necessity must be excluded. Or a value stock has increasing market activity, which may suggest a breakout to higher prices, but a growth manager may not be able to buy it due to fundamental growth parameters being too conservative. Of course, investment policies have to be so specific; otherwise the style bias could be defeated. But what would make either a growth or value manager, who cannot include a security of the opposite category in his/her portfolio, still wish to buy such an investment?

In reviewing security action over time, it must be understood that fundamentals are only a rough guide as to where a security price would be. We see fundamental arguments being used for bond prices, relative currency values, economic prospects, consumer confidence, etc. and hear the contention that something is wrong with the marketplace when fundamentals are being ignored.

For example, European finance ministers have long been touting that the Euro currency is severely overvalued, and likewise we hear the same argument from Canadian officials regarding the Canadian dollar. We saw the price for crude oil several years ago going to around $10 US a barrel, and saw that it was too cheap at the time, and then the price almost reached $40 a barrel a few years later and argued that the price was too expensive, based on reasonable market fundamentals. Yet prices often do not "revert to the mean" as is hoped, or at least not as quickly as our time frame would suggest. What is therefore going wrong with the marketplace, or are the fundamental approaches to valuation wrong?

When analyzing how some have made vast fortunes in investing, we come to realize that certain principles must be remembered in investing. Securities can never be too cheap to keep going down (witness the early 1930s) or can never be too expensive to keep going up (witness the late 1990s). In addition, behavioral issues or biases, which may have nothing to do with fundamentals may often be at work in the investment process. One parameter that is often missing in traditional market valuation is momentum. Speculators understand this principle well—it does not matter where the price is, or whether the price is considered cheap or expensive, but rather where it is going as suggested by market action, and what will be the possible signs as to when to get out. However, momentum is hard to characterize and measure, unless one knows what to look for. That is a subject for another discussion. Market technicians understand the principle well. Risk control in tandem with momentum plays must be evaluated carefully.

In portfolio management, the investment manager is not interested in playing the momentum game, contrary to a speculator. Playing momentum can be both dangerous and nerve wracking, but also quite rewarding. Momentum should be taken seriously when reviewed over a longer term, and should be an additional component when evaluating a stock or portfolio. For example, a value manager may have omitted Microsoft for years based on traditional valuation factors, and lost a good appreciating stock. Even though Microsoft suffered severely in the year 2000–2001, if the portfolio manager bought it a few years earlier, the more recent decline would have still not taken the manager to an overall loss from inception. And if the manager has a good framework established for determining when a security is losing momentum, then even a major decline can be avoided. It can also cut the waiting time before one makes a certain level of profit.

Momentum should be an important additional key in evaluating both growth and value security candidates. If interest is waning in buying the stock, then it is probable that things may be coming to an end, or at least stalling. However, until that happens, substantial gains can be made. Reversion to the mean can be a very long time in coming, and any catalyst to generate an interest in the stock may not materialize quickly.

My main argument is that momentum should be an additional parameter reviewed in the investment decision. Attaching a weight to momentum can improve the performance of both growth and value managers, and probably will have a greater significance on the latter's results.

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Challenges in Effectiveness Testing under FAS 133

by Rob Royall and Jay Glacy

Editor's Note: This article is reprinted with permission from Derivatives Week.

The requirement to assess hedge effectiveness in the Financial Accounting Standards Board's new statement on derivatives accounting, FAS 133, Accounting for Derivative Instruments and Hedging Activities, is critical for qualifying for "special" hedge accounting. But this requirement may be the most onerous of the statement because of the time and effort that is required to comply successfully. To the extent that companies can enter into hedges that are "highly effective," they can minimize earnings volatility. The degree of effort required to assess effectiveness depends on the complexity of the hedging relationships involved. This article illustrates the progression of effort required for relationships of increasing complexity and highlights the pitfalls associated with commonly employed methods (e.g., statistical regression) for assessing hedge effectiveness.

Effectiveness Assessment Approaches

1) *Is the Hedge Eligible for "Shortcut" Treatment?*
   Hedges that qualify for shortcut treatment require no ongoing hedge effectiveness assessments. However, the "shortcut" method is only available for hedging relationships involving interest rate swaps.
2) *Can the Hedge be Assessed Qualitatively as Having No Expectation of Ineffectiveness?*
   Many hedges that do not technically qualify for shortcut treatment because they do not involve interest rate swaps may otherwise be "perfect" and involve no timing or basis differences between the hedging instrument and the hedged item. While FAS 133 still requires a quarterly assessment of hedge effectiveness in these cases, assessment may require minimal effort. For example, Derivatives Implementation Group (DIG) Issue G9 permits certain assessments of hedge effectiveness to be *qualitatively* documented ("all the critical terms of the derivative match that of the hedged item"), with no quantitative methods necessary.
3) *If a Quantitative Method is Necessary, Is it Sufficient to Assess Effectiveness only at Inception?*
   In many cases, the company will know that, while the hedge relationship is not perfect, ineffectiveness is assuredly minimal. For example, hedge relationships with no basis differences but slight timing differences may make it highly unlikely that any movement in the relevant risk factor would be great enough to cause the hedge to fall out of an 80%–125% dollar offset corridor. If a source of ineffectiveness can be isolated in this manner, the company may not need to perform ongoing sophisticated statistical analyses to assess hedge effectiveness. However, the prospective analysis at the inception of the hedge should involve a quantitative effectiveness assessment.
4) *Evaluate the Efficacy of Potential Quantitative Methods for Assessing Effectiveness.*
   If a company's hedge relationship does not clearly fit in one of the above three categories, a company should then evaluate various quantitative methods for assessing hedge effectiveness. One option, if the hedge is not material into relationship to the financial statements taken as a whole, is to skip "special" accounting treatment altogether, especially in consideration of the comparative time and expense involved.

   For example, hedges that run for a relatively short period of time, such as four to six months, may affect only one reporting period. Quantitative assessment methods will be required for companies with either complex hedge relationships (such as portfolio hedges) or simple structures involving more than one source of ineffectiveness (either basis or timing differences). These are the types of hedges that on a cost-benefit basis are most likely to support the time, effort and expense required to maintain a quantitative approach to effectiveness assessment.

Pitfalls in Regression

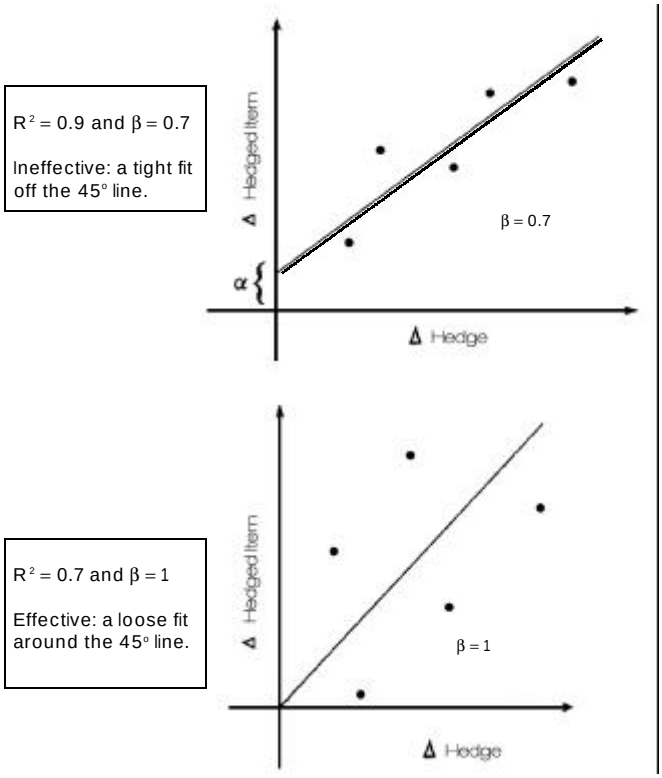
Paragraph 62 of FAS 133 "does not specify a single method for either assessing whether a hedge is expected to be highly effective or measuring hedge ineffectiveness" but does require "that an entity use that defined method consistently throughout the hedge period (a) to assess at inception of the hedge and on an ongoing basis whether it expects the hedging relationship to be highly effective in achieving offset and (b) to measure the ineffective part of the hedge." FAS 133 anticipates the use of tests to demonstrate that the hedge "offsets substantially all" of the variability in the hedged item. DIG Issue E7 states that effectiveness assessments "can be based on regression or other statistical analysis of past changes in fair values or cash flows as well as other relevant information."

