RISKS and REWARDS

The Newsletter of the Investment Section of the Society of Actuaries

NUMBER 35 SEPTEMBER 2000

Chairperson's Corner

by Josephine E. Marks

The Investment Section had 4,127 members and a continued strong financial position with a fund balance of $191,888 as of March 31, 2000. A future article will discuss the source and uses of our Section's financial surplus. The primary objective is to use Section assets to fund investment research and enhance the calibre of investment seminars and meeting sessions to provide educational services to our members. Currently approximately $ 30,000 of the Section's fund balance is committed to support research and education.

Elections for Section Council are taking place in this month. We have a strong slate of candidates for the Section election this year. Three are to be elected. The candidates are: Tony

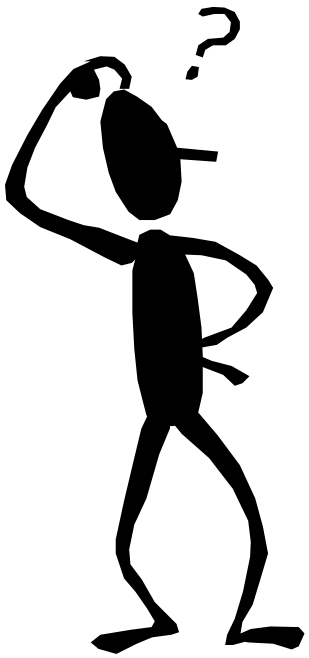
(continued on page 5, bottom)

When Is It Right To Use Arbitrage-Free Scenarios?

by Stephen Britt

One of the questions often asked of economic scenario generators and their simpler siblings — interest rate generators — is "Is it arbitrage free?" Curiously, this is not the question that should be asked, which is "Is the generator risk neutral or realistic?"

There is no right or wrong answer to this question, as the type of generator must be appropriate to the use of the simulation. In general, simulations to price securities that can be hedged require risk-neutral scenarios. Scenarios to assess the distribution of results of holding instruments (some of which may not be able to be hedged) require realistic scenarios. Simulations that will be used to price securities that cannot be hedged (such as a catastrophe reinsurance program) require realistic scenarios.



The Debate (re) Defined

Model builders in finance and insurance companies often need to build models of interest rates, and other

(continued on page 3, column 1)

In This Issue

Editor's Column...

Taking Stock

by Richard Q. Wendt

This issue of *Risks and Rewards* has the first article published by Jeremy Gold since obtaining his doctorate from Wharton. Jeremy is a frequent and popular poster to actuarial bulletin boards. We congratulate Jeremy and look forward to his prolific career in actuarial literature.

Our 1999 Market Triathlon shows that *Risks and Rewards* brooks absolutely no favoritism with the powers-that-be. Donna Claire, a candidate for SOA president-elect, came pretty close, but lost out in a tie-breaker for predicting 30-year T-Bond yields. Sorry, Donna, we didn't cut you any slack, but we appreciate your interest in the Triathlon. Laura Beckman of Mutual/United of Omaha was this year's Grand Prize winner. Thanks to the Investment Section Council, Laura, and the other winners (Ken Westover, Steve Huber, and Jim Borema) will each receive a $100 prize.

Richard Wendt

The Triathlon will be on hiatus for this year, but we hope to bring it back in the future.

This year's political arena includes many issues that affect investment actuaries — budget surpluses, elimination of the national debt, Social Security restructuring and/or privatization, and even taxation. Many of our Section members are knowledgeable in these areas and need to make their voices known as much as possible.

Thanks to all the contributors for this issue, and we urge all our members to please keep sending in articles. We definitely need your help.

Richard Q. Wendt, FSA, MAAA, is a principal at Towers Perrin in Philadelphia, PA. He is also the chief editor of this issue. He can be reached at wendtd@towers.com.

RISKS AND REWARDS

Issue Number 35 September 2000

Published quarterly by the Investment Section of the Society of Actuaries
475 N. Martingale Road, Suite 800
Schaumburg, IL 60173
Phone: 847-706-3500 Fax: 847-706-3599
World Wide Web: *http://www.soa.org*

This newsletter is free to Section members. A subscription is $15.00 for nonmembers.
Current-year issues are available from the Communications Department.
Back issues of Section newsletters have been placed in the Society library.
Photocopies of back issues may be requested for a nominal fee.

When Is It Right to Use Arbitrage-Free Scenarios?

continued from page 1

financial variables like equity returns. These scenario generators are used in simulations for a number of purposes. Scenario generators come in two flavors:

- Risk-neutral
- Realistic

There is often discussion, more heated than informative, on the relative merits of these two approaches to modeling interest rates and other variables. Our observation is that the religious zeal with which some practitioners praise one or the other is often in inverse proportion with their understanding of what should be a relatively straightforward issue.

Confusing the issue further is the question of "arbitrage free" scenarios.

In this article we discuss the issue of arbitrage-free scenarios, risk-neutral scenarios and realistic scenarios in the context of a Monte-Carlo simulation approach to solving financial problems. We start with the concept of "arbitrage-free" models. We assume the need to perform Monte-Carlo simulation of bond yields and other variables and address the issue of whether these simulated rates should be arbitrage-free, risk-neutral, or realistic.

Arbitrage and Arbitrage-Free Yield Curves

A set of scenarios allows arbitrage if it is possible to construct a portfolio of securities that offers a "free lunch." Either:

- The portfolio can lock in possibility of profit, at no initial cost to the investor; or
- The portfolio generates an immediate profit with no residual risk to the investor.

A clear example of arbitrage — imagine it were possible to borrow from the government at a rate of 5% for a period of 10 years, with no payments due until the end of year ten (an example could be a low-interest loan for study, funded by a government agency).

Imagine that at the same time the investor could lend to the government (buy a ten year zero) at 6%. A rational person would borrow as much as possible — and invest at the higher rate, locking in a significant profit on each dollar invested. This generates a locked-in profit at no cost, representing arbitrage. (It is customary in discussions such as these to assume that there is no limit to the amount that investors could borrow or buy).

Arbitrage opportunities are most often discussed in the context of the fixed income market; in particular, the treasury yield curve is assumed to offer no arbitrage opportunities.

