



RISKS AND REWARDS

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Back-to-Basics: Credit Default Swaps

by Teri L. Geske

In this back-to-basics article, we address the basics of credit default swaps. These instruments represent the majority (over 70 percent) of activity in the fast-growing credit derivatives market, with the notional amount of credit default swaps outstanding estimated at \$1.67 billion (as of year-end 2002), a 179 percent increase over the previous year.¹ Not only is the usage of credit default swaps increasing rapidly among a variety of financial institutions, prices for credit default swaps, which are quoted in terms of spreads, are becoming an important indicator of market levels and risk for corporate bond investors. So, we thought it would be useful to review these instruments from a theoretical and practical perspective.

First, the mechanics. In a credit default swap, the protection buyer pays a periodic premium called the credit default swap spread to the protection seller in exchange for compensation in the event that a referenced asset defaults during a specified period of time, most commonly five years. If an event of default occurs (which we'll define shortly), the protection seller's obligation may be fulfilled in one of two ways, referred to as physical delivery or cash settlement. In the case of physical delivery, the protection buyer delivers the defaulted instrument (such as a bond, or a loan) to the protection seller in exchange for the full face value of the instrument. With cash settlement, the protection seller pays the protection buyer the difference between the face value and the post-default market value of the debt instrument (where the market value is determined by polling a number of dealers a specific number of days after the default has occurred). In either case, the buyer is protected from losses arising from the default. The following is a diagram illustrating the payment flow of a credit default swap on a \$10



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1) Source: *Risk Magazine's* annual credit derivatives surveys (published February 2002 and 2003).



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Please e-mail your articles as attachments in either MS Word (.doc) or Simple Text (.txt) files to the newsletter editor. We are able to convert most PC-compatible software packages. Headlines are typed upper and lower case.

Please use a 10-point Times New Roman font for the body text. Carriage returns are put in only at the end of paragraphs. The right-hand margin is not justified. Author photos are accepted in .jpeg format (300 dpi) to accompany stories.

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Thanks you for your help.

Chairperson's Corner:

SOA Plans New Risk Management Section

by Douglas A. George

By the time you read this, you should have already been solicited by the SOA to join the new Risk Management Section. Since this has implications for Investment Section members, I thought I'd try to provide some brief background through this column.

The SOA has never before had a section dedicated solely to risk management. Many sections include some coverage of risk management issues. Ours, in particular, has a significant risk management component. After all, many of the risks faced by insurance companies and pension plans are investment-oriented or asset-liability in nature. Consequently, our section supports a number of activities with a risk management focus. We sponsor the Basic and Advanced Risk Management Seminars and the Stochastic Modeling Symposium. We actively participate in the Risk Management Task Force and provide funding for its activities. Just take a look at the name of this newsletter and you can see that risk management is core to our function. In addition to being the Investment Section, we have, over the years, become the de facto Risk Management Section of the SOA.

About one year ago I actually considered proposing to our Section Council that we change our name from the Investment Section to the Risk Management Section. It seemed to me that as much of our efforts were spent on risk management as on investment issues (while realizing that there is tremendous overlap between the two). However, I backed off because I believed that a portion of our membership would want us to retain investments as the primary focus, rather than shift to risk management, even if the shift were minor. Besides, we've been covering both topics anyway so why bother.

Then why does the SOA believe we need a separate and distinct Risk Management Section? It appears that a number of elements have contributed to the SOA's decision. The accounting scandals, the threat of terrorism and recent geopolitical events have increased worldwide attention on risk management. The SOA has made efforts to increase the visibility of our profession, and in particular to enhance the image of actuaries as risk managers. The success of the Risk Management Task Force, with 250 members and 10 subgroups, has also been a factor. Whatever the case, the Risk Management Section initiative has gained momentum very quickly and is on the fast track to

move forward at the SOA with the membership drive, election of a Section Council, a newsletter and funding all scheduled to get up and running in the near term.

What does this mean for the Investment Section? It's a bit too early to tell, but in concept, when it comes to risk management, the Investment Section should focus on investment risks and asset-liability risks (mainly C-1 and C-3). The Risk Management Section should include risks from both sides of the balance sheet (C-2 also). The Risk Management Section should also cover business risks (C-4). This latter category would include another hot topic these days, enterprise risk management. If you are not familiar with enterprise risk management, there are many different definitions, but in general it involves taking a comprehensive view of all risks facing a company. These include, for example, strategic risks and operational risks, in addition to the financial risks. Enterprise risk management usually also involves developing a corporate risk strategy, and implementing processes to quantify and monitor risk in light of corporate objectives.

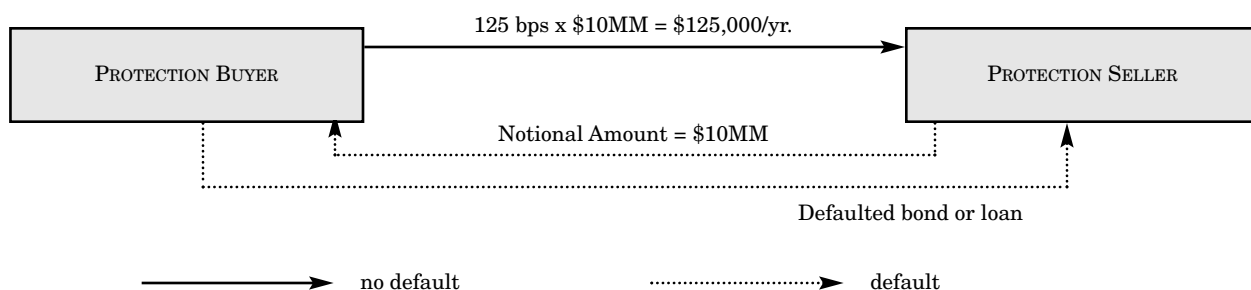
So, in the end, I do not see the Investment Section stepping away from risk management, but our focus may become more refined. My own view is that the volume of activity in the areas of investments and risk management provides enough room for two sections to address the issues. I would hope and expect to see a lot of coordination and cooperation between the two sections, such as cosponsoring seminars, research and sessions at SOA meetings.

If you haven't signed up for the Risk Management Section, I would urge you to join. Joining the new section will allow you to participate more directly in all of the current activity. For example, various subgroups of the Risk Management Task Force are developing research, writing specialty guides, performing surveys, sponsoring webcasts and putting together reading lists. Joining the section will help to sponsor these types of activities and will provide additional access to the valuable information produced by them.

Oh, and by the way, please make sure you continue to support the Investment Section too! We are still the strongest SOA section, with 4,174 members, and will continue to play a significant role in SOA, risk management and investment activities, no matter how this all plays out! 🍀



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million notional amount, where the default swap spread is 125 bps and we assume physical delivery if default occurs (see diagram above).

Under the current, standard International Swaps & Derivatives Association (ISDA) credit default swap agreement, an event of default is defined as a bankruptcy, obligation acceleration, failure to pay, debt moratorium/repudiation or restructuring. There is an ongoing controversy regarding the inclusion of "restructuring" as an event of default. In certain cases, banks that have purchased protection under a credit default swap are the same banks that have loaned money to an obligor and are therefore in a position to approve or accept a debt restructuring by that obligor, which would then trigger a payment under the default swap agreement. This situation creates a moral hazard, which is objectionable to credit protection sellers. Furthermore, there are some instances where a debt restructuring has arguably not resulted in financial harm to the debt holder and protection sellers object to paying under these circumstances. However, there are arguments to be made in favor of including restructuring as default event, and the issue is as yet unresolved.

What types of institutions use credit default swaps? Commercial banks, with their large portfolios of corporate loans, are the biggest participants in this market and are usually protection buyers. Insurance companies, both reinsurers and other insurers, represent a growing percentage of credit default swap

users, typically acting as protection sellers since insurance companies are accustomed to analyzing and accepting risk. Hedge funds are also active in the market. Selling protection via a credit default swap is similar to owning a corporate bond with the interest rate risk eliminated (it is equivalent to purchasing a corporate bond with funds obtained by shorting a duration-matched Treasury). Any change in value of this position would be due to a change in the credit quality of the corporate bond issuer. Similarly, buying protection is a way of shorting a corporate credit, which in the cash markets is usually not feasible. Other end-users include synthetic collateralized debt obligations (CDOs), whereby the exposure to one or more issuers is derived from selling protection under a credit default swap rather than from purchasing actual bonds. Synthetic CDOs are particularly popular in the European market where the corporate bond market is not as broad as it is in the U.S. Corporations themselves often buy protection against the default of obligors of trade receivables—for example, if Corporation X derives a significant percentage of its revenues from sales to Corporation Q, a default by Corporation Q might have a materially negative impact on Corporation X's financial situation, which a credit default swap can prevent. Traditional fixed income asset managers represent a potentially large group of credit default swap users, both as protection buyers and as sellers, although actual usage among this group is still limited, most likely due to investment policy restrictions against the use of most or all types of derivatives.

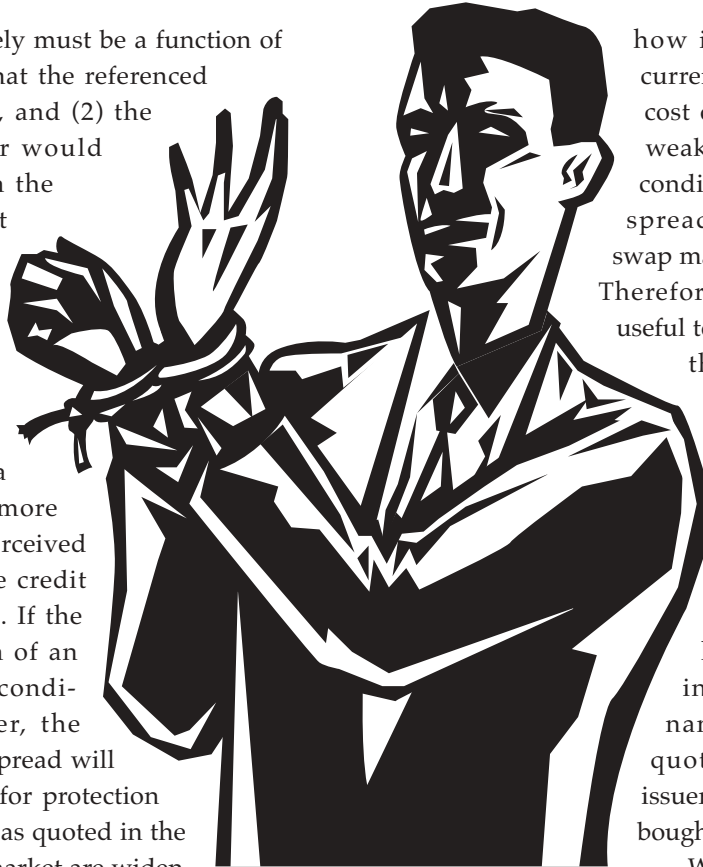
We now discuss how the cost of protection is determined. At the time a default swap is created, the present value of the payments made by the protection buyer must equal the expected value of the payment to be received from the protection

2) For more information about models of default probability, please see the CMS BondEdge research publication, "An Introduction to Credit Risk Modeling," available on the BondEdge Private Client Web site or by request at www.cmsbondedge.com.