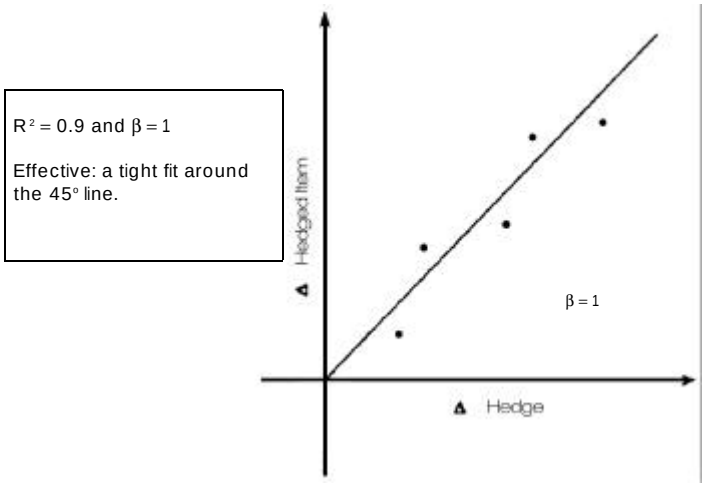
The statistical technique of regression fits observed changes in the hedged item to corresponding changes in the hedging instrument, as follows:

$$y = \alpha + \beta x + \varepsilon,$$

where *y* represents changes in the hedged item and *x* represents changes in the hedging instrument. The β coefficient, which the regression process determines, measures the degree to which *on average* the hedge offsets changes in the hedged item. A β value of 1 (i.e., the 45° line in the graphs shown below) indicates a one-to-one offset between the hedge and the hedged item. The α coefficient (or the intercept) measures changes in the hedged item that are unrelated to changes in the hedge. An α value of 0 indicates the absence of such effects. The ε coefficient captures unexplained variations in the hedged item. The R^2 value measures how closely the data points lie to the fitted line created by the regression. An R^2 value of 1 indicates that the regression "explains" 100% of the relationship between the hedging instrument and the hedged item.

A highly effective hedge, therefore, will exhibit a β close to 1, an α close to zero and an R^2 greater that 80%. The following three graphics vividly demonstrate the dangers involved in basing effectiveness assessments solely on either R^2 or β.





In addition, DIG Issue E7 recognizes that regression methodologies "require appropriate interpretation and understanding of the statistical inferences." While the graphs shown above are intentionally simplified for illustrative purposes, "appropriate" statistical interpretation requires a sufficient number of data points in order to be deemed "statistically significant." These may be difficult to amass for the retrospective evaluations of the type DIG Issue E7 contemplates. Further, the time steps separating the observed data points must correspond with the time steps of the hedge horizon (quarterly, since it is quarterly earnings that are presumably being hedged). Finally, overlapping (or rolling) data points may not be independent over time, creating autocorrelation problems.

A number of other observers have recognized the shortcomings of regression-based effectiveness approaches and have proposed solutions. For example, the *Volatility Reduction Measure (VRM)* of Andrew Kalotay Associates Inc. measures the reduction in variability achieved by adding the hedging instrument to the hedge item. Ira Kawaller and Paul D. Koch (*Journal of Derivatives,* Summer, 2000, p. 79) bless a similar method they refer to as "Alternative Method 1" in their paper on the subject. More recent enhancements to these variability-reduction methods employ Monte Carlo-based methods to assess effectiveness under a realistic range of possible outcomes. We expect practitioners to pursue further and refine innovative solutions to the effectiveness testing challenge as the FAS 133 implementation effort proceeds.

This week's Learning Curve was written by ***Rob Royall,*** *partner at Ernst & Young in New York and* ***Jay Glacy,*** *ASA, vice president at Gen Re—New England Asset Management in Farmington, CT.*

The Stable Value Wrap: Insurance Contract or Derivative? Experience Rated or Not?

by Paul J. Donahue[1]

Stable value, one of the options most popular with participants in defined contribution pension plans,[2] depends on accounting for investments at contract value. To be reported at contract value, an investment must provide a guarantee that principal and accrued interest always will be available to pay benefits and make permitted transfers. AICPA SOP 94-4, the Stable value constitution, descriptively names this guarantee "a principal and accrued interest risk transfer."[3] Industry practice names this required guarantee "benefit responsiveness." It is provided by the "benefit-responsive wrap contract," or simply a "wrap." In this article, I shall refer to the principal and accrued interest risk transferred by these contracts as a "wrap."

In December 2000, the FASB Derivatives Implementation Group released Statement 133 Implementation Issue No. A16, "Definition of a Derivative: Synthetic Guaranteed Investment Contracts,"[4] which concludes that "from the perspective of the issuer of the contract, synthetic GICs are derivatives under Statement 133."

This article discusses current controversies about the classification of the wrap contract and about the relative value of its experience-rated and non experience-rated versions. It begins with a brief description of stable value. It then discusses the operation of the stable value wrap contract. The article next takes up proper classification of the wrap. After applying the elements of the Statement of financial accounting standards (SFAS) definition of a derivative to the characteristics of a wrap, the article concludes that a wrap does not meet a single element of the definition and is not a derivative.

The article concludes that a wrap is most usefully understood as an insurance contract. In its most prevalent form, the wrap risk is self-insured, with a third party providing catastrophic stop-loss coverage, although broader third-party coverage is still available and purchased. The article then examines the widely shared opinion that nonexperience-rated wraps are significantly more valuable than experience-rated wraps. The article concludes that, in most situations, a non experience-rated wrap is worth no more than an experienced-rated wrap, and, in some situations, is worth even less. Each wrap purchase depends on plan specifics, and wrap managers of ERISA plans have a fiduciary duty to make certain they are getting added value when they choose to "pay-up" for nonexperienced-rated wraps.

The Stable Value Option

Stable value is primarily a feature of defined contribution benefit plans, and the plan context is assumed in this article. This means that transfer and withdrawal rights are dictated by plan design. The "stable" in stable value refers to preservation of principal. Account balances do not vary with changes in market interest rates, but only increase with credited interest. Most descriptions of stable value say that it assures principal and provides current income. Typical return expectations are that Stable Value will return 1% – 2% in excess of returns on 91-day T-bills.

The Wrap Contract

A wrap assures that funds will always be available to pay plan benefits and make transfers at contract ("book") value, regardless of the market value of the wrapped assets. In its original form in a Guaranteed Investment Contract (GIC), the actual withdrawal experience did not affect the interest credited to participants. In the language that prevails in the industry, it was non-experience-rated.[5]

The alternative, a wrap where withdrawal experience does affect the interest credited to participants (an experience-rated wrap), is easiest to understand when the wrapped asset is a readily marketable bond. The crediting rate changes periodically according to a formula that amortizes differences between the contract value of the bond and its market value. The amortization period is typically the duration of the investment on the date the rate is reset. When a withdrawal is made, the participant receives contract value. The market value of the contract is reduced by the same amount as the contract value. This forces the ratio of contract value to market value farther from one. For example, if market value is $95 and contract value is $100, a $5 withdrawal will reduce the market to book ratio from 95% (95/100) to 94.7% (90/95). There is an additional shortfall between contract and market of 0.30%. If the current duration of the bond is 1.5 years at the reset date, the withdrawal will have caused the credited rate to drop by 0.20%, .30% divided by 1.5 years.

The essence of a non-experience-rated wrap is a transfer of funds between the issuer of the wrap and the stable value fund of an amount that will keep the market-to-contract ratio the same after a withdrawal as it was before the withdrawal. If market value is below contract value, the issuer pays the fund; if market is above contract value, the fund pays the issuers. In the example above, the issuer would have contributed $.25 to the contract's market value, so that the ratio of market value to contract value, $90.25/$95.00, would remain at 95%.

To use the language of financial options, a stable value participant has the right to "put" his/her account to the fund at contract value, regardless of the market value of the underlying assets. The wrap contract is the mechanism that, either by adjusting the interest rate credited to the remaining participants, or by making or receiving a payment from the wrap issuer, eliminates any book/market differential caused by a participant withdrawal. It is factually incorrect to describe the wrap contract itself as a "put." Except in a catastrophic environment, the put experience of the fund does not affect the financial experience of the issuer in experience-rated wrap contracts, since crediting rate adjustments make continuing participants the ultimate option counterparties of those who withdraw. In the example considered above of a nonexperience-rated wrap, the issuer lost $.25.

The Problem of Pricing Wraps

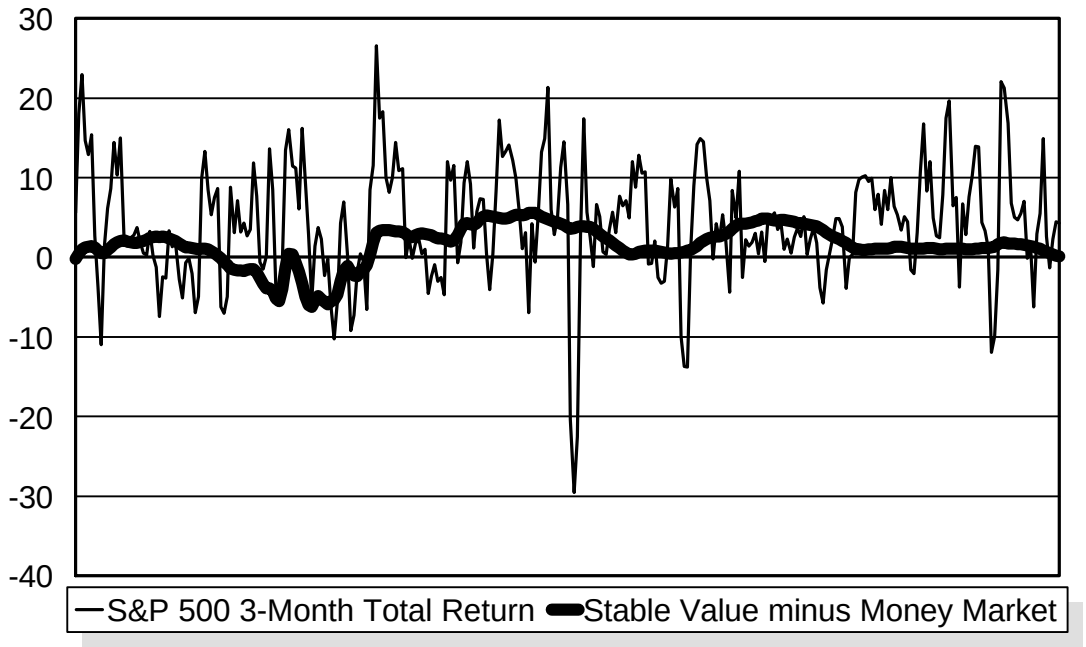
When risk assessments by potential purchasers of a risky investment are radically lower than those of prospective sellers, there may well be no "market price" on which a willing buyer and seller can agree. In my view, this is often the case for nonexperience-rated wraps.