Not surprisingly, arbitrage opportunities are rare in the real world, and should be rare in the models we build. How rare? At the extreme there should be no arbitrage opportunities for a portfolio of any securities, regardless of whether:

- The securities exist or not in the real world, or
- The securities are utilized in our models.

In theory (the theory going by the grand title of "The Fundamental Theory of Asset Pricing"), there should be no arbitrage opportunities within the span of available traded assets. That is, there should be no arbitrage for any securities (e.g., options, swaps, forward contracts) e.g., based on traded underlying securities, regardless of whether those securities exist.

This is an extreme restriction on arbitrage. Present technology is such that it is not possible to build models that restrict arbitrage to this extent and still faithfully reproduce the characteristics of yield curves and equity returns. For a discussion of this issue, see these references Cont R (2000), Christiansen (1998), Pliska (1997) and Tilley (1992).

For example, most models run at best at monthly rests; the need to interpolate for cash flows due mid-month open up opportunities for arbitrage for zero-coupon securities priced at less than monthly rests.

To create yield curves that truly look like yield curves, they must allow some limited arbitrage. In the real world, the presence of transaction costs will often make this arbitrage opportunity ineffective.

One option is to create yield curves that do not allow arbitrage among the securities and asset classes employed in the simulation. Call this the absence of model arbitrage. Model arbitrage can create critical errors in a simulation if the strategies that emerge from the simulation require this arbitrage to be effective, and the opportunities are not available in the real world.

Realistic Scenarios

For many purposes, we need to be able to place a distribution around a company's holdings of assets and liabilities. For example, an insurance company wishes to know the likelihood of exhausting its available capital given its holdings of investments and book of liabilities.

Under these circumstances, we generally need our distribution of interest rates to be realistic. An inverted yield curve at the current time should not imply an inverted yield curve in the future, and equities do not have the same expected return as bonds.

Risk-Neutral Scenarios

Suppose we wish to value a claim on the S&P 500 and the 10 Year T-Note. It could be something explicit like "pay $100 if the price of a 10 year T-Note falls below $95 and the S&P falls below

(continued on page 4, column 1)

When Is It Right to Use Arbitrage-Free Scenarios?

continued from page 3

1500." It could be something less clear, like the guaranteed minimum death benefit on a portfolio consisting of stocks and bonds.

It makes sense that if we could define a portfolio that exactly matches the payoff of our claim, we can work out the appropriate price for it in terms of the current price for the stocks, bonds, and perhaps cash. For simple claims (such as a forward contract), this is indeed the case. For more complex instruments (swaps, options, etc.), it can be proven (see a good textbook on option pricing) that there always is such an initial portfolio, although the portfolio will usually vary over time. That is, there is a dynamic hedging strategy that, given the usual assumptions relating to frictionless markets, reproduces the claim with no additional investment over time. The trick is to find the portfolio, or rather the initial portfolio and the replicating strategy.

It can be shown (again, see the text book) that the price of the claim and the portfolio to hedge the claim can be derived using the expected value of the claim in a "risk-neutral" world. The risk-neutral world is an odd place. It is identical to our own, except that expected return on risky assets (e.g., equities) is the same as the return on a riskless asset such as a government bond. The volatility and correlation structure of asset returns is the same; it is just the expected returns that are different.

When Is It Right to Use Arbitrage-Free Rates?

Paradoxically, the answer is "never" and "always." It is possible to find arbitrage opportunities in any model, when implemented in computer code. These arbitrage opportunities exist in the real world, but transaction costs and other real-world impediments make it impossible to exploit them.

The Issue Is the Degree of Model Arbitrage Allowed

If your simulation results are biased because of exploitation of arbitrage in the model that is not exploitable in the real world, then your results are invalid. Remove this arbitrage either from the model, or remove the opportunity from the set of available strategies.

When Is It Right to Use Risk-Neutral Rates?

Consider a trader wishing to work out a fair price for an option on a bond. This will pay a fixed amount depending on the state of the 10-year bond yield. The secret to pricing this option has been known ever since the seminal article by Fischer Black and Myron Scholes (Black-Scholes 1973) that derived the deservedly famous Black-Scholes option pricing formula. The secret is to derive an investment strategy that will:

- Require an initial investment to establish the portfolio,
- Require no additional investment, and
- Will replicate the payoff of the option, regardless of what it actually is, at the maturity date.

Arbitrage considerations would mean that the price of the option must be the same as the price of the initial portfolio that would eventually replicate the option. Furthermore, we can hedge the risk of holding the option by always holding the replicating portfolio.

How do we determine this strategy that replicates the option and hence its price? We can cheat a little here because if the option is solely dependent on the price of one or more tradeable securities (stocks and bonds), the price will be the same as if we were working out the expected value of the option using an arbitrage-free (or more precisely, risk-neutral) set of scenarios.

We can go further. A theorem in finance states that if a certain state-contingent claim (e.g., a security like an option or a bond) is solely determined by one or more tradeable securities, then there is a strategy that can replicate its pay-off. Furthermore, our trick of valuing using the risk-neutral scenarios can assist in finding the replicating portfolio and working out the price of the claim.

State-contingent claims can be more than just options. For example:

- A ten-year bond is a simple claim. (The payoff is simply the face value of the bond. The strategy is to hold the bond, and the value of the bond is, simply, the bond)
- The forward contract described above is a state-contingent claim. It can be replicated by holding a position in the nine and ten-year zero coupon bond
- An option on the S&P 500 is a state-contingent claim. It can be replicated by dynamically borrowing money to pay by some stock.
- Certain life-insurance products can be considered state-contingent claims. A pure endowment with a guaranteed surrender value is like an option. After making assumptions on the behavior of policyholders regarding surrender, it can be replicated by holding positions in bonds.

Not all claims are state-contingent claims, however, in the sense that they can be replicated by a strategy solely involving tradable securities:

- The pay-off from a lottery ticket cannot be replicated in this way.
- The pay-off from an insurance policy on a car cannot be replicated by holding positions in tradable securities.
- The pay-off from a term life insurance policy cannot be replicated in this way.