3) The default probability cannot be derived from default swap spreads without specifying a "recovery," or "loss given default" rate.

seller, which intuitively must be a function of (1) the probability that the referenced obligor will default, and (2) the amount an investor would expect to recover in the event a default occurs.² Therefore, quoted credit default swap spreads are indications of the market's view on the default probability for a given obligor.³ The more likely a default is perceived to be, the higher the credit default swap spread. If the market's perception of an obligor's financial condition grows stronger, the credit default swap spread will tighten. So, if prices for protection on a particular name as quoted in the credit default swap market are widening significantly, this is an indicator of a change in perceived credit quality. The credit default swap market may respond more quickly than the cash market and therefore can be an important leading indicator of what spreads on the issuer's bonds are likely to do.

Having said that, it is important to note that while the credit default swap market is growing in breadth and liquidity, it is still a new market and therefore suffers from supply/ demand imbalances that can cause substantial and potentially misleading price volatility. In fact, price volatility in the credit default swap spread market may even be a self-fulfilling prophecy: Assume Obligor X is planning a new debt issue. The dealers in the underwriting syndicate buy protection in the default swap market as a hedge against spreads widening while the new issue is being marketed, which causes the default swap spread for Obligor X to widen. Bond investors observe the volatility in the price of credit protection for Obligor X and begin to sell their current holdings, which causes spreads on Obligor X's existing debt to widen. The coupon rate Obligor X must now pay to raise new funds therefore increases to keep up with



how its outstanding debt is currently trading. This higher cost of debt could potentially weaken Obligor X's financial condition, which would cause spreads in the credit default swap market to widen, and so on. Therefore, while it is extremely useful to monitor spread levels in the credit default swap market, the information derived should be used judiciously. Note also that default protection is not available on all corporate issuers, although some claim to have databases containing thousands of obligor names, daily prices are quoted only on a subset of issuers for whom protection is bought and sold regularly.

While the bulk of activity in the credit derivatives market consists of single-name, "vanilla" default swaps, there are variations that are worth noting. In particular, there are so-called "first to default" swaps, where protection is bought/sold on a "basket" of obligors and a payoff occurs when the first issuer in the basket defaults. The price of protection (the swap spread) for this kind of swap is not simply the sum of the cost of protection for the individual names in the basket, since the expected loss on the basket of names depends upon the default correlation among the issuers in the basket. While a discussion of default risk correlation is beyond the scope of this article, suffice it to say that there is no standard way of measuring default correlations and that the correlation assumptions used make a substantial impact on the valuation of a basket default swap.

The credit derivatives market is growing rapidly, and offers financial institutions new ways to manage credit risk. Like any new market, it will undoubtedly experience "growing pains" but promises to be an increasingly valuable tool and important source of information for all types of institutions with exposure to credit risk. ☺



Ms. Geske is senior vice president at CMS BondEdge where she manages the research and design of enhancements to the BondEdge fixed income portfolio analytics system. This article was adapted from a series of articles on fixed income topics, available at www.cmsbondedge.com. Comments may be directed to her at teri.geske@be.ftid.com.

Economic Capital—

Recent Market Developments and Trends

by Hubert Mueller

Economic Capital (EC) has received increasing interest recently, both from the insurers as well as from regulators and rating agencies. This article is designed to provide some insights into this topic, by describing some of the work of the EC subgroup of the SOA's Risk Management Task Force (RMTF).

Background

Life insurer's capital has come under increased scrutiny as of late. Three years of equity market declines and a drop of interest rates to levels not seen since the 1950s have led to dramatic falls in revenues. The quest for higher yields has led life insurers to

invest in riskier fixed income assets, leading to a record \$18.7 billion of realized capital losses in 2002. Excluding capital contributions from parent organizations and shareholder dividends paid

out, the life industry's aggregate capital has stagnated since 1998. Many companies have seen downgrades in their financial strength ratings over the last six months.

At the same time, regulatory bodies are introducing new capital and reserving requirements for products with equity guarantees which will lead to increased strain on capital. Given this background, it is not surprising to find a growing number of companies paying greater attention to calculating the appropriate level of capital for their business.

EC Subgroup within the RMTF

One of the ten subgroups existing within the SOA's RMTF deals with the topic of EC Calculation and Allocation (ECCA). Founded in the spring of 2002, this subgroup has more than 120 people registered on its listserve. Approximately 10-12 of these have been actively participating in the subgroup's work over the past year, including:

- Regular conference calls
- Developing and interpreting an industry survey on EC, conducted in the fall of 2002 and
- Developing an EC Specialty Guide.

The remainder of this article will focus primarily on the work of the EC subgroup.

Highlights of Industry Survey on EC

An e-mail survey was sent to members of the International, Financial Reporting and Investment Sections of the SOA in July of 2002. There were 491 participants, including 44 percent from multinationals, 32 percent US-based, 8 percent North American and 4 percent from Canadian companies. 57 percent of participant companies had assets greater than \$20 billion; 68 percent were stock companies.

The following strawman definition of EC was proposed: At the enterprise level, EC is typically defined as "sufficient surplus capital to meet negative cash flows at a given risk tolerance level." Eighty-one percent of respondents agreed with this simplified definition. However, we also received a significant number of write-in text answers. These were included with the expanded definitions provided in the EC Specialty Guide (page 7).

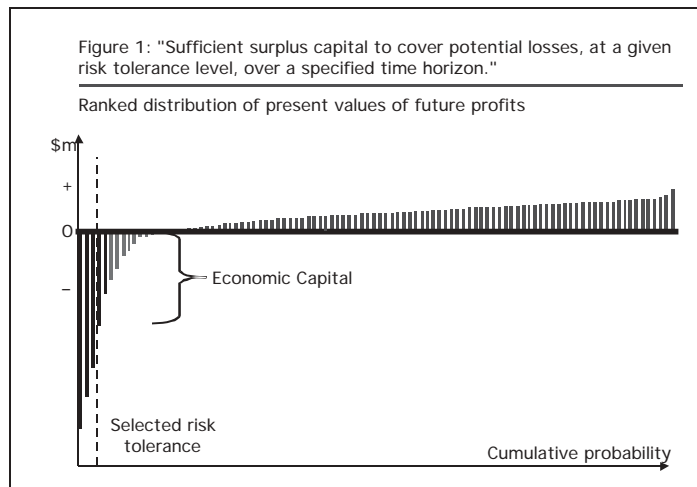
Most respondents also agreed that EC should cover various types of risks, including:

- Interest rate risk (96 percent)
- Pricing risk (93 percent)
- Credit risk (92 percent)
- Equity market risk (91 percent)
- Liquidity risk (86 percent) and
- Operational risk (79 percent).

Almost half of the respondents (45 percent) have been using the concept of EC in their work.

When determining EC, various risk tolerance measures are currently in use. Sixty percent of respondents use specified percentile measures (e.g. 98th percentile), while 17 percent use a multiple of standard deviation. 15 percent use a Conditional Tail Expectation (CTE) measure, and 9 percent indicated they use other methods. In particular, the CTE measure is also used for setting regulatory capital as part of the new C-3 Phase II proposal for regulatory capital on variable products ("RBC C-3 Phase II"). The proposed capital standard would be based on the average required surplus for the worst 10 percent of outcomes using a set of stochastic scenario's (CTE 90). This is further explained in the EC Specialty

Sufficient surplus capital to cover potential losses, at a given risk tolerance level, over a specified time horizon.



Guide. However, at the time of the survey, only 38 percent were aware of the new RBC C-3 Phase II requirements.

The main reasons for companies implementing EC to date have included risk and performance measurement. Forty-four percent of respondents cited risk management as the key reason, 32 percent cited performance measurement, and 59 percent have established a formal framework for the calculation of EC. Going forward, we expect the impetus to come more from competitive forces and rating agency pressures.

For measurement of EC, less than half of respondents (43 percent) use stochastic models. Thirty-one percent of participants use formulaic approaches, 28 percent use deterministic models, and 18 percent use a mean-variance-covariance model.

A majority of companies expect EC to have greater significance going forward.

Overview of EC Specialty Guide

Currently, the ECCA subgroup is working on completing a specialty guide on EC. By the time this article is printed, a completed draft version of the guide will have been posted to the subgroup's Web site (www.soa.org/sections/rmtf/rmtf_ecca.html).

The Specialty Guide is designed to be a source of information for practitioners interested in:

- Learning more about the subject of EC
- Finding out about current market practices in this area and
- Reviewing a list of available literature on this topic.

The specialty guide addresses the following topics:

- Definition of economic capital
- Uses of economic capital in the current marketplace
- Tie-in of economic capital to regulatory/rating agency capital
- Current approaches to calculating economic capital and
- Current approaches to allocating economic capital.

A summary of the answers obtained from the industry survey, as well as a review and discussion of available literature is provided in the appendix to the guide. Each of the main sections is briefly described below.

Definition of EC

First of all, we would like to distinguish economic capital from regulatory or rating agency capital. Economic capital is based on calculations which are specific to the company's risks, while regulatory or rating agency capital formulas are based on industry averages which may or may not be suitable to any particular company.

The subgroup has since refined the definition of EC as follows, "EC is defined as sufficient surplus capital to cover potential losses, at a given risk tolerance level, over a specified time horizon." However, it has quickly become apparent that there is no one consistent definition of economic capital in use in the marketplace. Potential definitions are numerous, but the following three composite definitions, developed from the many responses to our survey, demonstrate the main themes of the alternatives:

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Table 1 Alternative Definitions of Economic Capital	
Definition #1	Economic capital is defined as sufficient (statutory) surplus to meet potential negative cash flows and devaluation of the balance sheet at a given level of risk tolerance, over a specified time horizon.
Definition #2	Economic capital is defined as the excess of the market value of the assets over the fair value of liabilities required to ensure that obligations can be satisfied at a given level of risk tolerance, over a specified time horizon.
Definition #1	Economic capital is defined as sufficient (statutory) surplus to maintain solvency at a given level of risk tolerance, over a specified time horizon.