There is a wide disparity of views on the appropriate assumptions for both incidence and cost of exercise of the stable value participant's put against the fund. At one extreme, some (myself included) believe exercise is positively correlated with issuer gains and that the risk charge appropriate to a nonexperience-rated contract is negative. Others (1) restrict their analysis of alternatives to fixed-income products, ignoring the more popular equity options, (2) assume a high degree of efficiency of exercise, and (3) make interest rates highly volatile in their stochastic models. This leads to high projected wrap costs for non-experience-rated products.

Determinants of Participant Behavior

A plausible hypothesis that fits the evidence of at least my firm is that revaluation of the relative risk of the plan options available to the participant is the greatest single factor affecting stable value withdrawals.

The graph below tracks the quarter over quarter total return of the S&P 500 index and the difference between a 60-month rolling average of monthly yields for the five-year Constant Maturity Treasury bonds, a stable value surrogate, and a three-month rolling average of monthly yields on three-month T-bills, a money market surrogate, for the period January 1975 to May 2000.



Even over this period containing two periods of extreme rate inversion, the stable value average return, 8.37%, exceeded the money market average return, 6.79%, by 23%. A dollar invested in stable value at the beginning of the period would have grown to $8.36 by the end of the period. A dollar invested in a money market fund would have grown only to $5.67. The stable value accumulation exceeds that for money market by 47%. These advantages of stable value are compelling in the context of a program aimed at retirement income.

(continued on page 20)

The Stable Value Wrap: Insurance Contract or Derivative? Experience Rated or Not?

continued from page 19

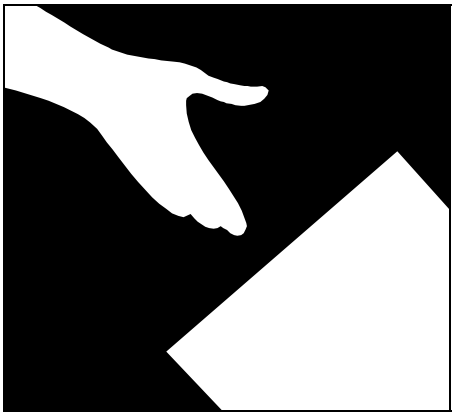
During the long equity boom, participants came to believe that equity investments were safer *with respect to preservation of principal* than they used to think. This led them to allocate less to stable value, and more to equities. While attitudes were changing, as the boom persisted and especially in the glory days of 1997 and 1998, participant allocations to stable value continued to fall. They have since stabilized, albeit at a lower level. Further, as aggregate wealth increases with respect to the demand for a given income, even the conservative investor rationally attaches a lower value to preservation of principal and a higher value to growth of capital sufficient to attain secondary goals.

From January 1991 to May 2000, interest rates, as measured by the five-year Treasury CMT rolling average, rose on a year-over-year basis in only 20 of the 113 months. Increased participant comfort with equities is positively correlated with positive equity returns, which are positively correlated with falling or stable interest rates. In general, then, participant withdrawals during this period were favorable to the party bearing the withdrawal risk. For experience-rated wraps, the other participants reaped the benefits; for nonexperience-rated wraps, the issuers reaped the benefits.

Classification of the Wrap: Insurance Contract or Derivative?

Wraps are not derivatives.
SFAS 133 states that for a financial instrument to qualify as a derivative it must possess all three of the following characteristics:

1. A derivative must have at least one variable factor in the calculation that determines the required payment. This required variable is called an "underlying." A derivative must have either some measure of quantity, to which the underlying(s) is (are) applied in the calculation that determines the required payment, or a payment provision, or both. That measure of quantity is called a "notional amount." An underlying is a specified financial variable, an interest rate, security price, or other variable. A payment



provision specifies a fixed or determinable settlement to be made if the underlying performs in a specified manner.

An option to buy 100 shares of stock at $50 per share provides a classic example. The notional amount is 100 shares; the underlying is the price of one share. The value of the option *on any date when exercise is possible* is the price of a share minus $50, not less than zero, times 100. If the current price of the share is $60, the value of the option is ($60 – $50) * 100 = $1000.

A wrap does not meet even this first test.

What is the underlying?
First of all, there is no clearcut underlying. The suggestion of 133 Issue A16 that the underlying could be the reset formula itself is problematic. A formula is in itself entirely static. The reference to "reset formula" may be shorthand for the series of rates generated by application of the formula. This would make the notional amount a complex series that impounds both market interest rate movement and participant behavior.

Market interest rate movement and participant behavior.
Market interest rate movement determines the market value of the assets. Participant net contributions reduce any market to book difference and net withdrawals increase any market to book difference. The reset formula moves book value to wherever market rates have taken market value, and the successive rates are autocorrelated. I have argued above that participant behavior is largely driven by participants' views of the safety of principal across the investment choices (including equities) the plan offers, not by differences across the yield curve. Is it useful to talk about a series where individual plan design is a major determinant as an "underlying," when that word usually refers to the price of a share or index, or to a market rate of interest?

The obvious candidate for an underlying is the market value of the wrapped portfolio. That at least is determined purely by market forces and is the underlying for accepted derivatives, for example, portfolio insurance.

Choosing a "notional amount" is even more problematic. To define the book value as the "notional amount," as 133 Issue A16 seems to do, would be to include one of the elements of the definition of a derivative in another of the elements. That is because, both for the 133 Issue A16 definition of underlying, crediting rate formula, and for what I would prefer as a definition of underlying if we are forcing wraps into the definition of derivative, the

difference between book and market, book value is part of the calculation. That cannot be what SFAS 133 intends.

The maximum value of the wrap (the issuer's maximum liability) is the difference of two variables, book value and market value. This difference varies unpredictably from day to day, whereas notional amounts are generally constant (e.g., 10 shares or $10 million), or are at least determinable with certainty in advance. Even accepting the difference between book and market as a notional amount, and knowing the behavior of the underlying, whatever it might be, one would not have determined the value of the wrap, but only its maximum value. The actual value at any moment of a wrap also depends on the probability of a withdrawal and the probability distribution of withdrawal amount. It further depends on the experience-rating provision of the wrap contract. Finally, if the wrap contract is experience rated, the value also depends on the probability that the contract will mature before any book-to-market shortfall has been amortized. This is the only time that an experience-rated wrap results in an issuer payout.

What is the payment provision?
For an experience-rated wrap, in the "normal course," there will never be a payment (other than the payment of the premium, which I discuss item 3). The crediting rate mechanism is designed to assure that there is no book/market discrepancy at contract maturity. Wrap contracts that simply expire at maturity even when market is less than book, with no issuer payment, are not uncommon. Other contracts provide for contract extensions as needed to assure eventually convergence. It strains language beyond natural bounds to call such terms "payment provisions," and, once again, cannot have been what FASB was trying to do in SFAS 133.

2. SFAS 133 states that a derivative requires no initial net investment or an initial net investment less than that required for other types of contracts expected to respond similarly to changes in market factors. The second factor is also problematic. A wrap contract requires the payment of a premium, so it has an initial investment. A wrap is a unique, plan-specific instrument, the value of which does not depend solely on factors in the financial markets. It cannot therefore be said that the premium is "smaller than would be expected for other types of contracts that would be expected to have similar responses to market factors." Therefore, wrap contracts do not satisfy either of the two tests of the second requirement, and thus do not satisfy the definition of derivative.
3. SFAS 133 requires that a derivative's terms require or allow net settlement. A derivative must be able to be readily settled net by a method outside the contract; or it provides for delivery of an asset that puts the recipient in a position similar to net settlement. No payment provisions of wrap contracts come close to satisfying this requirement. Most market wrap contracts permit termination by the buyer on notice and termination by the seller for certain enumerated reasons. When termination payments are required, they are universally a function of the premium rate. They do not take into account any changes in market factors or in the characteristics of the plan to which the wrap was issued. Indeed, as the discussion of wrap valuation above should have made clear, it would it be impossible to reach a consensus on a fair payment. Certainly, the contract does not provide for such a payment. Therefore, a wrap contract does not satisfy the third requirement of the definition of SFAS 133 and is therefore not a derivative.