Putting all this together, then arbitrage free scenarios can be used:

- Where the aim of the simulation is to find the price of certain claims (e.g., an option); and
- Those claims can be replicated using an investment strategy solely employing tradeable securities.

Not surprisingly, financial markets almost by definition deal with tradable securities, so there is a great deal of interest in being able to price these securities. Arbitrage-free scenarios are used commonly in finance to price and hedge these types of claims.

When Is It Right to Use Realistic Scenarios?

The short answer is "in almost all other cases." In particular:

- When the claim we are trying to price cannot be fully replicated using tradable securities.
- When we are not required to calculate the current price of a claim.
- When we are interested in the range of likely values of some claims in the future (what is the 5th percentile worst value for the S & P in five years).

These cases abound in insurance, but are less frequent in financial markets (although Value-At-Risk is an example of the last case). Examples include:

- Setting the asset mix for a pension fund or property-casualty insurance company
- Investigating the required capital for an insurance company and allocating it to lines of business
- Investigating certain reinsurance contracts

Summary and Conclusion

Risk-Neutral scenario generation is an elegant and useful tool for pricing certain securities and claims. It is right that these techniques and tools should be used in cases where they are appropriate. It is also incorrect not to use them when arbitrage consideration implies their use.

However, like any tool they cannot be used for many tasks. For tasks where we need to reproduce the statistical distribution of interest rates, inflation, and equity markets, we need to use different, realistic scenarios.

Steve Britt, CFA, FIAA, is an asset consultant at Tillinghast-Towers Perrin in Hartford, CT. He can be reached at BrittS@towers.com.

References:

1) Christiansen S (1998), "Representative Interest Rate Scenarios", *North American Actuarial Journal*, Volume 2, Number 3
3) Cont R (2000), "Modeling term structure dynamics: an infinite dimensional approach," Working Paper, Centre de Mathematiques Appliquees, Ecole Polytechnique
3) Pliska S (1997) *Introduction to Mathematical Finance,* Blackwell Publishers.
4) Tilley J (1992), "An Actuarial Layman's Guide to Building Stochastic Interest Rate Generators," *Transaction of the Society of Actuaries, Volume 44*

Chairperson's Corner

continued from page 1

Dardis, Craig Fowler, Doug George, Charles Gilbert, David Ingram and Ken Mungan. Those leaving the Council this year are Doug George (after a one-year term), Christian-Marc Panneton (after a two-year term) and Josephine Marks.

The Section will be sponsoring 10 sessions at the Annual Meeting in Chicago to be held from October 15 to 18, 2000. In Peter Tilley's article, he discusses the planning process for spring and annual meetings in a behind-the-scenes description of how these sessions are planned and organized. The Finance Practice area, with support from the Investment Section, is organizing several investment seminars to be held later this year, including one with a new concept — an Investment Actuary Symposium to be held November 13 – 14 in Boston. (See the article in this issue for more details).

Our Section Web site is now up and running. Refer to the SOA Web site (*www.soa.org*) to access the site under Special Interest Sections — Investments. The list serve is now active, and members are encouraged to join the list serve and use it wisely.

Josephine Marks, FSA, FCIA, is vice president of Investments at Sun Life Centre in Toronto, ON. She can be reached at Josephine_Marks@sunlife.com.

Actuarial Assumptions for Pension Plans Invite Arbitrage The Case of Pension Obligation Bonds

by Jeremy Gold

The following is an extract from a larger essay that argues that the use of actuarial discount rates that incorporate equity risk premiums[1] systematically misstates pension plan periodic costs when the liability cash flows are independent of the equity market portfolio. This systematic error favors the present generation of taxpayers over future generations and favors participants over taxpayers. Such mispricing encourages more sophisticated market participants to invent transactions designed to extract value. One such transaction developed in the late 1980s in the public plan sector is the issuance of pension obligation bonds (POBs).

Pension obligation bonds claim to be able to reduce the cash flow from a municipality in support of its pension fund by taking advantage of the assumed discount rate used by the plan's actuary — an investment bank has described its POB proposal as "arbitraging the actuary." Anand (2/3/97) refers to "the arbitrage between what Ms. Whitman's [New Jersey Governor Christine Todd Whitman] administration anticipates paying bond purchasers and what it hopes to earn through the pension funds' investments"

Suppose:

$\bar{r}$ = risk free rate of return

c = municipal rate of borrow on taxable debt

$\bar{e}$ = actuarial discount rate based on the plans usual asset allocation including equities.

$r < c < \bar{e}$

The idea is for the municipality to borrow by issuing taxable POB's (the IRS has ruled POBs cannot be tax-exempt), placing the proceeds in the pension plan where they "fund" a previously unfunded liability that was being amortized as part of the plan's annual cost.

Suppose an unfunded liability of $1 is being amortized over n periods in level dollar amounts. The actuary would compute the amortization cost as:

$$\frac{1}{a_{\overline{n}|}@\bar{e}} = \frac{\bar{e}}{1-(1+\bar{e})^{-n}}$$

The municipality issues an n-year POB with a $1 principal and a self-amortizing repayment of:

$$\frac{1}{a_{\overline{n}|}@c} = \frac{c}{1-(1+c)^{-n}}$$

The $1 proceeds of the issue are placed in the plan to "satisfy" the previously unfunded liability and invested in accordance with the plan's usual asset allocation. The actuary eliminates the amortization charge from the current cost. The municipality now pays the debt service instead of the amortization charge, a "saving" to the municipality of:

$$\frac{\bar{e}}{1-(1+\bar{e})^{-n}} - \frac{c}{1-(1+c)^{-n}} > 0$$

Note that when n = 1, the above reduces to: $\bar{e} - c > 0$.

The process outlined may be divided into two processes that, taken together, have the identical financial substance as the original process:

- The pension plan locates within its portfolio a subportfolio of Treasury securities with a market value of $1 and with cash flows exactly proportionate to the amortization schedule of the proposed POBs.[2] It sells this portfolio and invests the proceeds in accordance with the plan's usual asset allocation.
- The municipality issues the POBs and places the $1 proceeds in the pension fund where the $1 is used to repurchase the Treasury subportfolio sold above.