Table 2 Current and Planned Uses of EC *	
35%	Using now; anticipate same or greater significance in the future.
29%	Not using now; anticipate it will have greater significance in the future.
25%	Uncertain about future role.
9%	Not using now; not anticipating to use in the future.
1%	Using now; anticipate less significance in the future.

* Source: EC Survey (2002)

While definitions #1 and #3 refer to “sufficient surplus”, Definition #2 instead focuses on the characteristics of the assets (market value) and the liabilities (fair value) that define this surplus.

Each definition presents a different expression for the adverse outcome that the economic capital is intended to protect against. Definition #1 refers to “potential cash flows and devaluation of the balance sheet.” Definition #2 is concerned only that “obligations can be satisfied.” The goal of Definition #3 is to “maintain solvency.” These broad definitions seem to imply that all risks are to be taken into account.

Uses of Economic Capital

Three questions on the recent industry survey addressed the use of EC by today’s actuaries. The most basic question—whether you have “been using the concept of EC at your company or in your consulting work”—saw a nearly even split between

Yes and No, with slightly less than half of the 500 respondents reporting that they are currently using EC. Among those who used EC, their main reasons for using EC included, “To provide management with the knowledge that risks were being adequately managed and sufficient surplus was available.” (45percent) and “better measurement of the performance of different business units” (33 percent). Less than 15 percent of the respondents said that they were using EC primarily for due diligence analysis or to discuss excess capital with regulators and rating agencies. EC thus seems to be used more as an internal management tool than as a tool to communicate with external audiences.

Comparing answers to whether the respondents currently use EC and what the plans are in the future reveals a definite increasing trend in the use of EC, as shown in Table 2 above.

The heaviest users of EC are in diversified financial institutions, followed by life and annuity writers.

EC seems to have greater acceptance and application in the non-insurance financial world and is still establishing a foothold with pure insurers. Consultants indicate they use EC concepts in their work comparatively less than the insurance employees; they are also less likely to indicate anticipation of greater use in the future.

Given this overview of how prevalent the general use of economic capital is, we now examine its specific uses and applications. The following list taken from the EC Specialty Guide is not intended to be exhaustive, but does capture the major uses of economic capital in today's insurance industry environment, according to the views of the ECCA subgroup:

- Company/product risk profile
- Capital budgeting
- Evaluation of required capital in M&A situations
- Insurance product pricing
- Risk tolerances and constraints
- Asset/liability management
- Financial reporting
- Performance measurement
- Incentive compensation
- Rating agency and regulatory discussions

More details on each of these uses are provided in the EC Specialty Guide.

Tie-In of Economic Capital to Regulatory/Rating Agency Capital

Regulatory and rating agency capital requirements are motivated fundamentally by solvency concerns. Rating agencies are also concerned with the level of financial strength and general creditworthiness of an organization. These ratings provide a prospective evaluation of an insurer's financial security to its policyholders and debt holders. Capital requirements are generally targeted using simplified methods (eg. factor approaches) at levels appropriate for the aggregate industry and cannot reflect the nature of the company's risks to the degree to which can be achieved through a customized internal model.¹

The motives behind calculating Economic Capital concern the "appropriate" allocation of capital to the risks undertaken by the company. The level should be sufficient for a going-concern entity and reflect the degree of contribution of risk to the company. Holding too little economic capital threatens the ability of the company to meet its obligations;

holding too much economic capital will unnecessarily reduce return on equity, and potentially distort rational economically based decision-making.

A recent trend has been for external measures of economic capital to adopt more complex (and hopefully more meaningful/realistic) methods. For example, the NAIC RBC calculation is in a two-phase process of enhancing its C-3 risk measurement. Also, A. M. Best is moving towards an "Enterprise Risk Model" to supplement its Capital Adequacy Ratio.

Standard & Poor's has created a dynamic model called "Financial Product Capital (FPC)" to measure the required economic capital. This dynamic model has been applied to non-insurance "books" (e.g. GIC, MTN programs, credit derivatives), quantification of financial and credit market risk mitigation strategies (e.g. OTC and exchange traded market and credit derivatives), certain "one off" structured capital market transactions and financial product company subsidiaries or credit enhanced vehicles. The capital adequacy determined by the FPC model is intended to replace the capital adequacy requirement historically derived using the Standard & Poor's capital adequacy model for the specified "book."

The main rationale for these new models and methodologies are: (1) increased sophistication of risk management practices at insurance companies; (2) failure of factor-based approaches to properly deal with risks inherent in current products and investment strategies; (3) inquiries from companies seeking quantitative recognition of risk management practices including quality of their product structures; and (4) pressure on companies to optimize their capital base.

Capital levels required by the regulator and rating agencies create an overall constraint as to the amount of capital held by the firm. The EC Specialty Guide describes several methods a company may consider in recognizing the differences between economic and regulatory/rating agency capital requirements, and allocating them to various lines of business or the corporate line.

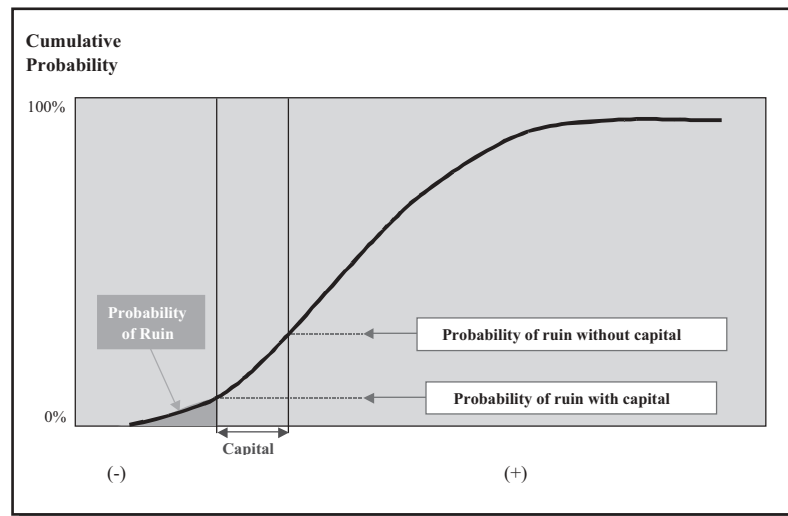
Calculation of EC

There are various methods for determining economic capital. A common methodology is to base EC on the probability of ruin. Probability of (statutory) ruin is the probability that liabilities will exceed assets on a present value basis at a given future valuation date, resulting in technical insolvency. It can be calculated from the probability density function of the present

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1) There are some emerging trends in regulatory capital to be based on methods linked to internal models. These will closer align regulatory and economic capital levels.

Figure 2: The Probability of Ruin can be calculated from the probability density function by measuring the area under the curve corresponding to the section where liabilities exceed assets on a present value basis



value of future surplus by measuring the area under the curve corresponding to the section where liabilities exceed assets. This is shown in Figure 2 as the shaded area. Alternatively, it can be calculated from the cumulative distribution function similar to Figure 1 on page 7 by determining the probability point (on the y-axis) where liabilities equal assets (on the x-axis). These probability graphs are generated by running computer simulations of liabilities and assets using a stochastic financial model.

Economic capital based on the probability of ruin is determined by calculating the amount of additional assets needed to reduce the probability of ruin to the probability target specified by management. The target probability of ruin is set by management in consideration of several factors, primary among them the solvency concerns of policyholders—usually expressed in terms of the minimum financial strength rating that management desires from the rating agencies. The EC Specialty Guide provides several examples for calculating EC.

Allocation of EC

Having determined the appropriate capital requirement at the enterprise level to satisfy policyholders' interests, it is necessary to fairly attribute capital to each segment in a way that reflects its contribution to the enterprise-wide capital requirement. This attribution allows the proper evaluation of the performance of each business segment.

There are several methods for attributing capital to each business unit. These methods differ primarily by the choice of risk measure used to estimate the capital requirement of each segment in relation to risk.

One such method is to attribute capital across business segments in proportion to the present value of expected customer payments. Under this method, each product is assumed to contribute to the risk of insolvency in proportion to the economic value of commitments to customers—and thus all products are assumed to involve the same degree of risk. Since this is not the case in most situations, less risky products provide a capital subsidy to the more risky products. The resulting unfairness may result in business decisions that destroy economic value.

To attribute capital fairly across segments, capital requirements must be determined in relation to the riskiness of each segment. Since, at the most intuitive level, policyholders, regulators and insurance executives can see that the level of risk is directly related to the probability of ruin of the company, it is often suggested that probability-of-ruin or Value-at-Risk (VAR) constraints be used to drive the capital attribution process. However, both probability of ruin and VAR have a drawback if they are used to attribute capital to business segments or to determine the capital of merged or combined operations: when two or more risky portfolios are combined, the capital based on these measures for the combined portfolio may turn out to be equal to or more than the sum of the capital for each portfolio determined separately.

Combining risky portfolios should, however, decrease total risk, and therefore capital, due to risk diversification. Under certain conditions then, these risk measures may suggest incorrectly that combining portfolios increases the level of risk.

To summarize, the attribution process requires completion of two steps.

1. Calculation of stand-alone capital requirements:

The objective of this step is to determine the minimum amount of capital that is needed by each individual segment to meet the corporate level risk constraint, expressed as a probability of default, for example. Note that adding up the stand-alone capital requirements calculated above will result in a capital requirement that is greater than the aggregate capital requirement of the enterprise. The difference between the two amounts represents the capital saving achieved by diversification. This benefit needs to be allocated to business segments.

2. Allocation of the diversification benefit to segments:

The allocation of the diversification benefit to segments needs to reflect the contribution of each segment to aggregate enterprise risk. It involves calculation of the marginal capital requirement of each segment, i.e., the amount of capital needed by the enterprise to add the segment to the enterprise. The difference between this marginal capital requirement and the stand-alone capital requirement calculated in the preceding step represents the maximum amount of diversification credit associated with any segment. The actual amount of credit given to any segment will be less than this maximum. It will be derived by use of any one of several possible algorithms that are designed to make the resulting allocation fair across segments.