> *"Relying on both my knowledge of wraps and on my experience as a health benefits actuary, I believe that group long-term disability insurance provides the best analogy to stable value wraps."*

The clear import of SFAS 133 is that it was meant to refer only to instruments the value of which is determined solely by "market forces." Market forces are no doubt hard to define with specificity, but certainly cannot be meant to include the underwriting characteristics of a particular defined benefit plan. This is the fundamental incongruity that the argument of the 133 Issue A16 cannot overcome.

Wraps are insurance contracts.
There is a term for financial contracts where not only market variables, but also characteristics of the individual entity purchasing the contract, which require underwriting, determine cost: insurance.

Relying both on my knowledge of wraps, and on my experience as a health benefits actuary, I believe that group long-term disability insurance provides

(continued on page 22)

The Stable Value Wrap: Insurance Contract or Derivative? Experience Rated or Not?

continued from page 21

the best analogy to stable value wraps. Nonexperience-rated wraps correspond to self-insurance with insured stop loss that kicks in at low levels of total claims. Experience-rated wraps correspond to self-insurance with insured stop-loss protection that kicks in only at very high multiples of expected claims.

Arguing by analogy, tax law permits the classification of reserves for noncancellable accident and health insurance as life company reserves if they are computed on the basis of health contingencies and are required by law.[6] Wrap contracts are "noncancellable" in that the issuer generally cannot cancel a wrap contract before its stated maturity except for cause. The causes are nearly all related to plan specifics. The variety of plan designs and differences in the economic "health" of plan sponsors require underwriting. The underwriting required makes a striking parallel to underwriting the long-term disability risk, incorporating many of the same elements.[7]

A key feature of insurance is that the owner of the contract does not control the right to payment. For example, health insurance policies, including group long-term disability policies, exclude coverage for self-inflicted injuries. Underwriting is intended to assure that the insurer understands the nature of the risk and charges a premium appropriate to it.

The stable value option is the owner of the wrap contract, but is the one entity universally excluded in all wrap contracts from precipitating a payment on it! Even the most sweeping wrap contracts exclude coverage for plan termination and for plan changes which materially increase the issuer's risk of payment. The disconnect between the owner and the beneficiaries of the wrap contract severely weakens the characterization of a wrap as a derivative. The analogy to a financial put is fundamentally flawed because it is the owner of a put who decides whether or not to exercise the put and who benefits from the decision to exercise a put that is in the money.

> *"A fundamental principle of insurance is that an insurance premium will always be higher than the expected loss, because in addition to claims losses, a premium must also pay the insurer's expenses and provide the insurer with a profit."*

For a covered participant, even one who, like a COBRA participant, is paying the full cost of group coverage, self-insurance is real insurance. It protects against the threat of financial ruin due to catastrophic health care expenditures by spreading the risk over a large number of participants.[8] When the group as a whole has experience bad enough otherwise to overwhelm the pool, the insured stop-loss protection steps in.

Insurance provides a natural context that helps us gain insight into the nature of the wrap, unlike the unhelpful attempt to classify it as a derivative. Further, our analysis of the wrap contract suggests a useful generalization: Contracts involving purchaser-specific risk are best understood as insurance, whatever their financial features. Contracts not involving purchaser-specific risk are better understood as general financial market instruments, a classification that includes derivatives.

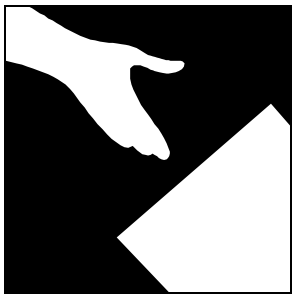
To Experience Rate or Not? Essentials of Insurance Pricing

A risk that an individual or entity will wish to insure is first of all a risk that would be catastrophic, or at least seriously inconvenient, for the individual in the absence of insurance. The risk must be sufficiently improbable that its expected value in any year is low enough to be reasonably payable out of recurring income. Fire insurance for a home or business is a classic example of an insurable risk. Chemotherapy would for many be a catastrophic medical expense, but that does not make medical insurance available to someone who already has cancer, because the expected value of the treatment has become too high. Finally, discretionary actions of the insured should not be able to alter materially the risk the insurer has assumed. To return to the example of fire insurance, if an insured cuts down on fire prevention efforts, the contract should permit the insurer to raise the premium or to cancel the policy.

A fundamental principle of insurance is that an insurance premium will always be higher than the expected loss, because in addition to claims losses, a premium must also pay the insurer's expenses and provide the insurer with a profit commensurate with the risk the insurer is taking on.

Application of Insurance Principles to Stable Value Wraps

Applying these principles to stable value wraps makes it evident that participants have no reason to pay more for a non-experience-rated wrap unless it results in higher expected crediting rates. An experience-rated wrap is sufficient to assure stability of principal. A pronounced change in the crediting rate will threaten the participant's assessment of the option only when it lowers the rate so much that the rate fails to meet the participant's expectation of a minimum margin over money market yields. Even this would not be a loss especially difficult to bear, since principal is preserved. No stable value option is a plan's sole offering. Should the yield fall too far, the participant can transfer his/her balance to a different option, which he/she now values more highly.[9]



What crediting rate insurance fits the market demand for stable value?
Ideal Crediting rate insurance would protect stable value's margin over money market returns at the cost of a modest sacrifice in the total expected excess return. If, for example, the long-term expected excess return, unwrapped, of a stable value option was 1.5%, the conservative investors who choose stable value might rationally choose to sacrifice .10%, to assure that the differential was never less than 1%.

Why would a rational stable value investor pay more for an experience-rated wrap? Only the purchaser who expects interest rates to move up more than market prices for wraps for wraps reflect will pay more. In general, managers without a view on movement of interest rates do a disservice to participants when they pay more for nonexperience rated wraps.

Any differential in cost that does not pay for an added guarantee must be fully recoverable in value, providing no additional contribution to insurer profit or expenses. The expected value of additional issuer transfers must equal the expected value of the increase in wrap charges.

Times Have Been Good; What Would Have Happened When They Weren't?

No one disputes that the last few years were a very good time to have been in the business of selling nonexperience-rated wraps. The interest rate environments issuers have good reason to fear are those that occurred at the end of the 1970s and in the early 1980s, when the yield curve became severely inverted during a period of overall increases in the level of interest rates. Of course, the relevance of this analysis depends largely on how likely one estimates the chances of similar environments recurring.[10]

The graph on page 19[11] shows that issuers would have faced significant losses on nonexperience-rated wraps, *if participants had arbitrage opportunities using money market funds.* In similar environments, modern stable value investors would not have available to them a money market alternative. Issuers require that participants not be able to transfer funds directly from a stable value option into a money market fund. Even in those few instances where there is both a stable value option and a money market fund, the participant must "wash" funds withdrawn from Stable Value in an equity option for 90 days before deposit in a money market fund.[12]

In the absence of the ability to transfer to a money market account, would there have been significant withdrawals from stable value funds, if they had existed? During recent periods of withdrawals from stable value, equities have moved sharply, but also steadily, upward. In the periods of interest rate inversion, equity market volatility was great, and long periods of negative returns were recent memories. That is an important difference.

My conclusion is that, even during the worst interest-rate environment in recent times for stable value, there is no reason to believe that there would have been significant withdrawals from the option. For participants who value safety of principal, the defining characteristic of the stable value investor, and who do not have the right to make direct transfers to money market accounts, there was no place to go. Further, participants may have well viewed their absolute level of stable value return as eminently satisfactory. From the beginning of the first period of rate inversion to the end of the second, stable value returns averaged 8.77%!

Issuer claims of the importance both of nonexperience-rated wraps, and of the overall riskiness of the wrap business, cannot be supported by reliance on a balanced evaluation of the period from 1978 to 1982, and certainly not by any subsequent period.

The Realities of the Marketplace

A "pure" version of a nonexperience-rated contract is rare indeed. Nearly all contracts, including GICs, require the plan to turn first to cash flows to finance withdrawals before access to the contract's funds is possible. In a rising rate environment, net withdrawals will keep the rate on the fund from rising as money-market rates rise. A "pure" non-experience-rated contract would increase expenses both for the issuer and for the manager, and both would want to recover those costs by increasing their charges to the plan.

Even "nonexperience-rated" after cash flows is increasingly unavailable at all for synthetic wraps.[13] A manager with a

(continued on page 24)

The Stable Value Wrap: Insurance Contract or Derivative? Experience Rated or Not?

continued from page 23

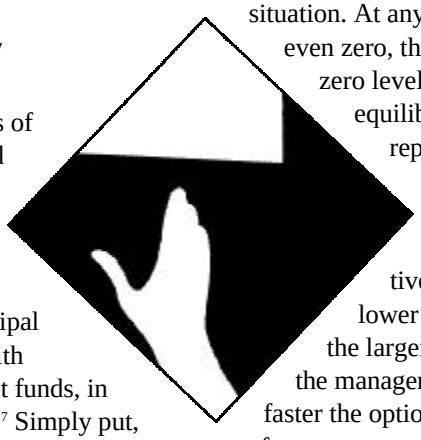
strong preference for nonexperience rating of withdrawals would give for that reason alone a higher ranking to GICs as investments, intensifying credit and nondiversification risk, because GICs provide nonexperience rating of withdrawals. Based on quotation experience at my firm, those issuers who do offer nonexperience-rated wrap contracts charge an additional two to six basis points.