This deconstruction shows that the first step is a swap or an asset reallocation whose risk-adjusted value is zero. This is as simple as the recognition that $1 in bonds has the same value as $1 in stocks. Their divergent expected future values are exact compensation for their differential risk. The second step constitutes a borrowing by the municipality at its borrowing rate, c, for the purpose of investing in Treasury securities with a rate r. With $c > r$, the differential periodic cash flow equals

$$\frac{c(1+c)^n}{(1+c)^n - 1} - \frac{r(1+r)^n}{(1+r)^n - 1} > 0$$

which equals $c - r$ for $n = 1$ and for very large values of n and is somewhat less for intermediate n. The two steps taken together make it clear that the POB process amounts to an asset reallocation that could be done independently of the

bond issuance coupled with a borrowing at rate c in order to invest at rate r.

The market assigns the higher borrowing rate, c, to the municipal debt because holders of this debt face a greater risk of default or "a debt-service moratorium" [3] than do holders of Treasury debt. There are two ways to look at the debt-for-debt transaction:

- If the municipality deems its promise (the unfunded liability) to the pension plan to be without risk to the plan (clearly a view somewhat at odds with the market debt rate assignments), then the transaction is simply a money loser.
- If the municipality agrees with the market that its promise is not as good as the Treasury promise, then the debt-for-debt transaction amounts to a defeasance in favor of the plan and its participants, and the net cost of the defeasance, (c-r) annually, is an additional benefit to plan participants paid for by the taxpayers.

Note that, if the municipality could issue tax-exempt POBs at a rate c' < r, then a true arbitrage could be effected. It is just this reasoning that led the IRS to rule that POBs are taxable bonds.

An unsigned editorial, *Pensions and Investments* (3/3/97), warns: "Gov. Christine Todd Whitman's plan to issue $2.9 billion in pension obligation bonds is good news for participants…. The state, and taxpayers should view the pension obligation bonds more cautiously…".

Earlier in the decade, Los Angeles County debated the merits of POBs. During the debate, the actuarial rate remained unchanged. As the rates that would be required to sell the POBs rose, the proponents argued that the delays were costly to the county. "In October 1992, issuing the pension obligation bonds would have saved the county an estimated $519 million [over 20 years]. By February 25 of this [1994] year, interest rate increases shrunk potential savings to $318 million. By March 10, higher interest rates had reduced the estimated savings to $240 million, [according to a plan trustee]." Hemmerick (4/18/94). This article exposes many of the political consequences arising from the use of an actuarial discount rate that is not risk-adjusted. Hemmerick (7/25/94) shows the county bargaining position weakening through the delay, and the trustees demanding additional concessions from the county.

In an exchange of "Commentary" (Surz, 4/4/94) and "Letters" (Stoufer, 5/30/94, Surz, 6/13/94), Mr. Surz, with a technical error later corrected by Mr. Stoufer, gets the substantive issues correct and concludes: "My basic premise still stands. POBs are advocated by those who benefit from them — underwriters, investment managers, consultants, and beneficiaries. From whence does this benefit derive? It's paid by taxpayers, who clearly lose as they are bilked into buying off on bogus arbitrage arguments."

In the *Pittsburgh Post-Gazette*, 1/18/98, Brian O'Neill writes: "I'm asking (a friend who knows about high-finance) about the city selling $250 million in bonds to bail out its pension fund, asking if it's a good idea for taxpayers, when he offers eight words of solace I'll never forget: 'If we're really stupid, we're not uniquely stupid.'"An Internet search indicates recent POB activities in Massachusetts, Connecticut, and Georgia along with an unending river of POBs in California.

There is a simpler burlesque of the POB phenomenon that contains all the financial substance of the claimed POB advantages: Suppose a state government issues $1 billion of 30-year bonds promising to pay 6% interest and then takes $500 million of the proceeds and puts it into an account where it is invested in equities. Since the expected return on the $500 million of equities is sufficiently high to meet all of the bond payments, the state spends the remaining $500 million immediately as it pleases. An actuary says he believes that the assets are sufficient to meet the liabilities and cites ASOP 27 in support of his position.

The fundamental point is this: the persistent use of expected returns in actuarial models involving risky assets ignores 40 years of financial economics and exposes taxpayers to manipulations by those who are more sophisticated about securities markets.

References

1) Anand, V., "Pension Bonds to Help N.J," *Pensions and Investments,* 2/3/97
2) Editorial (Unsigned), "A Pension Arbitrage," *Pensions and Investments,* 3/3/97
3) Hemmerick, S., "Los Angeles Bond Offering Likely to be Dead," *Pensions and Investments,* 4/18/94
4) Hemmerick, S., "L. A. County Eyes Bonds," *Pensions and Investments,* 7/25/94
5) O'Neill, B., *Pittsburgh Post-Gazette,* 1/18/98
6) Stoufer, J., "Letters," Pensions and Investments, 5/30/94; Surz, R. J., "Commentary," *Pensions and Investments,* 4/4/94
7) Surz, R. J., "Letters," *Pensions and Investments,* 6/13/94

Footnotes

1) In accordance with ASOP 27.
2) If, as is likely, such bonds cannot be found, many equivalent alternatives can be constructed using swaps or futures contracts. The important point here is that a large, liquid pension fund with substantially deferred cash outflows can effectively borrow at or near the Treasury borrowing rate.
3) Mid-1970s euphemism for default by New York City.

Jeremy Gold, FSA, MAAA, is the proprietor of Jeremy Gold Pensions in New York. He can be reached at jeremyg @aol.com.

1999 Market Triathlon Results

by Frank M. Grossman

Could the stereotypical image of "the actuary," deliberate in his approach, conservative in his outlook, have ever been in doubt? (Better to put aside any quips about the trusty scientific calculator at his side, stained plastic pocket protector, and bad haircut for the time being.) I think not. And the results of the 1999 Market Triathlon appear to back me up.

Our triathletes boldly ventured to predict the 3-month Treasury bill rate, 30-year Treasury bond rate, and Dow Jones Industrial Average index value at year-end 1999. Yet their seven-month forecasts, on average, fell short of the actual statistics on December 31, 1999 (Table 1). Short rates at year-end were roughly 40 basis points higher than the average pick, while long rates were more than 55 points higher. The Dow outstripped the average triathlete pick by more than 900 points.