It is important to note that capital attribution results can be highly sensitive to the risk measure and risk constraints that are selected. In particular, there are situations in which using a probability-of-ruin constraint can lead to erroneous conclusions about capital requirements and to inappropriate attribution of capital across business segments (especially in property/casualty insurance companies). These difficulties can be avoided by using CTE measures or (for P/C companies) the Economic Cost of Ruin (ECOR) ratio as measures of risk and selecting an

appropriate target as a risk constraint. This is further described in a monograph from Tillinghast – Towers Perrin on Enterprise Risk Management available through the following link:

http://www.tillinghast.com/tillinghast/publications/reports/Creating_Value_through_Ent_Risk_Mgmt/2002051306.pdf

Outlook

EC was discussed at the recent SOA Spring Meeting in Washington, DC in several sessions. Interest among the participants on the ECCA listserve is high, as is evidenced by the fact that the ECCA website had the highest number of hits in April among all the RMTF Web sites. Also, actuaries and governing bodies in other parts of the world are showing an increasing interest in the subgroup's work on Economic Capital.

There are a number of questions which still need to be addressed, including, for example:

- What should economic capital be for credit default swaps?
- Should investment market-implied assumptions be used to "price" economic capital?
- Can I use economic capital to set issuer and concentration limits?
- Does economic capital lead to nontraditional asset allocation decisions? For instance, should insurers/pensions invest in commodity futures, and why or why not?
- Can I estimate a company's economic capital from public information about its securities, and use it in a buy/sell decision?
- What does internally calculated economic capital tell management about how best to raise capital by issuing securities?

The EC Subgroup will continue to address current issues, such as the ones identified above, in the coming months. Anybody interested in actively contributing to the subgroup's work should contact the author of this article. People generally interested in the developments of this subgroup should contact Julie Young (JYoung@soa.org) and ask to be added to the ECCA listserve. ☺



Hubert Mueller, FSA, is a principal with Tillinghast - Towers Perrin in their Hartford, CT office. He can be reached at Hubert.Mueller@Tillinghast.com.

Special Event! The Investment Section Luncheon

Mark your calendar for the SOA Annual Meeting, October 27-29 in Orlando.

And sign up to attend the Investment Section Luncheon, to be held on Monday October 27 12:15 PM–1:45 PM, featuring our special guest speaker, Peter Ricchiuti. His topic:

The Financial Markets, Diversification and the Cyclical Nature of Investments

Peter Ricchiuti is a finance professor and dean at Tulane University's A. B. Freeman School of Business. He is founder of the Burkenroad Reports research program which has been featured on CNBC, CNN-fn, in the *Wall Street Journal* and the *New York Times*. His unique style and humorous delivery have twice made him Tulane's top professor.

"I've seen Peter in action, and he is one of the best speakers I've ever heard—not only educational and informative, but extremely entertaining. You will not be disappointed."

—Doug George, *Investment Section Chair*

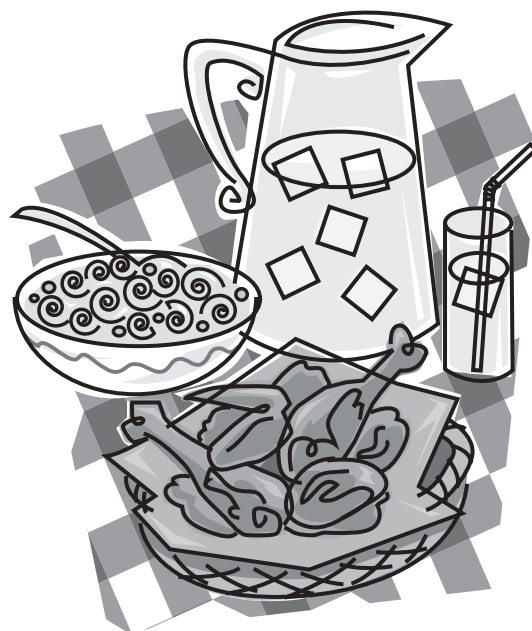
This buffet luncheon is open to all meeting attendees. There is a non-refundable charge

of \$10 for section members and \$30 per person for all others. Please include the additional fee with your registration.

We have an exciting lineup of regular investment sessions as well, including:

- Introduction to Credit Derivatives
- Equity Analysts Look at Insurers (Still)
- Investment Related Assumptions
- Investment Performance Attribution
- Modeling Active Trading Strategies
- New and Exciting Instruments for the Bulls and Bears
- Risk Management Task Force

Check your preliminary program or the SOA Web site in mid-July for more details and register today! ☛



Beginning Risk Management Seminar

by Michael A. Bean

The third annual Beginning Risk Management Seminar was held at the New York Marriott Financial Center on December 4 and 5, 2002. Presenters were Michael Bean of Manulife Financial, David Ingram of Milliman USA and William Schnaer of Swiss Re. Over 40 people participated in the sessions.

The purpose of this seminar was to provide actuaries and other professionals working in risk management a thorough understanding of the basic principles and tools of risk management as they apply to insurance companies.

Insurance companies have always been in the business of managing risk. However, the types of risks faced by insurers (e.g., embedded financial options in variable annuity products) and the tools available to manage them (e.g., dynamic hedging) have become much more complex over the past 10 years. Failure to recognize and appropriately manage these risks has resulted in significant losses at many companies.

The seminar presentations were designed to appeal to a broad audience, from students nearing completion of their Fellowship to seasoned professionals interested in expanding their knowledge of the risk management area. Seminar participants received professional development or continuing education credits as appropriate.

Topics discussed at the seminar included:

- Types of risks faced by insurance companies
- Techniques for measuring risk
- Economic risk capital calculation and allocation
- Stochastic pricing and valuation
- Risk-adjusted return on capital
- Management of correlated risks



- Dynamic hedging
- Operational risks and incentive compensation
- Risk management in banking.

Risk management in the insurance industry continues to evolve. Many of the larger insurance organizations now have a Chief Risk Officer and a department dedicated to the management of risk at the enterprise level. Such departments are often staffed with professionals from a variety of backgrounds including insurance, banking and operations management.

Actuaries have an important role to play in the management of risk, both at traditional life companies and the integrated financial service organizations that are becoming quite common in the financial industry. There are many exciting career opportunities for the actuary who can thrive in this dynamic area.

The Beginning Risk Management Seminar is designed to provide actuaries and other insurance professionals with the fundamental background to be successful in this exciting and emerging field. The seminar is scheduled again for the fall of 2003. ☪



Michael A. Bean, FSA, FCIA, is an actuary at Manulife Financial in Toronto, Ontario. He can be reached at michael_bean@manulife.com.

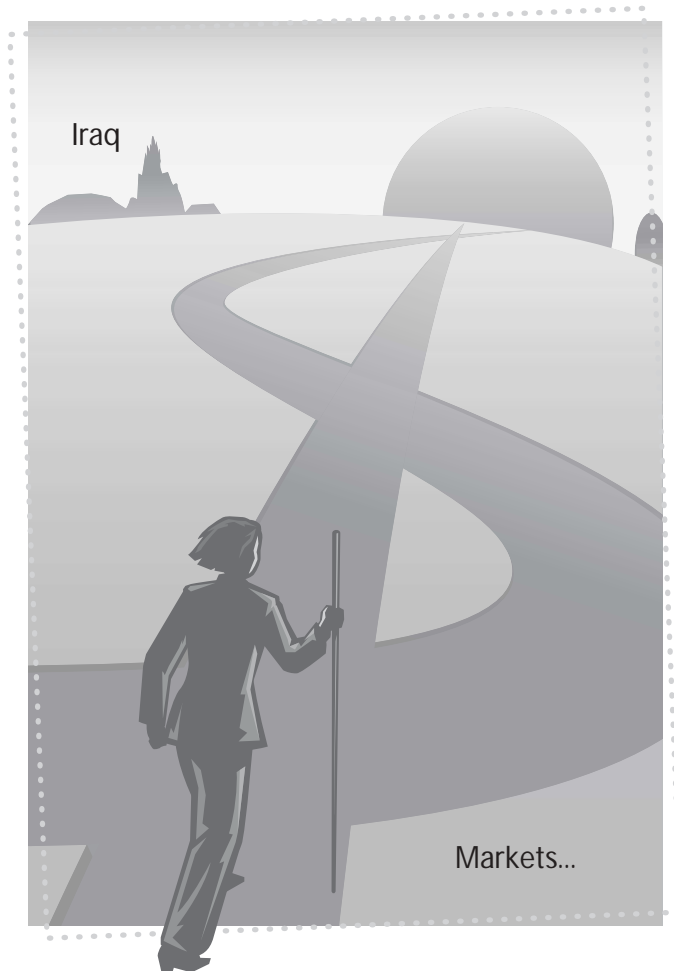
What The Markets Should Reflect From The Victory In Iraq

A Candian's Perspective

by Nino Boezio

Now that the war in Iraq is over (and it was considered a major success), we are all wondering what its implications will be for the equity markets. Based on what we have seen from history, we can make certain assertions as to what to look for in the near-term economic climate, and the resulting market performance.

- *Relative peace and prosperity for the next 10-20 years.* After past wars, it has been difficult for a new challenger to rise up anytime soon there after, so we can expect the United States to continue to dominate the world scene for some time. Peace endures when there is only one superpower. This should help create a healthy



stock market, even though it could also foster an overshoot in equity valuations, as it did in the 1990s.

- *Declining uncertainty as time passes.* The end of the war now reduces uncertainty. The only other major concern is fear of another terrorist attack. This terrorism fear will continue to factor into equity performance, but time will eventually erode this extra risk premium. We do note however, that just before the actual Iraq conflict took place, stock markets around the world no longer had major and prolonged declines the way they did prior to last fall. So there is more confidence that the market is on a sure footing and that the world economy is recovering.
- *More interest in helping the Third World, even if it results in deficits.* Some see terrorism to be partly rooted in poverty, ignorance and religious fanaticism. Hence there is more incentive to help the Third World rise out of poverty and to better understand the Western world. How much money will actually go to poorer nations remains to be seen, but if it is viewed in part as a preventive measure against future terrorism, then there will be more justification for shelling out large sums of money. Hence government deficits will become more likely, resulting in more government bond issues than previously anticipated.
- *A greater focus on technology.* The U.S. victory in Iraq was in large part due to advanced technology. Technology is now proving to help win wars (and also save lives), not just to make life more convenient. And as President Bush stated in a presidential address, advanced warfare can now target a troublesome leader, without destroying much of the infrastructure in the process. Hence there will be more interest than ever before on the part of all world governments, to promote and encourage technological development. This could help once again create some bubbles in certain sectors of technology, where the tangible results are still unproven and speculative.
- *A re-test of OPEC.* It is hard to see Iraq being in a position of independence from the U.S. anytime

soon. Iraq will also need money to rebuild from the current war and to catch up from 10 years of economic sanctions. In order for Iraq to sell enough oil to generate sufficient revenues for rebuilding, other OPEC nations will have to cut their own output to keep the price of crude at the target of \$22-\$28 per barrel. It will be interesting to see if other OPEC nations are willing to forego some of their own additional wealth and prosperity in order to help Iraq, or instead try and cheat one another once again to get an edge on revenues.