A rational manager who agrees with the analysis of wrap risk presented above would not choose to pay that premium,[14] since that manager would conclude that the additional protection would be overpriced.[15]

My conclusion is this: *The realities of market pricing drive the rational manager to buy experience rated wraps in the typical wrap purchase situation.*

The Theoretically Ideal Wrap

The standard in analysis of benefit programs should be legitimate participant expectations.[16] What participants expect of a stable value option is safety of principal and an excess return, with respect to money market funds, in the range of 1% to 2%.[17] Simply put, the ideal wrap contract would ensure that the effects of withdrawals would never deprive participants of what they expect from the stable value option.



A contract that ties the degree of experience, rating to the effect of withdrawals on the crediting rate meets that test. The crediting rate would be compared to money-market returns plus an increment ranging from 0% to 1%. The issuer would make any payment required to keep withdrawals from driving the crediting rate below the reference rate. All other withdrawals would be fully experience rated.

A hybrid contract of this type would be likely to lead issuers to require tighter investment guidelines, and permit them to require changes at a minimum in portfolio duration as the crediting rate approaches the reference rate.[18]

Such a contract would provide both participants and the issuer with superior protection against the risk that an anti-selection death spiral will lead to a catastrophic meltdown of the kind that issuers profess to believe would have occurred in the late '70s and early '80s. While changes in the interest rate environment could still lead to crediting rates below the reference rate, participant withdrawals would not exacerbate the situation. At any level of interest rates, even zero, there will be some non-zero level of at least relative equilibrium, where slow decay replaces the stampede to exit. The higher the crediting rate, the higher the level of relative equilibrium, and the lower the losses of the issuer, the larger the fee bases of both the manager and the issuer, and the faster the option will return to the reference rate and above.

A critical advantage of what I call a "crediting rate hybrid" is that it minimizes the importance of issuer/manager differences on the value of the catastrophic risk, because it substantially reduces the likelihood that the catastrophic risk will materialize.

An added advantage to the plan is that, precisely for this reason, and depending on the level of the increment used to set the reference rate, a crediting rate hybrid should be cheaper than existing experience-rated contracts. Existing experience-rated contracts would further depress rates already below money market rates, accelerating the stampede to the exits and locking in issuer losses. In my view, the reference rate can be set at a level that will include sufficiently few losses in the way of noise that the gains in catastrophic protection will more than offset them.

However, the higher the reference rate, the more a manager can rationally choose to pay a wrap premium that actually reduces expected participant return. For example, if the reference rate is money market returns plus 1%, the manager has purchased a contract that substantially increases the likelihood that the option will always meet the participants' return expectations. The contract thus has higher utility to participants than a fully experience-rated contract, and the manager can rationally choose to pay more for it. Such a contract offers an issuer an opportunity for a risk charge and risk profit that other contracts do not.

Crediting rate hybrids thus offer an opportunity to improve the value of a Stable Value option to participants while reducing the friction that differences in pricing perspectives introduce in negotiations about wraps between managers and issuers.

Conclusion

In this article, I we briefly introduced the stable value option and examined the expectations participants have of the option. I discussed the characteristics of the wrap contract, seeking additional understanding by examining the factors influencing pricing, and concluded that a wrap is not a derivative, but an insurance contract. I reviewed the basic principles of insurance pricing and applied those principles to wrap pricing, concluding that the realities of the market place often lead the rational manager faithful to its fiduciary responsibility to participants to buy experience-rated wraps. I ended by

describing a theoretical ideal wrap, the crediting rate hybrid, and concluded that the crediting rate hybrid offered a way out of the wrap pricing impasse that would enhance the value wrap contracts offer to participants in a stable value option.

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Endnotes

1) The author is Counsel, Product Initiatives, INVESCO Fixed Income. He is a graduate of Dartmouth College, and has his J. D. and Ph. D. degrees from Yale University. He is a Fellow of the Society of Actuaries and of its Investment, International and Health Sections, and also a member of the American Academy of Actuaries. He holds the CFA designation. He is a member of the New York and Connecticut bars. He has written extensively about stable value and other investment issues, as well as about tax and health care policy. He expresses his thanks to Kim McCarrel, for her extensive comments on an earlier draft, and to Robbi Ray, for her technical assistance.

2) According to the Stable Value Investment Association, in 1998 stable value constituted 16% of defined contribution plan assets, or $182 billion.

3) Statement of Position 94-4, Reporting of Investment Contracts Held by Health and Welfare Benefit Plans and Defined Contribution Pension Plans (American Institute of Certified Public Accountants, New York, NY, Sept. 23, 1994, p. 15.)

4) Available online at *http://www.rutgers.edu/Accounting/raw/fasb/derivatives/issuea16.html*, cited below as "133 Issue A16."

5) There is unfortunately variation in nomenclature that causes confusion. For nearly all disaggregated wraps, the interest credited to participants varies with the value of the underlying investment. Such a wrap is generally called "participating," which means it participates in investment results. However, some use the word "participating" to refer to participation in the effects of withdrawals, what I have chosen to call "experience-rated," adopting the more prevalent convention.

6) IRC § 816(b).

7) For example, the age and income of the participants, the financial health of the plan sponsor, the industry sector, indeed the health status of the employees, since both death and disability give rise to qualified withdrawals in defined contribution plans!

8) As an aside, it is the failure of advice providers to appreciated the value of the self-insurance that is the primary characteristic of the stable value wrap that leads to their failure to give due credit to the wrap's dampening of return volatility.

9) Looking at the problem of crediting-rate movement and insurable interest in this light shows that issuers have the clearest insurable interest, followed by stable value option investment managers. I shall return to this point, when I argue for a wrap contract not currently available that would maximize utility for all parties economically affected by the contract.

10) I believe that globalization of finance has worked a shift in paradigm that makes extreme interest rate volatility of a major global markets participant, like the United States, much less probable, if not actually impossible.

11) See above page 4.

12) This restriction does not apply to retired participants, who can "roll-over" their plan assets into money market IRAs. However, a retired participant cannot return to the plan once the period of rate inversion has passed. A retiree with funds in stable value will know the long-term advantage of stable value from personal experience, and is unlikely to be willing to sacrifice that long-term advantage for a temporary gain.

13) For example, of the issuers from which PRIMCO Capital Management buys wraps, only one is willing to sell non-experience-rated wraps.

14) See above page 10.

15) The manager might rationally believe that a nonexperience-rated wrap should be cheaper than an experience-rated wrap. See above page 5.

16) See above page 2, and my article "What AICPA SOP 94-4 Hath Wrought: The Demand Characteristics, Accounting Foundation and Management of Stable Value Funds" BENEFITS QUARTERLY, (1Q2000), 16:1.

17) See above page 2.

18) Existing synthetic contracts usually give issuers the right to require changes in the composition of the portfolio when a recalculated crediting rate would fall below some stated absolute level, usually 2%.

The Wall Street Journal *2001 Forecasting Survey: A Deconstruction*

by Victor A. Canto

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Each time we review the *Wall Street Journal's* semiannual survey of economists' forecasts, we ask ourselves if there is a simple way to summarize the results and to extract a consensus forecast. From this extraction, we could then determine when an individual forecast is significantly different from that of the consensus. If we could accomplish this, we could then better understand each forecast separately and value it accordingly (perhaps "value" is an inappropriate word—who are we to value another economist's forecast, particularly among this group—let's say we will be able to "assess" their forecasts accordingly).

The Consensus Forecast

The individual forecasts are all over the lot. In what follows we assume that each forecast contains some information unique to the forecaster. We also assume the forecasts are contaminated by noise. Viewed this way we face a classic signal-extraction problem. And a good first step in developing a consensus forecast is to average each of the individual forecasts. As the number of forecasts increases, the random variation of individual forecasts around the "true" or consensus forecast is eliminated. As long as the forecasts are not perfectly correlated (and trust me, they are not), adding an additional forecast reduces the standard error of the sample mean and increases the information contained in the average figures.

The average is reported in Table 1. Comparing the most recent economic numbers to the average of the forecasts gives some insights into the overall picture painted by the "consensus" forecast. Looking at the numbers, the story is fairly straightforward: On average, the group expects a decline of 54 basis points on the short end of the yield curve, while only a 15 basis points drop is expected on the long end. Therefore, taken at face value, the consensus calls for a flat yield curve.