Some might concede, however, that it was difficult to forecast recent increases in the federal funds rate: up 0.75% during the last half of 1999; followed in 2000 by 0.25% on February 21, another 0.25% on March 21, capped by a 0.50% increase on May 16 (just for those who weren't paying attention). Fasten your seat belts for the so-called "soft landing."

And how could you anticipate the run-up in long bond rates to year-end 1999 and their subsequent decline? The first half of 2000 has witnessed the demise of the 30-year Treasury bond as a bellwether for the American bond market as the supply of Treasuries has been shrinking due to the emerging federal budget surplus. In particular, only $15 billion of 30-year bonds are expected to be auctioned this year (this figure was $47 million in 1991 and $20 billion last year), and its price of late has increasingly reflected "maturity preference" market dynamics. The 10-year Treasury note has now effectively supplanted the 30-year bond as the bond market benchmark.

As well, the impact of momentum trading on equity markets should not be underestimated. For example, it is thought that the travails of hedge funds are largely rooted in disconnect between market valuations and fundamental data. Consider the fate of mighty Tiger Management, with greater that $25 billion under management in 1998, now soon to liquidate its holdings and go out of business.

Table 1
Recent Historical Data

	3-Month T-Bill Yield	30-Year T-Bond Yield	DJIA Index Close
June 1, 1999	4.56%	5.936%	10596.26
December 31, 1999	5.19%	6.477%	11497.12
June 30, 2000	5.70%	5.889%	10447.89

Perhaps the real story of note over the past several months, aside from the continuing unpredictability of financial markets, has been the degree of volatility within those markets (Charts 1 through 3). And the fluctuations in the DJIA close doesn't relate the significant intraday variation that exists. Just the stuff to fog any seer's crystal ball.

Chart 1

3-Month T-Bill Yield from June 1999 Through June 2000

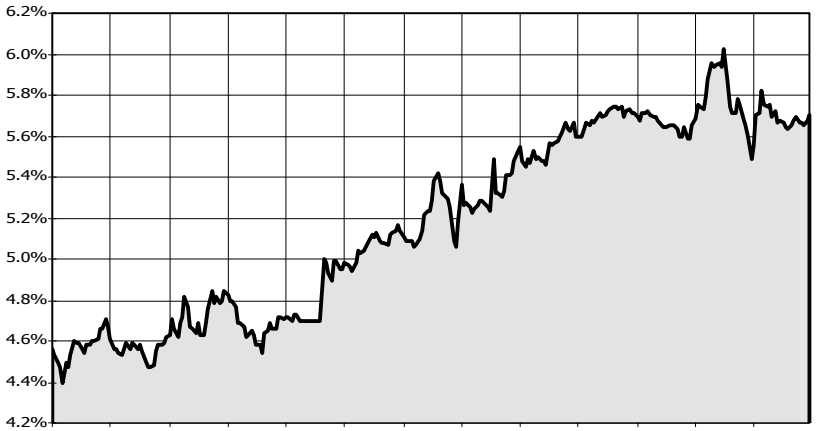
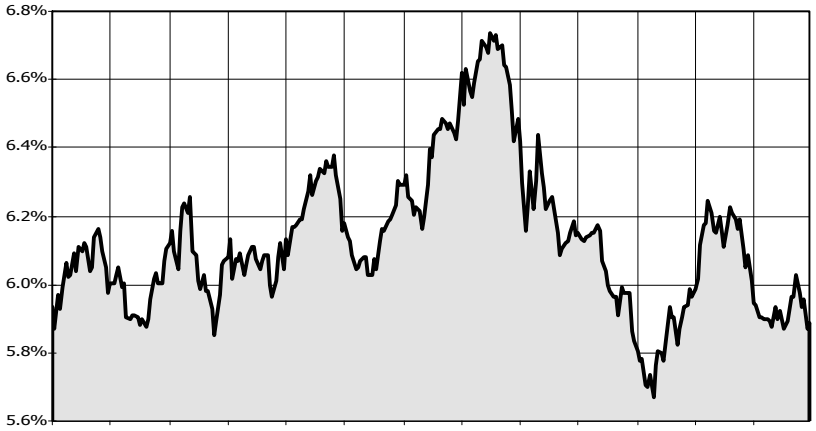


Chart 2

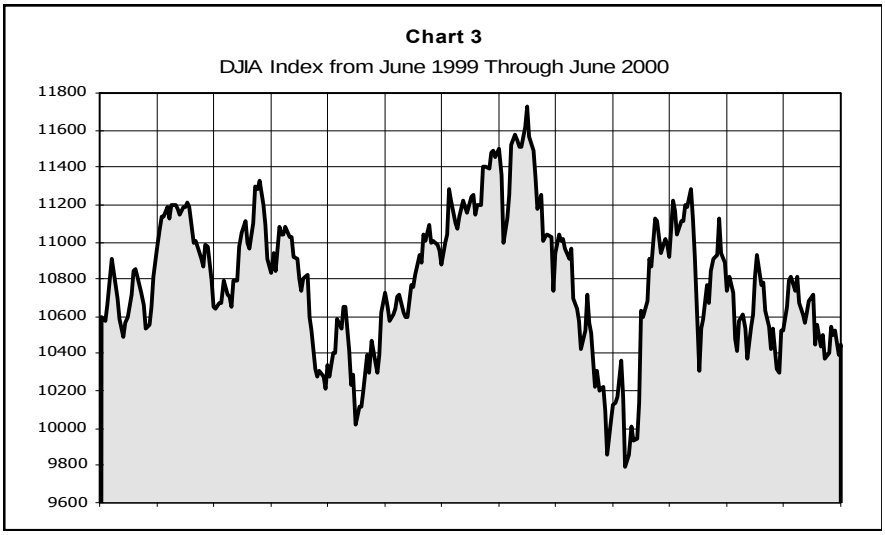
30-Year T-Bond Yield from June 1999 Through June 2000



(continued on page 10)