- *The American experiment.* President George W. Bush after the fall of the World Trade Center twin towers, remarked that he did not understand why many people and nations in the world hated the United States. Therefore there will be a tremendous temptation by the U.S. to make Iraq a model of American generosity, prosperity and an example of the good aspects of the U.S. way of life in order to silence many of the critics. In addition, Afghanistan should also receive added benefit, in order to counter the claims of critics that "the Iraqi war was all about oil." So we will likely see a large amount of money devoted to the region, in an effort to counter the negative elements that speak out against U.S. foreign policy. On the other hand, it will also be tempting for the U.S. to look for ways that such generosity can pay for itself, through economic and financial benefits being realized on behalf of American companies. So we should see more of an interdependence developing between North American energy and development companies, and foreign aid. The Middle East will also be encouraged to develop its own stock markets and share wealth. The Middle East will continue to be a major focal point for the world in general, as it has a long history of instability; yet it supplies the world with much needed energy. So we will even see many countries trying to jockey for position in the region, not just the U.S.
- *More confidence for the U.S. to get involved in world affairs.* Success in Iraq 1, Iraq 2 and Afghanistan, encourages involvement in the next one. In one sense the U.S. has now gotten momentum to clean up what it considers to be world problems, as long as the human and financial costs remain low. If the stock market continues to rebound, and if George W. Bush's approval rating and popularity remains high, then there will be more interest in doing this again under a future president (no one wants to deviate from a winning formula). This could help promote defense stocks as an investment alternative (the fall of the USSR in 1989 did not alleviate

the need for a strong military). However, the U.S. has dealt a disastrous blow to the United Nations, which it in large part helped to create.

- *Europe is becoming a dangerous ally.* One cannot tell whether the European Community (EC) in general, dislikes the U.S. or the Islamic world more. The EC has already set goals to build an economic, military and political system that will be equivalent to, or will surpass the U.S.. Various European voices imply that the U.S. is dangerous, which is rather ironic given that the U.S. has been the major factor that saved Europe a number of times from its own self-destruction, and also was the nation that afterwards provided substantial financial support for Europe to rebuild. So we will see the major economic and military competitor against the U.S. to be Europe. If this is realized, then there should be fewer hurdles to permitting U.S. companies to merge in narrow industries, such as airlines, defense and technology.
- *Market performance can be subdued in the short-run.* We know that financial markets tend to oscillate between extremes, which some characterize as fear and greed. The late 1990s may be characterized by greed and excess, the last few years could be characterized as one of fear and depression. The only time we see the middle ground is when the markets travel from one extreme to another. However, it takes time to get out of one mind-set and go to another, so it will take a few years for investors to lose their fear and be once again comfortable with stocks. So we can expect the next few years not to have dramatic equity returns, even though this year may be an exception, as we bounce off very depressed prices.

Overall, we do see a backdrop for prosperity and economic development to once again embrace the world. Of course, if any unforeseen events occur of a non-economic nature (such as a nuclear incident, a natural disaster or a health epidemic that gets out-of-control) then all bets are off. But in the meantime, it looks like we have a number of positives that were also present in the early 1990s, which can help foster a healthier stock market and better economic growth. Even though some cite persistently high P/E ratios as an indication that equity valuations are still high, this does not mean that all stocks in a particular group are unattractive. So there should be opportunities for equities to do well, even though there is always the fear that we can be in a market malaise for years, as occurred in the 1970s. Right now that latter assessment is too pessimistic. **♣**



Nino A. Boezio, FSA, FCIA, CFA, is a consulting actuary at Mathis Associates in Pickering, Ontario and is an associate editor of this issue of Risks and Rewards. He can be reached at nboezio@sympatico.ca.

Are We In A Different Market Paradigm?

by Christian Gilles, Larry Rubin, John Ryding, Leo M. Tilman and Ajay Rajadhyaksha

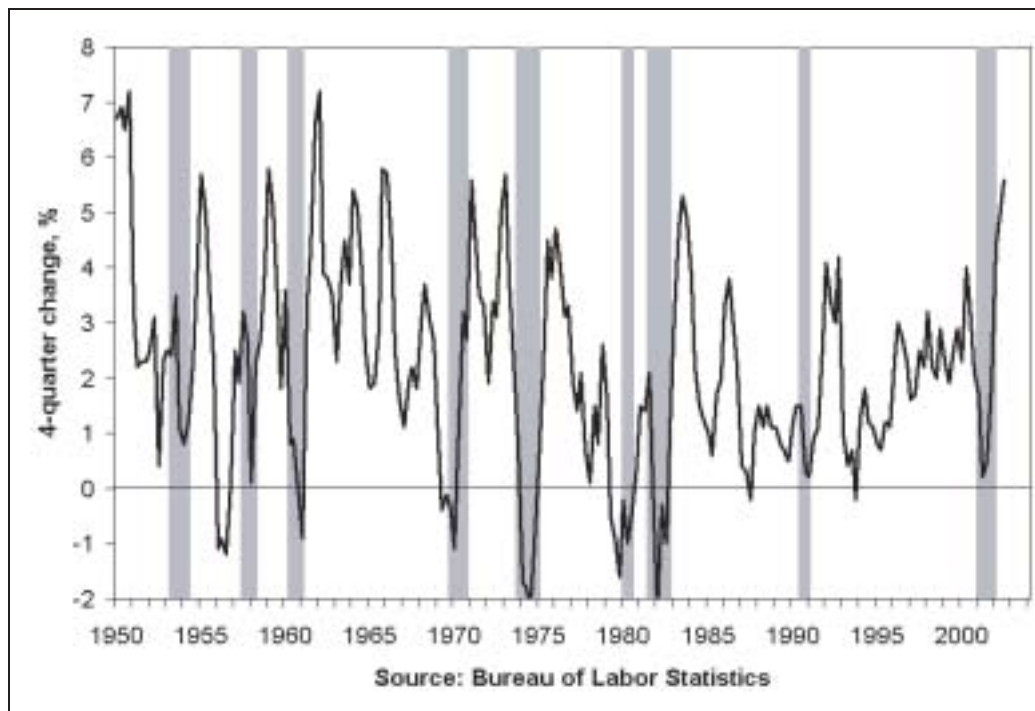
Authors' Note: this article is an excerpt from an article in the Winter 2003 issue of the Journal of Risk Finance.

Introduction

Assumptions regarding long-term expected returns play a critical role in Asset/Liability Management (ALM) of financial institutions. Importantly, these assumptions influence not only the activities related to the asset-side of the balance sheet—asset allocation, portfolio management, and trading—but also the liability side via the discounting of future cash flows as well as business decisions related to the fight for market share. This article questions the validity of assumptions regarding long-term expected returns used by many financial institutions at the present time. Using macroeconomic as well as analytical arguments, we debate whether the dynamics of financial markets

has experienced a paradigm shift, resulting in lower expected future returns than those witnessed over the past three decades. An analysis of balance sheets of insurance companies suggests that with very few exceptions, the vast majority of growth in 1990s was driven by investment returns. Should investment returns remain below “historical norms” going forward, as they are today, the fight for market share is likely to intensify, pressuring insurance companies to short an increasing number of options embedded in their policies. Many of these options are currently unhedged and will remain so, and may require ever-greater reserves to be held against them. Moreover, reinsurance opportunities have decreased greatly and as a result, the majority of hedging must be done using capital market instruments. While this article focuses on the insurance industry, its conclusions are relevant for all institutional investors in fixed income markets.

Exhibit 4: U.S. Non-Farm Productivity Growth



shading = recession

Macroeconomic Perspective

Long-term forecasts for default-free interest rates (commonly represented as the yield of the 10-yr U.S. Treasury note) are derived from corresponding outlooks on economic growth, inflation and productivity. More precisely, the 10-yr Treasury yield, in equilibrium, reflects the underlying real rate of interest, expected inflation and an inflation risk premium. At the present time, all three components that determine this yield appear to be unsustainably low, keeping investors' hopes that interest rates will revert back to historically "more normal" levels alive. This section discusses our baseline ten-year economic scenario, economic considerations that are likely to influence financial markets over the next decade and the risks to our outlook for the economy and the markets.

RealGDP Growth

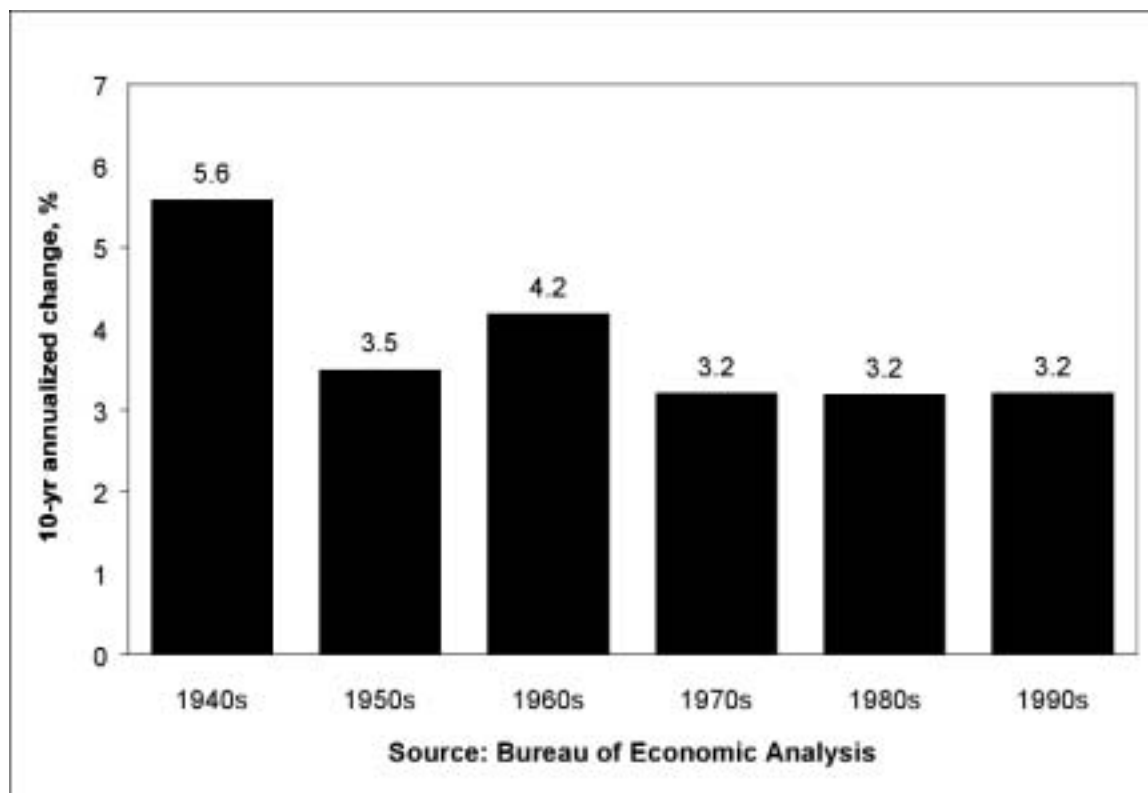
In articulating the baseline economic expectation over the next 10 years—*robust growth and low inflation*—we start with a long-term view on U.S. real GDP growth. According to Say's Law, supply creates its own demand, so unless monetary and fiscal policy

are on inappropriate settings, the U.S. economy should grow at its potential. The long-run growth potential of the economy, in turn, is determined as the sum of the growth of labor productivity (real GDP per worker) and the growth of the labor forces. The growth rate of the labor force is largely determined by demographic considerations and, based on an estimated 1 percent growth rate of the population of working age and a projected decline in the unemployment rate to 5.0 percent by the end of the decade, we estimate that the growth in the labor force will average 1.2 percent per year over the next decade.