The Consensus Forecasts

Table 1

	T-Bill	*T-Bond*	*GDP*	*CPI*	*YEN*	*EURO*	*Unemp.*
Average Forecast	5.36	5.35	2.5	2.8	113	0.95	4.4
Actual	5.9	5.5	4.2	3.4	114	0.94	4
Difference Between Average and Actual	-0.54	-0.15	-1.72	-0.60	-0.88	1.06	0.40
Standard Deviation of the Individual Forecasts	0.376	0.304	1.108	0.374	4.680	5.068	0.189

Comparing the consensus real GDP forecast for the next three quarters to the economic performance during the past three quarters, these economists are forecasting a positive but much lower rate of economic expansion, with an increase in growth occurring as the year progresses. They are also calling for lower inflation during the year—seeing a decline in the inflation rate of 60 basis points.

Since the expected reduction in inflation is greater than the forecast reduction in interest rates, the real rate is expected to rise. The rising real rate of return is consistent with the forecast of a steady increase in the real GDP growth rate as the year progresses.

The most intriguing part of the forecast is in the international arena. The exchange rate forecast measures the expected relative performance between the dollar and either the yen or the euro. The consensus is that the dollar will appreciate against the yen and

depreciate against the euro. The divergence in the forecasts leads one to conclude that the economists are implicitly forecasting the outlook for Euroland and Japan in their currency forecast. In short, these economists are bullish on Euroland and bearish on Japan.

Significance of Individual Forecasts in Relation to the Consensus

Looking at individual forecasts, there appears to be great deal of variation among the economists participating in the survey. Within the context of our framework, the differences between the individual forecasts and the consensus contain two distinct types of information. One is random noise, and the other is the difference between the individual forecast and the consensus. Since we assume the noise is random, we can use the standard deviation measure to calculate confidence intervals and significance levels of individual forecasts compared to the average.

In Table 1 we report the standard deviation of the differences in the forecasts from the mean. In an attempt to be succinct, we have adopted a simple convention. We use the 5% significance level to determine whether a forecast is significantly different from the mean of the economists' forecasts. Thus, a forecast is only considered to be significant if the difference between the forecast and the consensus is greater than twice the standard deviation of the consensus forecast.

There were 54 panelists who participated in the survey. Each panelist was asked to make 10 forecasts; hence we have 540 separate forecasts. Under the null hypothesis of a normal distribution and assuming the forecasts are independent of each other, we would expect that out of 540 "random" drawings we would get 5%, or 27 observations, that we would consider significantly different from the mean forecast. Well, we got 31. Nevertheless, the results are quite close to the expected result under the "random" null hypothesis. This result leads us to conclude that, on average, the economists' individual forecasts are not statistically different from that of the consensus. Alternatively stated, once the consensus is calculated, the individual forecasts add little or no additional information. Collectively, the value of the forecast is in what they contribute to the consensus, but there is little individual value.

A corollary to the conclusion that the individual forecasts are not significantly different than the consensus is that the selection of the top forecaster for any given quarter is more than likely a result of luck than to the true acumen of the forecaster.

How to Identify a Superior Forecaster?

The problem with selecting the top forecaster is analogous to selecting a top portfolio manager for a given quarter based on performance. If one chooses the hot hand and chases performance, there is no guarantee that superior results will be obtained. The reason is very simple. Is the ranking luck or skill?

If the manager or economist has superior information we should expect him or her to be consistently above average. However, that doesn't preclude some random event propelling a lower quality forecaster to outperform in any one period. To solve this problem, we utilize the statistical technique of sampling. More than one observation is needed to establish the quality of the forecast. As the number of observations increases, the noise surrounding the accuracy of the forecast disappears. We know very well that a manager who ranks slightly above average "every" year will also rank high on the five- and ten-year charts.

The same should hold true for forecasters. Looking at their track records is a way to "average" out random fluctuations and obtain information on their true forecasting ability. Borrowing a page from the investment consultants, investors need to develop alternative measures that help determine the likelihood of success, such as style and style consistency. The style is important because it helps develop some decision rules as to how different environments favor different styles. In turn, style consistency ensures that when a particular economic environment materializes, the expected style performance will be there. Within this framework, style consistency is of the utmost importance. For only if a manager stays within his or her style will an asset allocation process maximize returns or minimize risks. A manager that violates his or her style may be able to increase returns, but in so doing could increase overall portfolio risk.

The analogy is very appropriate for money managers hiring economists. If measuring true forecasting ability is a hard process, as we've argued, then evaluating an economist would take several forecasting periods. The investment manager may be well served by focusing on analysis consistency.

Comparing the various styles or persuasions, the manager will be able to identify issues at the margin. Also, based on experience, the manager may be able to determine which style works best for each environment. Using the asset allocation/style analogy. A consensus economic forecast could be easily built by "averaging" the various economic forecasts. In this case, style consistency is of the utmost importance. In some cases this becomes more important than the forecast, for it is the consistency of the style that allows managers to filter the information and adjust the analysis to their views.

Investors need a Keynesian, a monetarist, a supply-sider, etc., to evaluate, and in this way be able to compare and contrast the insights of the different views/styles.

How to Identify a Forecaster Style

To aid our interpretation of the consistency of the different sets of forecasts, we have found a way to summarize some key relationships that characterize the theoretical underpinnings of the various forecasts.

(continued on page 28)

The Wall Street Journal 2001 Forecasting Survey: A Deconstruction

continued from page 27

The first step in our characterization is to identify the nature of the shock implicit in the economists' forecasts. For example, an aggregate demand shock will lead to higher output and higher interest rates. Hence, under an aggregate demand shock we should observe a positive relationship between the rate of change in real GDP growth and the change in interest rates. A negative correlation between the two variables implies an aggregate supply shock. Thus, looking at the correlation between the two variables in the economists' forecasts, one can determine whether they are forecasting a demand shock or a supply shock.

The Phillips curve postulates a positive relationship between inflation and unemployment. Hence, looking at the inflation and unemployment forecasts, one can determine whether the forecaster has built a Keynesian/Phillips curve into his model. As a practical matter we only looked at absolute values in excess of 0.1 in calculating the correlations.

The final characterization is the relationship between inflation and T-bill yields. If monetary shocks are the major sources of disturbances, inflation expectations will be a major source of variation in nominal yields. In which case we should observe a positive correlation between inflation and nominal interest rates. On the other hand, if real disturbances are the major source of interest rate fluctuations, a negative correlation between inflation and T-bill yields will be observed. A related implication is something that that we have said many times before. Currency movements can be attributed to two factors: relative inflation rates or relative rates of returns. We have argued that when PPP is the relevant framework, currency movements reflect relative inflation rates. Hence we would expect to see a negative correlation between interest rates and exchange rates. On the other hand, when PPP is violated and the real exchange rate is the dominant force a positive correlation is then observed.

Is There Any Forecaster-Specific Information?

We just made the case that the bulk of the individual forecasts are not statistically different from the average of the individual forecasts. The outliers may provide an opportunity to evaluate the true forecasting record of the individual economists. Economists have a particular view of the world, meaning that their individual forecasts may not be totally independent of each other. Thus, if we are willing to look at their forecasts as a package, the outliers (greater than a two-sigma difference) here have the potential of having an insight truly different from the consensus. This process reduces the list to 16 forecasters worthy of consideration.

The list of economists whose forecasts are the most likely to be significantly different from the consensus is reported in Table 2. The numbers in the columns represent the difference between the economist's forecasts and the average or consensus forecast. The number in bold represent the forecast that we have identified as two-sigma events. A number of forecasters differ from the consensus in that they made one different forecast. The single outlier makes it difficult to identify any consistency in the economists' forecasts. To aid in our interpretation of the consistency of the forecasts, we have also looked at the relationship among the individual forecasts. The last three columns describe the economic relationships built into their model. These include the nature of the shock, whether interest rates are driven by real or monetary factors, and whether a Phillips curve is built into their model.

Gary Shilling of Shilling & Co. takes the honors as the forecast with the most outliers. The Shilling model is a Keynesian-based Phillips curve where nominal interest rates are driven by inflationary expectations. The model assumes a large negative aggregate demand shock. Given the structure of the model and the nature of the shock, the forecast of lower output, inflation, interest rates and a higher unemployment rate than the consensus immediately follow.

Five forecasts are based on Keynesian models, where nominal rates are driven by monetary disturbances just as in the Shilling model. However, unlike Shilling, these five economists are forecasting an aggregate supply shock. In relation to the consensus, the three of the economists-Laufenburg, Synott and Swonk—are forecasting above average growth and thus project the unemployment rate to decline. In Laufenburg's case the supply-led growth will result in higher long-term yields. The two economic groups forecasting a negative supply shock within this group are Lazar/Hyman and Smith. We found it troubling that even though Smith calls for slower growth, he projects an unemployment rate below and a T-bill yield above the consensus.

The next group of forecasts consists of two Keynesian-based models in which the real rate is the main driving force behind interest rates changes. Both Kurt Karl and Richard Yamarone forecast a positive aggregate demand shock. So they both forecast a lower than average unemployment rate. In Yamarone's case the rise in short-term real rates result in an above average forecast for higher interest rates and a higher foreign exchange value of the dollar.

The remaining forecasts don't embody a Phillips curve type of relationship. Four of the forecasts assume that interest rates are driven by real rates of returns. Two forecasters—William Dudley and Tracy Herrick—are forecasting a negative aggregate demand shock. Hence their forecasts are below average across the board. Two other groups—David Littman and R. Berner/D. Greenlaw—forecast a positive aggregate supply shock. Thus their model projects higher than average growth, lower real rates, and a deteriorating dollar.