1999 Market Triathlon Results

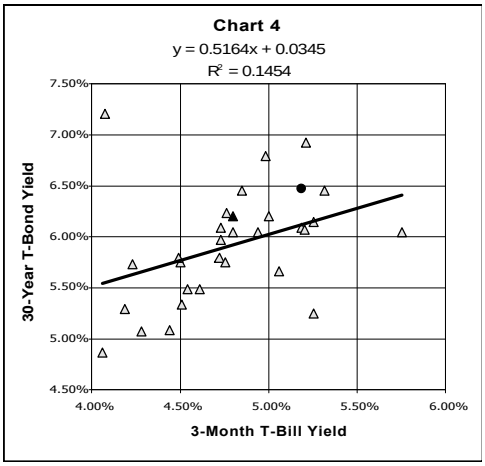
continued from page 9

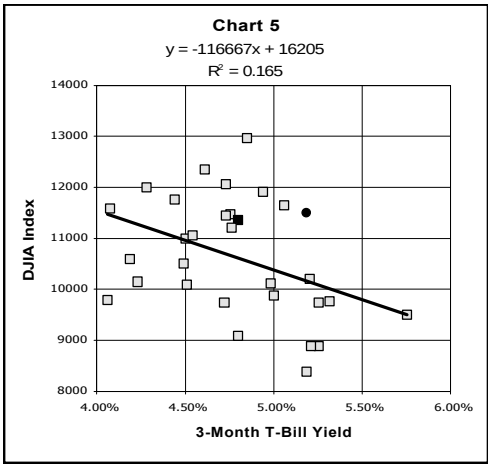


Through this haze of market uncertainty, the pairwise scatter charts of triathlete picks have been updated to include the actual year-end 1999 statistics, denoted by the dark circle in each chart (Charts 4 through 6). To the credit of the triathletes, the actual results fall within the locus of their picks — though just barely so in the case of the short rate / DJIA index plot (Chart 5).

The winners of the 1999 Market Triathlon individual events are: Ken Westover (3-month T-bill), Steve Huber on tie-break over Donna Claire (30-year T-bond), and Jim Borema (DJIA index) (Table 2). It is often said "better to be approximately right than exactly wrong," and the Market Triathlon is no different, as the key to overall success is to place well within each of the three categories.

Hearty congratulations to Laura Beckman for her first-place finish in the 1999 Market Triathlon (Table 3). The location of the winning overall pick is denoted on the scatter plots by the dark triangle/square/diamond symbols. First-place prizes of $100 will be soon on their way to Laura and the three individual event winners.





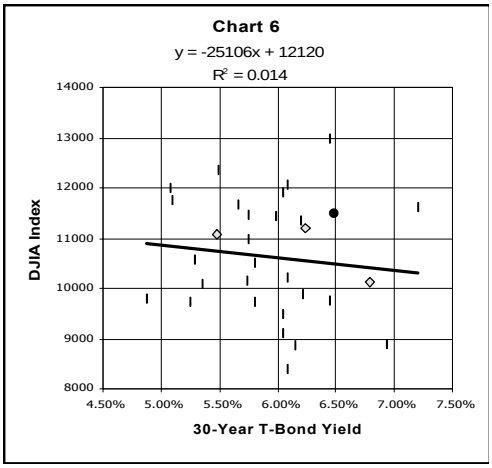


Table 2
1999 Market Triathlon Results by Event

Event	Rank	Name	Pick at December 31, 1999	Absolute Deviation of Pick from Actual
3-Month T-Bill (5.190%)	1	**Ken Westover**	5.190%	0.000%
	2	Michael Wiesner	5.200%	0.010%
	3	David Moser	5.211%	0.021%
30-Year T-Bond (6.477%)	1*	**Steve Huber**	6.450%	0.027%
	1	Donna Claire	6.450%	0.027%
	3	Donald Krouse	6.240%	0.237%
DJIA Index (11497.12)	1	**Jim Borema**	11476.00	21.12
	2	Harold Ingraham	11431.00	65.36
	3	Raymond D. Berry	11600.23	103.11

* Steve Huber placed first in the long bond event on tie-break.
The lowest DJIA index close during the fourth quarter of 1999 was 10019.71 on October 15.
Steve Huber's pick was 9607.00; Donna Claire's pick was 9035.00.

Table 3
1999 Market Triathlon Overall Results

Overall Rank	Name	Cumulative Event Rank	Rank in Individual Events		
			90d	30yr	DJIA
1	**Laura Beckman**	21	12	5	4
2	Donald Krouse	24	14	3	7
3	Michael Wiesner	28	2	10	16
4	Lori Vande Krol	29	10	11	8
5	Steve Huber	30	6	1	23

Is it possible that our triathletes weren't lacking in imagination with their staid seven-month forecasts, and that they were simply caught unawares — along with everyone else — by Alan Greenspan and those pesky "animal spirits" on Wall Street? Something to think about. Now where did I put my calculator?

Frank M. Grossman, ASA, is a senior actuarial associate at Manulife Financial in Toronto, Ontario. He can be reached at frank_grossman@manulife.com.

Municipal Reinvestment Contracts

by Victor Modugno

During 1999, municipal bond outstandings crossed the $1.5 trillion mark.[1] Of this, about 60% are revenue bonds, with the balance being general obligation (GO) bonds. GO bonds are backed by the tax revenue of the state or municipality, and their credit rating is based on the credit of the issuer. Revenue bonds can only look to revenue from the project they are financing. The credit ratings are based upon the structure of the program, and so they are called structured financings. Whereas proceeds from GO bonds usually go into the issuer's cash management (e.g., to pay off short-term debt or invested in short term accounts), revenue bond proceeds are held in trust for the bondholders to secure repayment. Guaranteed Investment Contracts (GICs), also called Investment Agreements, are used for investment of these trust funds.

While higher interest rates led to a drop in refundings in 1999, new money bond issues have remained level at about $150 billion per year over the past few years. A combination of low interest rates and a strong economy have led to a high level of municipal projects. GICs are typically purchased for new money issues, not for refinancings. New money revenue bonds, which might purchase GICs, have been running at about $90 billion per year.