Pinning down the likely growth rate of productivity over the next 10 years is more difficult and controversial. We believe that in response to a sharp rise in the share of business equipment spending in real GDP as new technologies became embodied in the capital stock, the growth rate of productivity has shifted upward from the relatively slow growth rate of productivity recorded from the mid-1970s to the mid-1990s. Over the last seven years, real GDP per person employed has grown at an average annualized rate of 2.2 percent, which was one percentage point faster than the average growth

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Exhibit 5: U.S. Real GDP Growth by Decade



rate of productivity over the prior 20 years. The income-based measure of nonfinancial corporate productivity growth shows a somewhat larger productivity acceleration than the GDP-based data of about 1.5 percentage point per year. We judge this 1 to 1.5 percentage point pickup in productivity growth to be structural rather than cyclical since real GDP growth has averaged 3.3 percent over the last seven years, which is only slightly above the average growth rate of 3.1 percent recorded over the prior 30 years.

Even if the pickup in productivity growth was arguably structural, the question as to how sustainable it is remains. We expect productivity growth to be at least as strong over the next decade as we have seen over the last seven years for several reasons.

The decline in business equipment spending appears to have leveled out at about 10.2 percent of real GDP. This is still a high ratio by historical standards as, for example, it averaged 5.8 percent per year from the mid-1970s to the mid-1990s.

Exhibit 4 on page 16 suggests that productivity

might still be on a rising trend with productivity over the last four quarters running at the strongest rate in almost 30 years.

As pointed out by former Fed Governor Laurence Meyer, productivity growth has alternated between periods of high growth followed by low growth over the last century or so. The last episode of strong productivity growth lasted some 25 years from the late 1940s to the early 1970s.

If the trend non-financial corporate productivity growth is likely to be in the range of 2.5 percent – 3 percent over the next decade, this should translate into growth in real GDP per employed person of 2 percent – 2.5 percent. Using the mid-point of these ranges and the projected growth in the labor force gives us our estimate of trend real GDP growth of about 3.5 percent over the next decade. Exhibit 5 on page 17 illustrates that real GDP growth has averaged 3.2 percent per year in each of the last three decades. In the 1970s and 1980s, however, a greater contribution to trend growth came from a growing labor force. For example, in

Exhibit 6: U.S. Real Yields as Given by Coupons on 10- yr Treasury Inflation Protected Securities (TIPS)



the 1970s labor force growth averaged 2.6 percent per year and in the 1980s labor force growth averaged 1.6 percent per year. The 1990s, in contrast, saw the annual growth of the labor force average only 1.1 percent, which is somewhat similar to our projection for the next decade. Over the next decade, therefore, productivity growth is likely to make a greater contribution to real GDP growth than the increase in the labor force is likely to make. The contribution of productivity suggests that real wage growth over the next decade will remain relatively robust and provide a solid basis for rising personal income. We project that real wage growth will average 2 percent per year over the next decade and real personal income will rise at 3.25 percent per year on average. The slower growth of real personal income relative to real GDP is seen as a byproduct of the attempt by companies to rebuild profit margins, which is discussed in more detail below.

In equilibrium, real yields are determined by the rate of return on capital. As witnessed in the late

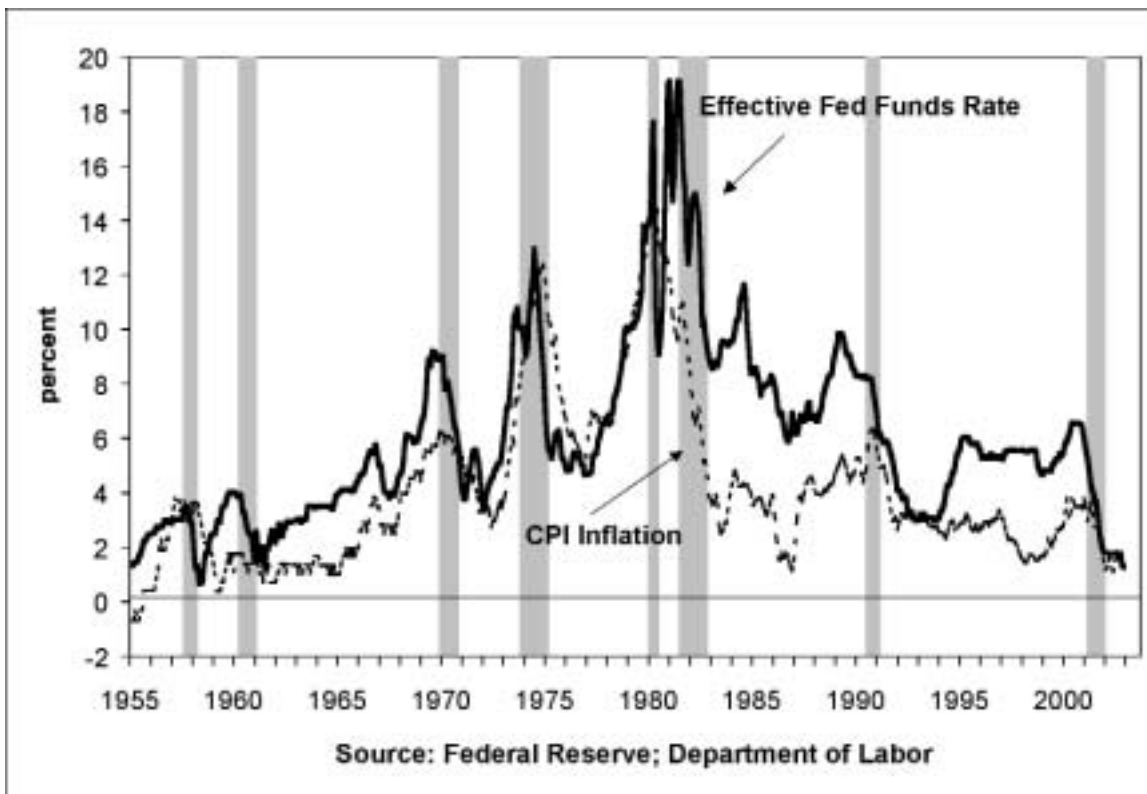
1990s, a rise in the growth rate of productivity was followed by an increase in real yields. On our projection of real GDP for the next decade, real yields are expected to continue to average in the 3.5 percent ballpark. If our estimates of trend productivity growth and trend real GDP growth are too high, then real yields of this level could not be supported over time and real yields would be lower. We do not think real yields of 4 percent or higher are sustainable as evidenced by 2000, when real yields averaged about 4.2 percent in the first half of that year, which was followed by a slowdown and eventual recession in the economy.

Determinants Of Inflation

The outlook on inflation is more uncertain than that for real GDP growth. The primary determinant of the inflation rate is monetary policy, and, importantly, monetary errors have a much larger impact on inflation than growth. Note that while GDP growth by

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Exhibit 7: U.S. CPI Inflation and Effective Fed Funds Rate



shading = recession

decade has been as high as 5.6 percent in the 1940s and as low as 3.2 percent, the range on inflation has been much wider, with the average CPI inflation rate as low as 2.1 percent in the 1950s and as high as 7.8 percent in the 1970s. The inflationary experience of the last 50 years has not been the norm. Prior to the second world war persistent inflation was unheard of. Monetary policy made errors, sometimes large as in the deflationary contraction of the money supply during the period 1929-1932, however, prior to this episode, the growth in money was largely held regulated by some form of gold standard. In 1890, for example, wholesale prices were 3.5 percent lower than they were in 1791, which is an average wholesale price inflation rate of -0.04 percent over a period of a century! Monetary policy since the end of the second world war can be divided into three phases. First was the Bretton Woods gold-price link period from 1946 to around 1968. During this period, dollar creation was constrained by the U.S. promise to exchange dollars for gold at a fixed price of \$35 an

ounce. The promise, however, was only good for other monetary authorities and not for the general public, which is why this period was not a true gold standard.

As per Exhibit 7 on page 19, over the 30-year period ending in 1968, CPI inflation averaged 1.9 percent. At the end of the 1960s, the Bretton Woods system began to break down as dollar creation policy became inconsistent with maintaining the gold peg, and rising inflation ensued. The inflation rate rose from the 1 percent – 1.5 percent range that was typical in the first half of the 1960s to hit a high of 14.6 percent in 1981. The average inflation rate during the period from 1968 to 1981 was 7.8 percent but the real story was that inflation was rising. This awful policy period ushered in the Volcker-Greenspan period at the Fed, which resulted in a two-decade period of disinflation, which brought the CPI inflation rate down to 1.5 percent in 2001. Over the last 20 years the CPI inflation rate has averaged 3.1 percent.

Exhibit 8: Nominal Yields on 10-yr U.S. Treasury Notes



shading = recession

Fed Policy and Bond Yields

With the inflation rate so low, fears emerged in the middle of 2002 that the U.S. could spill over into a period of deflation, especially given the experience of Japan in the 1990s. In our opinion, these fears are overblown, especially given the recent price appreciation of gold which, in our opinion, remains the single best indicator of future inflation. Having flirted with deflation risks, the Federal Reserve appears determined to avoid deflation, as the surprise half-point interest rate cut in early November 2002 underscores. The break in the inflationary psychology that the last few years has produced has likely set the stage for the Federal Reserve to achieve a very low inflation rate over the next ten years. The spread between the 10-year Treasury and its inflation-indexed counterpart is currently about 1.6 percent, which conceptually represents expected CPI inflation plus the inflation risk premium. We believe that this inflation rate is achievable and project a CPI inflation rate of 1 percent – 2 percent over the next 10 years.