The remaining three forecasters have models in which nominal interest rates are driven by monetary shocks. Lawrence

Forecasters Who Differ From the Consensus

Table 2

	T-Bill	*T-Bond*	*GDP*	*CPI*	*YEN*	*EURO*	*Unemp.*	*Shock*	*Interest*	*Phillips*
Gail Foster, Conference Board	1.0	0.6	1.3	0.7	2.6	11.7	-0.1	AD	N	
Daniel E. Laufenburg, American Express	0.1	-0.1	1.3	-0.2	-1.8	-1.1	-0.5	AS	N	K
Kurt Karl, Swiss Re	0.1	-0.1	1.3	-0.2	-1.8	-1.1	-0.5	AD	R	K
Thomas W. Synott III, U.S.	0.1	0.7	0.4	0.6	-3.5	-1.1	-0.2	AS	N	K
Diane C. Swonk, Bank One	0.0	0.4	1.4	0.1	0.0	2.1	-0.5	AS	N	K
N. Lazar/Ed Hyman, ISI Group	-0.2	0.0	-1.0	-0.6	0.9	-3.2	0.4	AS	N	K
David L. Littman, Comerica Bank	-0.8	0.0	0.5	0.6	4.4	-11.7	0.0	AS	R	
William Dudley, Goldman Sachs	-0.5	-0.1	-0.1	0.1	-14.9	-11.7	-0.1	AD	R	
James F. Smith, Univ. of North Carolina	0.7	-0.1	-1.4	0.4	11.4	8.5	-0.2	AS	N	K
Tracy Herrick, Jeffries & Co.	-0.1	-0.4	-3.5	1.0	-12.3	-8.5	0.0	AD	R	
Lawrence Kudlow, ING Barings	-0.4	-0.6	-0.3	-0.3	5.3	6.4	0.1	AD	N	
R. Berner/D. Greenlaw, Morgan Stanley	-0.1	-0.3	0.4	0.1	-10.5	-6.4	0.1	AS	R	
A. Gary Shilling, Morgan Stanley	-1.1	-0.9	-5.3	-0.9	3.5	4.3	0.6	AD	N	K
John McDevitt, 3M	N/A	0.7	0.2	0.0	-0.9	-6.4	0.0	AD	N	
Richard Yamarone, Argus Research	0.5	0.2	0.9	-0.8	0.9	10.6	-0.2	AD	N	K

Kudlow is the only one with a classical model and thus is the one model/forecast different from the pack, both theoretically and quantitatively. Larry's forecast is driven by his belief that rates will decline, which, in turn, will result in lower real GDP growth. The other two—Gail Fosler and John McDevitt- have Keynesian-like forecasts. They are both looking for stronger growth, and higher inflation and higher interest rates than the average.

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Pension Forecasts, Part II: The Model Has No Clothes

by Lawrence N. Bader

Editor's Note: In a previous issue of this newsletter, Part 1 of this article described a simplified problem in pension plan financing and presented two questions about how that pension plan can be modeled. The questions are repeated here, together with answers.

Consider this simplified pension plan and funding system. The liabilities consist of a single known benefit payment to be made 20 years from today. That benefit payment can be matched in timing and amount by a portfolio of 20-year zero-coupon Treasury bonds with a market value of $1 million. The plan assets also equal $1 million.

The company will make no interim contributions to or withdrawals from the plan. At the end of year 20, the company will wind up the plan by withdrawing the surplus or contributing to cover the deficit. (I ignore taxes and assume that there is no risk of default by the company.[1])

The corporate sponsor of this plan asks for your help. The assets are currently invested in the matching Treasury portfolio, which will ensure full funding of the plan with a company cost of zero. The sponsor believes that, over a 20-year horizon, equity investments would give rise to potential withdrawals that greatly outweigh the potential contributions, in both probability and magnitude. So he asks you *Question #1: Ignoring taxes, how would shifting the $1 million from Treasuries into equities affect shareholder value?*

You decide to use a pension forecasting model. You prepare a series of 20-year simulations that show a range of terminal company contributions or withdrawals. To provide a single answer to Question #1, you need to discount each of these terminal payments to a present value. This presents *Question #2: What discount rate should you use—the Treasury yield, the expected return on the plan assets, the company's borrowing rate, the company's weighted average cost of capital, or some other rate?*

Answers

At the end of year 20, the company will withdraw from the plan an amount equal to the cumulative change in the assets minus the cumulative change in the liability (or contribute the difference, if negative). Because the matching Treasury portfolio mimics the liability, we can think of the withdrawal as the total asset return minus the total return of the matching Treasury portfolio (the "liability return"). If the assets are in fact invested in that matching Treasury portfolio, the asset and liability returns are of course identical and the withdrawal is zero. If the assets are equities, readers familiar with swaps will recognize that the company is engaging in a simple debt-for-equity swap, paying the return on a specific Treasury portfolio and receiving the return on an equity portfolio of equal size. The value of such a swap is zero. Therefore the proposed equity investment would leave shareholder value unchanged.

This result may seem quite counterintuitive to those who have not studied swaps, and a simple swap illustration may be helpful. Ignore tax considerations, transaction costs, and other frictions, and assume that you and I both have flawless credit—we can borrow at Treasury rates. Let's agree to engage in the following swap transaction:

I'll pay you the return of the S&P 500 on a $1-million investment for the next 20 years (or I'll collect from you if the return is negative). You'll pay me the return on $1 million of 20-year zero-coupon Treasury bonds. Although swaps are commonly for shorter periods with periodic interim settlement, we'll duplicate the pension problem by waiting and settling the entire difference at the end of 20 years.

Both history and common sense indicate that you're much more likely to collect than to pay, and your likely collections are much larger than your likely payments. It seems that you are receiving, and I am paying, something with a substantial positive present value. So would it be fair for you to pay me a little extra to get this deal—say, 2% annually on top of the Treasury return?

The correct answer is that the swap is a fair deal and no additional payment is appropriate. We can show that the swap is fair by demonstrating that I can hedge my position:

1. I borrow $1 million at the Treasury rate, with all interest and principal due in 20 years.

2. I invest the loan proceeds in the S&P 500. During the next 20 years, I earn the S&P return on my $1-million investment.

3. I pay that S&P return to you in exchange for 20 years of Treasury bond interest.

4. I use that interest plus the original $1-million investment to repay my loan.

This hedge assures me of breaking even on the swap. If you're willing to give me any extra payment beyond the Treasury bond interest, I can pocket it as pure and certain profit, which I make without putting up any capital or taking any risk. Therefore my offer to pay you the equity return minus the Treasury bond return has a true present value of zero. (These results can easily be generalized to any pair of marketable portfolios and any length period, and the swap market reflects this zero present value.)

To put the matter in its starkest form, a million dollars' worth of equity is not worth more than a million dollars' worth of Treasury bonds. Current shareholder value is unaffected when the company replaces one with the other, or with any other marketable asset. (A change in investment strategy can affect shareholder value if other factors, such as corporate taxation and PBGC premiums, are considered.) The corporation can hope, even expect, that the equity will be worth more in the future than the Treasuries, but that higher expected return is only anticipated compensation for bearing risk, not additional present value.

Question #2, the discount rate for company withdrawals (or contributions), becomes moot in our example, because we have determined from general principles that the true present value of the company's withdrawals must be zero. The expected equity return exceeds the Treasury return, so the company withdrawal, before discounting, has a positive expected value. The expected value remains positive after applying any single finite discount rate. We conclude that any single finite discount rate gives a positive and therefore incorrect discounted present value of the company withdrawals, just as it would incorrectly attribute a non-zero value to a swap.

Although the correct expected present value of the company cost is zero, we may still wish to discount individual simulation results to understand the risks inherent in the distribution of costs around their zero mean. Is there any discounting procedure that enables us to observe the distribution while preserving a zero mean?

Corporate finance principles require that a discount rate reflect the risk of the cash flow stream to which it is applied. For example, we would discount the scheduled flows from a noncallable bond at the market yield appropriate to the bond's quality, and the discounted value would be the fair market price. By discounting expected equity returns at the expected equity return rate, we similarly arrive at the market value of the equity.

In our pension fund example, the cash flow that we seek to discount is actually the difference between two flows—the asset return and the liability return—with different risks. We must recognize that these two components should have separate discount rates to reflect their different risk levels. We can then discount each simulated terminal value of assets and liability, as the market does, at its own appropriate discount rate—we discount the Treasury bond maturity value (liability value) at the Treasury rate, and the simulated terminal asset values at the expected asset return rate.

On any particular simulation, the discounted terminal asset value may differ from the initial market value, but the expected discounted value will equal that initial market value. We can then net the separately discounted values of terminal assets and liabilities, with a correct expected net present value of zero. The standard pension modeling practice of using a single discount rate or yield curve gives the wrong answer: It fails to adjust for the different risks of the asset and liability components of cost, and would therefore show a net present value gain for any asset reallocation (or swap) that raises expected return.