Of this $90 billion, about $50 billion requires collateral in the form of government bonds. Tri-party repo GICs can be used for this purpose. Under this arrangement, collateral is transferred to a third party trustee. The level of over collateral and the frequency of mark-to-market will be a function of the securities (treasuries or agencies), and the rating of the GIC provider. Repo-GICs are used by government bond dealers to finance inventory as an alternate to bank loans. Of the remaining $40 billion where unsecured contracts can be used, about half require AAA/Aaa ratings, which would eliminate most life insurers.

A Historical Perspective

The growth in structured financing in the late 1970s, following the "tax-payer revolt" exemplified by Prop 13 in California, laid the groundwork for the muni-GIC market. The tax reform act of 1986 attempted to curb some of the abuses in the tax-exempt market by limiting issuance for private activity and requiring rebate of interest arbitrage on tax-exempt reinvestment. This created a new taxable municipal bond market that Executive Life and Drexel exploited by issuing $3 billion of these bonds in 1986, after Executive Life received a triple A rating from S&P. Under this program, all of the bond issue was placed in an Executive Life GIC. Because of Executive Life's junk bond investments, the crediting rate on the GIC was higher than the cost of funds of the bond issue, allowing the municipality to earn arbitrage, as well as cover Drexel's underwriting fees.

The Executive Life program brought muni-GICs to the attention of the life insurance industry. Funding agreement legislation was passed in New York and California and other states in the late 1980s. Funding agreements are a series of payments not contingent upon mortality or morbidity, and some states took the position that GICs could only be issued to groups covering individuals where annuities would be purchased. A statute was needed to permit life insurers to issue such contracts for municipal reinvestment.

The failure of Executive Life and the attempted repudiation of the muni-GIC contracts by the insurance commissioner contributed to a negative image of life insurers as GIC issuers. While the courts ultimately ruled in favor of the muni-GIC holders, the credit requirements for life insurers are frequently stricter than other providers.

Common Funds That Use GICs

Unlike the Executive Life GICs, the tax-exempt reinvestment market provides funds for valuable public projects, such as schools, fire stations and equipment, low-income housing, sewer systems, and waste disposal.

Some of the more common funds that use GICs, including risks and other issues, are listed below.

Debt Service Reserve (DSR) Funds

Typically 10% of the proceeds of the bond issue are placed into a reserve fund that can be drawn in the event the issuer cannot make an interest payment. Usually there is a provision to allow replenishment within 12 months. The reserve fund runs for the same period as the bond issue, typically 30 years, callable after 10 years. Since the bond issue would be called if interest rates are low, this is an ideal liability — a fixed rate contract that is called when interest rates go down. It can be perfectly matched with a callable bond.

An off-balance-sheet version of this contract is called a treasury put. Here the issuer buys a 30-year Treasury and a synthetic funding agreement to cover book value on draws. The risk is that the

muni-bond issuer will default in a high interest environment, resulting in a loss when funds are paid out at book value.

Municipal bonds generally cover necessities such as sewer systems and do not have the same default rates as corporates. A study of defaults of unrated muni-debt during the 1980s showed a default rate of less than .2% per year.[2] The only historic period of high level of defaults was the 1930s, when interest rates were low.

Discount DSRs, where a payment is made upfront reflecting the lower crediting rate on the DSR, have more risk since the discount would be made up in a default and require more careful underwriting of the bond issue.

As with all muni-GICs, DSRs require downgrade provisions. While the economic risk can be mitigated by using novation or assignment remedy (where a replacement contract is purchased from a qualified provider upon downgrade), some states are requiring type C reserves, which could result in deficiency reserves on these contracts with 30-year final maturity.

Float Funds
These are funds that accumulate monthly payments and then pay out principal and interest semi-annually. They go to zero at least once per year. Like DSRs, they run for the term of the bond. By writing contracts with different payment dates, average balances can be invested long, or swaps can be used to immunized cashflows. An off-balance-sheet version of this contract is called Debt Service Deposit Agreement.

Construction
Funds are held until disbursed to pay for construction. Typically there is a 2-to-3 year final maturity with a 9- to 12-month average life. A draw schedule is developed as part of an engineering study. The GIC may allow schedule draws only. However most are full-flex or "no sooner, no greater" where the funds can be drawn as needed for construction. Since the engineering study doesn't allow for problems like bad weather, draws are almost always later than scheduled and are not interest sensitive.

Capitalized Interest (Cap-I)
Funds to make the first 3 years' interest payments are set aside to make payments until the project starts to generate revenues.

Tax Revenue Anticipation Notes (TRANS)
These are issued by school districts to provide for cash management. They are typically issued for one year. A small amount is withdrawn and then repaid prior to maturity. This is one exception where the issuer can keep interest arbitrage earned on the spread between the GIC and the bond. These are obligations of the school district, so even insured deals may allow AA GIC providers.

Housing
These funds provide mortgages to low-income homebuyers. After a 3-year origination period, mortgages are packaged into Ginnie Mae securities and sold to investors. These funds are somewhat interest sensitive, since loan originations may decline as interest rates fall (or accelerate if they rise). However, since these are subsidized and may be the only source of loans for low-income buyers, they are not as interest sensitive as regular mortgage loans.

Differences in Funds

About 90% of the funds are short term, generally being dispensed within one year to provide for the underlying purpose of the bond issue, with the balance held in reserve funds for the term of the bond, typically 30 years, subject to early call. This is different from stable value, 401(k) GICs, which are issued for 3-5 year terms. Other differences include:

- **Downgrade Provisions**
  These provisions have been required since the failure of Executive Life caused losses to bondholders. They provide an out if the GIC provider is downgraded below a certain level. A put provision, where the book value is paid out, novation or assignment provision where a replacement contract is purchased from a qualified provider, and posting collateral are the most common remedies for downgrade.

"Municipal bonds generally cover necessities such as sewer systems and do not have the same default rates as corporates."

- **Enforceability Opinions**
  Every contract in this market must be accompanied by a legal opinion that states the contract is enforceable and the issuer is authorized to issue it.

- **Signed Contract Required before Transfer of Funds**
  The issuer typically has a few days between commitment and funding to issue a signed contract.