If inflation is to be contained then the Fed must maintain a fed funds rate target consistent with low and stable inflation. We believe that the fed funds rate has to be roughly equal to the trend growth rate of nominal GDP to maintain monetary neutrality (i.e. for policy to be consistent with neither rising nor falling inflation). At the present time, we believe that the Fed erred in lowering the funds rate target to 1.25 percent given that nominal GDP growth is at 4.0 percent over the last four quarters. The reflation of gold prices over the last year suggests that the fed funds rate is below the natural short-term rate of interest. Moreover, as the recovery firms, the natural rate of interest will move higher, putting the neutral rate into the same ballpark as nominal GDP growth. If the Fed tried to keep rates below the natural rate of interest, commodity and gold prices would rise and a higher inflation rate would follow. If the Fed tried to keep interest rates higher than the natural rate, we would have a resumption of deflation/disinflation. We think the equilibrium level of the fed funds rate in our scenario would be somewhere close to 5 percent over time, which is in the ballpark of expected growth rate of nominal GDP, but we do not expect the Fed will get the funds rate into this area until some time in 2004.

With our view that real rates are likely to be around 3.5 percent over the medium term and our projection for inflation (which is essentially a forecast of Fed policy intentions), we expect that 10-yr Treasury yields should average around 5 percent – 5.5 percent over the next ten years. Of course, insurance companies do not exclusively invest their investment portfolios in 10-yr Treasuries; instead they tend to benchmark themselves against balanced portfolios represented by various U.S. aggregate indices. Since excess return over Treasuries of managed balanced portfolios can reasonably be expected to be around 30-50 bps per year over long time horizons, total expected return of insurance companies' fixed income portfolios is likely to be on the order of 5.5-6.0 percent over the next decade. *While interest rates are expected to increase from the current levels (or "mean-revert"), we argue that they will "revert" to a mean that is lower than average rates experienced over the past three decades.* ❖

* * *

This article is an excerpt from an article in the Winter 2003 issue of the Journal of Risk Finance, entitled "Long-Term Economic and Market Trends and their Implications for Asset/Liability Management of Insurance Companies," by Christian Gilles, Larry Rubin, John Ryding, Leo M. Tilman, and Ajay Rajadhyaksha. Questions and comments should be directed to Larry Rubin FSA, Managing Director at Bear, Stearns & Co. Inc., at lrubin@bear.com.

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Advanced Risk Management Seminar

New York, December 2002

by Cathy Ehrlich, David Ingram and Hubert Mueller

The World Trade Center site in New York City is immediately north of the site of the second annual Advanced Risk Management Seminar, which was held on December 5 and 6. Activity at Ground Zero was low that week. Many decisions still have to be made about future developments and memorials. Next door, inside the Marriott Financial Center hotel, the 75 attendees to the seminar were very active. The seminar was co-sponsored by the Investment Section and the Finance Practice Area. The co-chairs of the seminar, Dave Ingram and Larry Rubin, especially want to thank the 15 speakers who presented on 13 topics. In 2003, the Advanced Risk Management Seminar will be held as a joint meeting with the CAS ERM committee on July 29, 30 in Washington, DC. As of the press deadline for this article, there are 20 sessions planned for that meeting and over 30 speakers.

Opening Presentation – Evolution of Banking ERM –

Robert Mark, Black Diamond Enterprises

Banking risk management has evolved significantly over the years, according to Robert Mark, the former Chief Risk Officer for Canadian Imperial Bank Corporation and GARP Risk Manager of the Year in 2000. Mark provided examples of VaR calculation methods that have improved in complexity and accuracy over time as bank risk managers have learned more about their products, markets and available technology has grown. Pressure for the development of bank risk management has come from the increasingly complex products and instruments that banks

The three pillars of the Basel capital accords are the minimum capital requirements, the supervisory review process and the market discipline (disclosure) requirements.

have used in their business as well as the intense pressure for the bank regulators, particularly the Basel committee of international bank regulators. The three pillars of the Basel capital accords are the minimum capital requirements, the supervisory review process and the market discipline (disclosure) requirements. Best practice banks continue to evolve

in their ability to perform completely integrated enterprise risk management.

Hedging Equity Risk for Variable Products –

Marshall Greenbaum, Constellation Management and Sandeep Bidani, Bear Stearns

Both Marshall Greenbaum and Sandeep Bidani emphasized the embedded risks in the variable and equity linked products that have been sold by the insurance industry over the past 15 years. Greenbaum reviewed five options for variable product risk management: (1) Going Naked, (2) Reinsurance, (3) Securitization of M&E fees, (4) Dynamic Hedging and (5) Static Hedging. He talked through the steps that a company could use to determine the most cost effective hedging strategy that eliminated a the portion of the variable product risk a fraction of the cost of a risk elimination hedging strategy. Bidani discussed similar considerations regarding the equity linked annuity products. He provided information on principal protection notes linked to hedge fund performance, SPX variance. In addition, he described possible insurance product designs that were keyed off of available investment structures so that the problem of approximating a hedge against a unusual insurance liability would be greatly reduced.

Interest Rate Risk Management –

Cathy Ehrlich, Milliman USA

Interest rate risk management has been practiced at insurance companies for decades. Cathy Ehrlich gave an overview of the process including the sources of the risks, an evolution of the metrics used and the different management techniques employed. Metrics used by insurance companies have evolved from static measures like McCaulay duration to more dynamic approaches such as effective duration, VaR and CTE. These dynamic approaches measure the expected change in value or model the distribution of the change in value caused by changes in interest rates. Therefore, they depend on sophisticated models of the asset and liability cash flows and sophisticated models of the term structure. Term structure models vary by whether they are equilibrium or arbitrage-free, continuous or discrete time, single or multiple factors and

whether they are normal or log-normal. In the end, they are all just models and none is “right” so care must be taken to choose the best model for the situation at hand. While it is relatively easy to check whether arbitrage-free models are properly calibrated, equilibrium models must be tested by whether they are biased, the distribution of interest rate changes and the prevalence of inversions. Although interest rate risk management is well established at insurance companies, new metrics, technologies and quantitative techniques have kept the process quite modern.

Credit Risk Management –

Kevin Strobel, Aegon and Dan Kaiser, Bear Stearns

The recent credit losses of the insurance industry served as a backdrop and motivation for Strobel and Kaiser’s discussion of methods of quantifying and managing future credit risk. Strobel reviewed the approaches taken by the commercial credit analysis software packages and then walked through a detailed description of the home-grown credit analysis system developed at Aegon. That system was, in effect a multi regime approach where defaults, as well as recoveries, occurred at different frequencies in different regimes. This was then used within a stochastic process that was parameterized to have the desired fit to historical patterns and/or future expectations. Strobel described various methods for managing credit risk that all keyed off of monitoring systems that are detailed yet easy to use on a very frequent basis. Exposures need to be aggregated across bonds, mortgages, derivatives and liabilities.

Kaiser concentrated on the use of credit derivatives to manage insurer credit risk. The impact of these instruments on cash flow, liquidity and income is important information for the valuation actuary as well. Kaiser gave an example of a large portfolio that was restructured into three layers: a senior secured layer, a leveraged investment layer and a secured leveraged investment layer. Kaiser urged that companies should pay attention to structuring and managing their credit risk in good times as well as bad.

Risk Management Task Force Update –

Valentina Isakina, SOA, Hubert Mueller, Tillinghast and David Ingram, Milliman USA

Valentina Isakina provided an overview of the development and structure of the SOA Risk Management Task Force (see *Risk & Rewards* article February, 2003). She described the efforts to date of the RBC Covariance, Policyholder Behavior in the Tails, Extreme Value Models, Risk Management Metrics, Equity Risk Modeling and Health Risk Management subgroups. Huber Mueller presented a report on the

Economic Capital Calculation and Allocation (ECCA) subgroup, which he chairs, including highlights of the survey that was conducted by that group in mid-2002. Slightly less than half of the almost 500 respondents answered that they were using economic capital in their work. Less than 20 percent of the respondents were using stochastic methods to determine economic capital. Over 80 percent of the respondents agreed with the basic definition of economic capital as “sufficient surplus capital to meet negative cash flows at a given risk tolerance level.”

Over 90 percent agreed that interest rate, pricing, credit and equity market risk should be included in economic capital and almost as many would include liquidity and operational risk as well. The ECCA group will be incorporating the survey results as well as a literature search into a specialty guide that should be completed in 2003. Dave Ingram then gave a report on the progress of the Pricing for Risk subgroup. That group, chaired by Todd Henderson, has completed a survey of pricing practices. That survey found that quite a number of basic pricing techniques are in use at various companies for different products. When similar methods were grouped, the survey showed that 34 percent of the respondents reported using some version of an internal rate of return method, 21 percent a premium margin method, 14 percent a return on equity method and 11 percent were using embedded value, with the remainder scattered over several diverse alternatives. A variety of methodology was found when the method of incorporating risk into pricing was asked. All five choices in the survey, capital allocation, risk adjusted profit target, stochastic scenario analysis, assumption PADS and assumption stress testing got significant levels of responses, with no apparent favorite. Ingram said that the Pricing for Risk group is in the process of developing a report on the survey to be published in 2003.

That survey found that quite a number of basic pricing techniques are in use at various companies for different products.

Risk Management as a Profit Opportunity –

Hubert Mueller, Tillinghast

Hubert Mueller provided an overview of key risks with current life and annuity products, covering economic, accounting, pricing and operational risks. The goal for insurance companies is not to eliminate risks, but to maximize their financial objectives, subject to a given set of risk tolerances and constraints.

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Hubert then provided an overview of current best practices for risk management, using the results of two recent surveys conducted by Tillinghast:

- A quarterly survey among North American life insurance CFO's
- A global ERM benchmarking survey, conducted in late 2002 among 94 companies worldwide

Some of the key findings which were obtained from the surveys include:

- Although companies are making steady progress in implementing ERM, few companies appear to be proactively managing the risks associated with equity-based products
- Companies appear to be adopting ERM for business reasons, rather than as a compliance issue
- General agreement that ERM can help executives with their most important business issues: earnings growth, revenue growth and return on capital (see Figure 1 below).

Hubert then provided a case study on the management of guarantees for equity-based products and some anecdotal evidence of companies exemplifying ERM "best practices." His conclusion was that more than a profit opportunity, risk management is an essential tool to avoid losing money.