In real-world pension funding, various deferrals mask the underlying exchange of liability returns for asset returns. But to the plan sponsor, the financial essence of funding remains a swap, which customary pension discount methodology clearly misvalues. So our final question: If traditional actuarial models and techniques stumble over questions about pension cost and asset allocation for the simple case described here, is there any reason to think that they get it right for real-world pension plans and funding practices?

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Endnotes

1) The assumption of no default risk was inadvertently omitted from Part 1 as published in the previous issue. The discussion following initially reflects this assumption, but an endnote explains how to adjust for default risk.

2) If the corporate sponsor has default risk, we use its own borrowing rate rather than the Treasury rate on the unfunded portion of the terminal liability. (An unfunded liability can arise only if the assets are not invested in the matching Treasury portfolio.) This higher discount rate lowers the liability. By investing in risky assets, the sponsor can then show an average gain on the plan, with a corresponding loss to the participants or guarantee agency.

Risk Management for Life Insurance Companies

by David Ingram

Insurance companies have been in the business of risk management for hundreds of years. The latest trend towards risk management in banks is both new to insurance companies and very old hat—new because it applies new techniques (at least new to the last half century) and old hat because many risk management techniques are so old hat to insurance companies that they are almost unconsciously performing them.

Risk management at insurance companies, since it is so old, is most likely to have evolved gradually rather than developed within a complete conceptual framework.

The Basle committee on Banking Supervision proposed a set of principles for the management of interest rate risks by banks in 1997. These principles can be easily generalized to apply to all risk management and to insurance companies. Here is a sampler of generalized principles:

1. Clear lines of responsibility for risk management.

2. Separation of risk takers and risk managers.

3. Quantitative risk limits.

4. System for promptly reacting to positions that exceed limits.

5. Risk management must apply to new products.

6. Focus on both earnings fluctuation & economic value fluctuations.

7. Need to assess *all* material Risks.

8. Risk measurement system should utilize generally accepted financial concepts and measurement techniques.

9. Well-documented assumptions and parameters.

10. Need to measure risks under wide ranges of underlying economic situations and regularly re-evaluate assumptions.

11. Stress testing to evaluate extreme fluctuations and develop contingency plans.

12. Regular internal and independent review of Risk Management system

From these or other basic principles, a company can begin the process of forming a complete and modern risk management process.

Basic risk control processes already exist within almost all life insurance companies to deal with insurance underwriting and investment selection.

Companies should consider the consistency of the risk limits and control processes in these two functions and determine if there is any consistency. Can anyone say if the risk limits and control processes for dealing with interest rate risk or liquidity risk are more or less risk adverse or comprehensive?

Once a consistent set of limits and control processes are in place, the company needs to develop a process for reporting the risks positions of all of the various activities.

At many banks, it is customary for the CEO to get a daily report of the risk position of the entire enterprise, summarized onto a single sheet of paper. Daily may be too frequent for most risks encountered by a life insurance company. Annual is probably too infrequent, but is fairly common.

Ultimately, risk management can be tied directly into capital allocation. If products are required to hold capital in proportion to their risks, then consistent risk-adjusted returns can be measured.

Allocating capital based on risk-adjusted return optimizes return on capital, rather than orienting the company to maximize investment in the products with the highest returns that may also have the highest risks. True allocation of capital in proportion to risk may have practical measurement problems, and companies may fall back on using risk-based capital or rating agency formulas. The danger in this is that it creates the opportunity for product managers to arbitrage the actual risk against the simplified formula.

Another large hurdle to overcome to implement a modern risk management is proper reflection of the correlation of risks.

Perhaps the independently measured risks do not need to be added together. Low correlations among the various risks managed by life insurance companies have not been widely studied, and extreme events are of such low frequency that it may be another 100 years before enough data can be collected.

Excessive dependence in correlation calculations can, however, be dangerous. In 1998, many financial institutions found that there were higher correlations than expected in an extreme situation.

Hedging and reinsurance are two powerful risk management tools. At some companies, reinsurance is being used extensively to sell off large parts of the company's risk positions, while hedging is being shunned as a waste of money.

"The structure of a company's compensation plan is its most powerful tool for motivating employee performance. Compensation plans can focus employees on organizational objectives."

Just as risk limits and control processes should be consistent, the use of risk management tools should be used consistently to sculpt the risks of the company to the desired form. This should be looked at on a risk and cost adjusted basis.

Ultimately, risk management can be integrated into all operational, financial and strategic decision-making processes. risk-adjusted pricing is one of the tools that can be used to accomplish this. Stochastically generated scenarios are used to develop the projected profits of all products in risk-adjusted pricing.

Alternate strategies for investing, reinsuring, price setting and product design can be tested under multiple stochastic scenarios. A plot of the returns and risks of each strategy can generate the "efficient frontier" for each product. Final product design, investment strategy and pricing are then chosen to be near or on the efficient frontier.

The structure of a company's compensation plan is its most powerful tool for motivating employee performance. Compensation plans can focus employees on organizational objectives. These include maximizing stock value, Maximizing the net present value of *risk adjusted* earnings or maximizing *risk adjusted* return on capital. Stock and option based compensation plans focus employee performance on shareholder return. Incentive compensation related to risk-adjusted earnings or risk-adjusted return on capital is risk management for shareholders. Without those types of company goals and incentives, shareholders are left to try to manage their risks from insurance company stock ownership without the detailed knowledge needed to do so.

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2001 Symposium on Stochastic Modelling for Variable Annuity/Segregated Fund Investment Guarantees

by David Gilliland

The 2001 Symposium on Stochastic Modelling for Variable Annuity/Segregated Fund Investment Guarantees will be held September 5, 2001 at the Royal York Hotel in Toronto.

This will be the third year that the CIA has sponsored an event designed to advance education and research in areas of interest to actuaries working with investment guarantees.

The first symposium in 1999 was jointly sponsored by the SOA, CIA and The Actuarial Foundation and included 27 papers presented over two days to more than 300 delegates attending from all over North America.

The CIA Task Force on Segregated Fund Investment Guarantees was formed in the fall of 1999 and last year it recommended that actuaries in Canada use stochastic investment modelling techniques to establish policy liabilities for segregated fund investment guarantees for their 2000 valuation. These principles were also adopted by the Office of the Superintendent of Financial Institutions in establishing capital requirements for these products based on stochastically developed factors. Last year's seminar, titled "Seminar on the Practical Application of Stochastic Techniques to Value Segregated Fund Guarantee Liabilities," focused on helping actuaries prepare to implement this recommendation.

This year the symposium will include concurrent sessions that cover material of interest to both practitioners and decision makers. Sessions will provide an opportunity to learn from the experience of implementing the recommended stochastic approach to establishing policy liabilities and capital requirements for segregated fund investment guarantees. Topics to be considered include:

- Business and product design implications
- Selection and calibration of long term investment return models
- Modelling specific funds—benchmark or proxy funds and basis risk
- Using stochastic models to establish actuarial liabilities
- Stochastic capital requirements
- Hedging
- Product features and policyholder behavior
- Practical implementation issues
- Areas for further investigation

Please plan to join us on Sept. 5 for what should be another interesting meeting. You may also want to attend the adjoining AFIR Colloquium on Sept. 6–7 at the same location. The theme of the colloquium for this year will be risk management.

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Investment Record Sessions on the Web

by Linda Blatchford

Be on the lookout for Investment Section sessions coming to the SOA Web site!

Dallas 2001

13TS Introduction to Derivatives

26PD (Summary) Risk Management Practices in the Insurance Industry
(See Toronto for entire session)

Toronto 2001

7PD Embedded Value

10OF Successful Communications with Investment Professionals

18PD Risk Management Practices in the Insurance Industry

44PD Investment Structures for Life Insurers

45PD Chief Risk Officer—Is This a Job for an Actuary?

57PD Follow-up to RBC C-3 Component Methodology Change

58PD Enterprise Risk Management Meets UVS

74PD Asset Strategies for Long-Tail Liabilities

86PD Stochastic Pricing

101PD Liquidity Modeling and Management

102PD Risk Management Tools

113PD The Impact of Policyholder Behavior on Variable Annuities

114PD Acceleration of Monte Carlo Methods in Insurance and Investment Models

Don't Forget to Vote in the Investment Section Council Election!

Take an active role in the election process! The following section members are candidates for the three council seats:

Mark W. Bursinger - *AEGON USA Investment Management, Inc.,* Cedar Rapids, Iowa

Rishi Kapur - *Swiss Re New Markets,* New York, New York

Joseph D. Koltisko - *American General Financial Group,* New York, New York

Richard J. Lauria - *Fortis, Inc.,* New York, New York

Russell A. Osborn - *Nationwide Financial,* Columbus, Ohio

Larry H. Rubin, *Bear Stearns and Co.,* New York, New York

David C. Scheinerman - *PricewaterhouseCoopers,* Hartford, Connecticut

Ballots must arrive in the SOA office no later than Friday, August 3. Section members who do not receive the election mailing by July 18 should contact Lois Chinnock at the SOA office (phone: 847/706-3524; e-mail: *lchinnock@soa.org*)

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