Risk Management at the NY State Insurance Department Capital Markets Bureau –

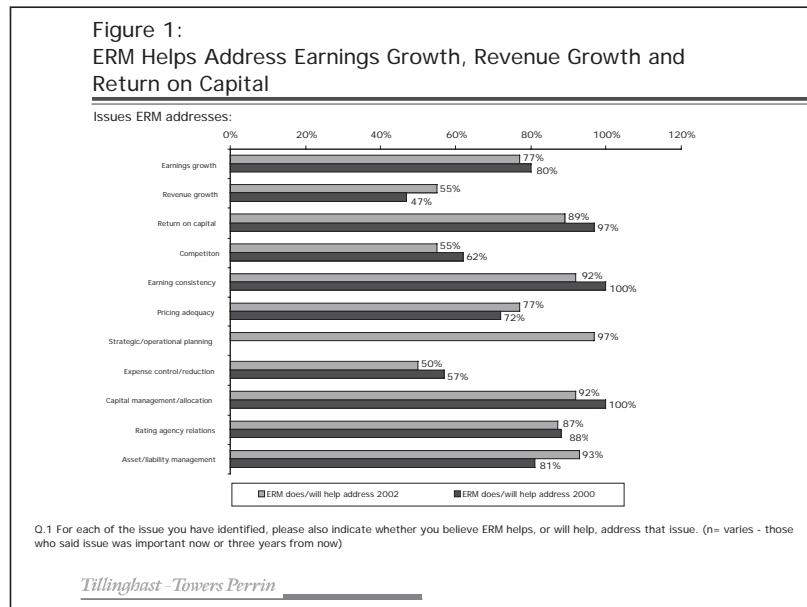
Matti Peltonen, NYSID

In 1999, the New York State Insurance Department established a new functional area to assist with the oversight of capital markets activities of the 1100 Life, Property Casualty and Reinsurance companies that it regulates. Matti Peltonen of the Capital Markets Bureau (CMB) gave a brief overview of the mandate of the bureau as well as a sampling of some projects undertaken by the bureau. Activities of the bureau have included financial analytics of the investment performance of companies, review of the control and corporate governance aspects of third party investment management agreements and analysis of securitization transactions such as the catastrophe bonds. The CMB adds a financial analytical risk based approach to the traditional balance sheet orientation of insurance department examinations. Peltonen showed how a number of metrics and analytical devices are used to develop "warning flags" used to target the company examination process.

Operations Risk –

Samir Shah, Tillinghast

Samir Shah explained three methods that can be used to model and quantify operational risks: systems dynamic simulation, Bayesian belief networks and fuzzy logic. Methods rely on differing



levels of historical data and expert opinion. These three methods use both data and expert input. Systems dynamic simulation is a method that has been primarily used in engineering sciences. It uses non-linear system maps to represent the causal dynamics of a system fuzzy logic uses linguistic variables and rules based on expert input. Bayesian Belief Networks (BBN) rely on a network of cause-effect relationships quantified using conditional probabilities. An example was presented where the fuzzy logic method was applied to the problem of modeling market conduct risk.

ERM and Operational Risk –

Mark Shaw, AFLAC

Mark Shaw provided a comprehensive review of risk management including a definition of risks, discussion of implementation issues and review of some major contributions to risk management literature from the CAS and the Institute of Chartered Accountants in the UK. His best practices list included the comprehensive inclusion of risks, senior management understanding of risks, management responsibility for risk management, aggregation of risks across the organization and a balance between control and flexibility. Shaw reminded everyone that many of the fundamentals of good risk management were already in place at most companies.

Legal Risk for Insurers –

Chris Tahbaz, Debevoise & Plimpton

The primary legal risk of insurers in the 1990s was the risk of market conduct class action litigation. Chris Tahbaz provided a history of the industry class action problems and particularly the actuarial issues that were involved. The central allegation of the plaintiffs' bar was that "insurance products were designed/managed to over promise and under perform." Actuarial documentation has often been key to these suits. In the future, the plaintiffs' bar will offer new theories of "systematic" wrongdoing and actuarial documentation will continue to be a source of insight into company practices.

Mortality Risk -

Larry Rubin, Bear Stearns and Dave Ingram, Milliman USA

Mortality risk concerns for risk managers and pricing actuaries was the theme of presentations by Dave Ingram and Larry Rubin. Rubin gave examples of the impact of different levels of mortality on a long term

care product where there is little historical experience and little opportunity to adjust pricing for changes in mortality levels. Estimation error in this pricing parameter can result in differences in calculated premiums of over 20 percent, according to Rubin's examples. Equally significant mortality risk was shown to exist related to estimates of mortality improvements at the later ages, which impacts both long term care and SPIA products. Data for projecting improvements at the later ages is also scarce and parameter estimation error is a significant possibility.

Implementing ERM –

Vinaya Sharma, Allstate

Vinaya Sharma discussed the practical issues that surround the process of bringing an enterprise risk management program into an organization. An organization needs to start with a frank assessment of where they are regarding risk assessment and risk management. Then the goals for ERM must be established, which leads directly to the development of the targeted approach for ERM. Sharma described the process that Allstate uses to bring the information within their organization together to aggregate risks. Individuals involved in the Enterprise Risk Team at Allstate come from 24 different departments. Lessons learned include the extent of turf issues in building an ERM process and the differences in the meaning of risk management to different key people across the organization.

Closing Remarks –

Dave Ingram, Milliman USA

Actuaries are often led to feel that the risk management practices of the insurance are behind the practices of Banks. Dave Ingram concluded the seminar by reviewing a list of areas where actuaries have made important contributions to insurance company risk management and often these developments came before similar bank risk management practices. Those areas include risk measurement and risk exposure reports, risk limits and risk control procedures, risk analysis of new products, investments and projects, RAROC and risk adjusted financial reporting, risk adjusted product pricing and economic capital calculations. ☺



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2003 Stochastic Modeling Symposium

by Martin Roy

The 2003 Stochastic Modeling Symposium will take place at the Crowne Plaza Toronto Centre on September 4th and 5th, 2003. The objectives of the Symposium are: (1) to build on the 1999 Symposium on Stochastic Modeling for Variable Annuity/Segregated Fund Investment Guarantees, and (2) to develop and promote other actuarial applications for stochastic modeling techniques. The symposium is being co-sponsored by the CIA, the SOA and the Actuarial Foundation.

We are pleased and excited by the response to the Call for Papers. About 30 papers will be presented at the symposium. The papers will be grouped under the following categories:

- Latest development in regime switching log-normal models
- Stochastic modeling of long term stock returns
- Stochastic interest rate models
- Building efficient scenarios
- Valuation, pricing and other applications using stochastic modeling techniques
- Risk management

We have also lined up two great luncheon speakers. On Thursday, our luncheon speaker will be Henry Hengeveld from Environment Canada. He will discuss how to deal with scientific uncertainty when assessing the risks of climate change, as an example that actuaries are not the only ones having to deal with uncertainties and dynamic models. Friday's luncheon speaker will be Phelim Boyle from the University of Waterloo. He will discuss how long-term financial guarantees have caused the fall of one of the oldest and most prestigious insurance

companies. He will describe how these long-term financial guarantees are priced and how they can be properly managed.

To relax before you sit down and listen to all the great papers being presented at the symposium, we invite you to join us for a welcoming reception at the Crowne Plaza hotel on Wednesday, September 3 at 5:00 p.m. Following the welcoming reception, we will walk next door to the SkyDome, home of Major League Baseball's Toronto Blue Jays, to see what the visiting New York Yankees are up to. Make sure you send in your registration form by August 5th to obtain a complimentary ticket to the game in a section reserved for symposium attendees. Additional tickets in the reserved section can also be purchased at a group rate for your guest.

Visit the 2003 Stochastic Modeling Symposium's Web site at www.actuaries.ca/meetings/stochastic_symposium_e.html for up-to-date information on the symposium and to obtain a registration form.

If you have any questions regarding the symposium, please feel free to email one of the following Organizing Committee members:

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We are looking forward to seeing you in Toronto. ☺

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Risk Relevant Resources

by The SOA Risk Management Task Force

Looking for timely, thought provoking information on risks affecting your line of business? Why not visit the SOA Risk Management Task Force Web site at <http://www.soa.org/sections/rmtf/rmtf.html>

Created back in 2002, Task Force subgroups have been researching and writing about all facets of risk that affect the industry. Not only will you benefit from the research and documentation available on the site, you'll find useful links to other risk oriented resources, network opportunities and events. Subgroups include:

- Economic Capital Calculation and Allocation
- Enterprise Risk Management
- Equity Modeling
- Extreme Value Models

- Health Risk Management
- Policyholder Behavior in the Tail
- Pricing for Risk
- Risk Based Capital Covariance
- Risk Management Metrics

Please take this opportunity to visit the site, add it to your list of favorites for frequent review and send your comments, questions and considerations to RMTF contacts.

The RMTF welcomes and needs your participation too! If you would like to learn more about the Risk Management Task Force in general or any of its subgroups, contact Dave Ingram or Valentina Isakina at david.ingram@milliman.com or visakina@soa.org. ☒

Investment Section Luncheon Speaker

Monday October 27 • SOA Annual Meeting • Orlando, Florida

PETER RICCHIUTI

Peter Ricchiuti (Ri-Chooty) is the finance professor you wish you had back in college! He is the assistant dean at Tulane University's A. B. Freeman School of Business and his insight and humor have twice made him the school's top professor. After a successful career on Wall Street, Peter served for five years as the assistant state treasurer and chief investment officer for the State of Louisiana. There he skillfully managed the state's three billion-dollar investment portfolio and served on boards overseeing another eight billion in retirement funds.

In 1993 Peter founded the BURKENROAD REPORTS investment research program. Here he




leads a team of more than 130 of the university's business students in search of the investment "skinny" on undervalued stocks in five southern states. He and his program have been featured in *The Wall Street Journal*, *The New York Times*, *CNN-fn* and *CNBC*.

Peter is a frequent contributor to several financial sources including *Family Money* magazine and National Public Radio's *Marketplace* program. He is a popular speaker at meetings and conference throughout the United States

and in Europe. His unique presentation style puts him in front of a wide variety of audiences including his selection by the NFL to teach investment workshops to the New Orleans Saints. ☒

CIA/SOA Investment Actuary Symposium

Mark your calendar to attend this symposium on November 9-11 at the Royal York Hotel in Toronto, Ontario.

Please visit www.soa.org for more information on this upcoming event. 



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