- **Less Price Sensitive**
  Interest arbitrage, over certain amounts, is rebated to the IRS for most muni-bond issues. The highest rate does not necessarily win.

- **Different Players**
  Bond counsel, financial advisors, bond underwriters, and brokers are involved in the GIC purchase. The rating agencies and bond insurers establish the requirements for the GIC issuers. The municipalities are usually passive entities in this process. These fee-based advisors are focused on avoiding problems, not on getting the best rate. Competitors include

(continued on page 14, column 1)

Municipal Reinvestment Contracts
continued from page 13

securities firms, subsidiaries of bond insurers and foreign banks.

- **Bond Insurance**
  This has increased from 25% to 50% of new issues between 1990 and 2000. Bond insurers require AAA/Aaa ratings from insurers in this market.

- **Inefficient Market**
  There are over 50,000 municipal bond issuers. Bond insurers and underwriters who exercise control over the GIC placement have subsidiaries that compete in the muni-GIC market. Yield restrictions and lack of profit motive also limit competition. Frequently one institutional buyer (a tax-exempt mutual fund) will buy all or a large portion of the bond issue and can specify or object to the GIC provider.

For life insurers who do venture into this market, there is lower cost of funds and different, non-correlated risks compared to 401(k) or capital market GICs. There are A/L synergies in adding these liabilities to other liabilities of typical life insurer and the capital model is favorable, resulting in high shareholder value-added from this business.

Victor Modugno, FSA, MAAA, is a consulting actuary in Los Angeles and a member of the Investment Section Council. He is an associate editor of Risks and Rewards. *He can be reached at* vic@internetactuary.com.

Footnotes

1) Most of the data for this article was taken from the *Bond Buyer*.

2) "Municipal Bond Defaults, the 1980s: A Decade in Review," J.J. Kenny Co., Inc. 1993.

The Investment Actuary Symposium

Investment Actuary Symposium in November

The Society of Actuaries Finance Practice Area is pleased to announce its first Investment Actuary Symposium on November 13-14 in Boston. With the growing importance of the position of Investment Actuary, this is an opportune time to hold such a symposium. The symposium will focus on issues and matters impacting the work of the actuaries working in the finance, investment, and asset-liability management related areas.

Highlights will include:

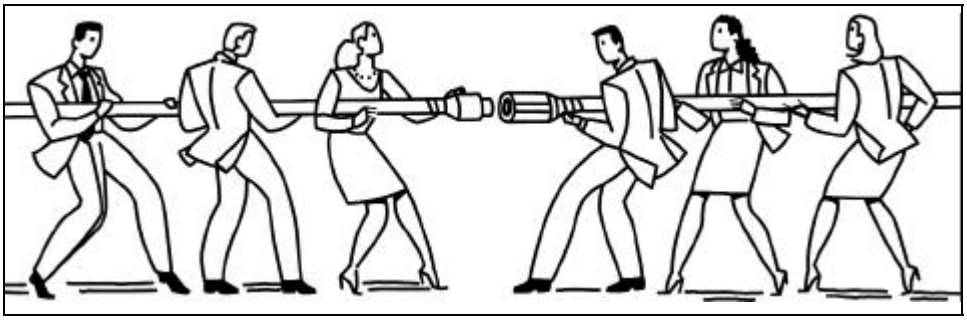
- General sessions focusing on the economic and market outlook
- Break-out sessions covering hot topics of the moment, including:
  - performance measurement
  - liquidity
  - option pricing
  - how to develop an investment strategy

The symposium will be 1.5 days long: November 13 (full-day) and November 14 (half-day). Tentative planning is being done for a special "piggy-back" seminar on Unified Valuation System (UVS), beginning in the afternoon of November 14, going into November 15. So, mark your calendars now, and we look forward to seeing you at what promises to be a very exciting symposium!

"Let's Meet — Does a Year From Monday Work For You?"

by Peter D. Tilley

Have you ever attended a Society meeting and wondered: 1) Why there were no sessions on the hot new investment topic that hit the news last month? 2) Why the speakers at the sessions weren't all listed in the program the SOA mailed you with the registration materials? 3) Why there always seem to be speaker changes at the last minute?



I used to wonder about these questions myself until I became a member of the Investment Council back in 1998 and was immediately given the responsibility of representing the Council on the 1999 Spring Meeting planning committee. I'm currently filling the same role for this year's annual meeting in Chicago.

The Chicago meeting takes place this October. The first meeting of the planning committee took place last December, when we were all still humming Tony Bennett tunes from the San Francisco 50th Anniversary meeting only six weeks earlier. The Investment Council was required to develop 10 sessions with full descriptions by February 9 still more than 10 months away from the meeting. I guess this answers the first question above and also explains why we sometimes see sessions titled "Current Hot Topics" without much detail in the description.

The SOA meeting staff pulled all of the session descriptions together for the next planning committee meeting in February. All of the wording was subject to SOA guidelines and went through a peer review at this meeting. This gives the program brochure a consistent overall look and feel. After a day of peer review, we have all learned to say, "the panel discusses…" rather than "the panel will discuss…" or "the panelists talk about…."

Now for the printing deadlines. To get the registration materials and the meeting brochures to you in time for you to make your travel plans, all of the information on the session moderators and speakers had to be in to the SOA by April 7, still more than six months away from the meeting. This answers the second question above, because as hard as your Council members try, it can be challenging to line up the best speakers possible that far in advance. For the Chicago meeting, most of the Investment sessions were fully recruited by the print deadline. For the rest of our sessions, you'll just have to trust us to fill out the panels with great speakers between now and October. The SOA Web site can give you up-to-date information on the speakers for each session. Our next deadline, August 3, is to have the speakers listed in the on-site program that you'll receive when you check in at the meeting in October. That answers the third question.

Another deadline that affects your full enjoyment of each session is the speakers' deadline for submitting handouts to the SOA. For legal reasons, the SOA must pre-approve all handouts. Each speaker must submit his or her handouts to the SOA by September 15, more than a month before the meeting. I know that I appreciate a session more when handouts are available, so I have now come to appreciate the speakers' advance efforts even more.

The Council exists to serve the Investment Section membership. We are always looking for ideas for meeting sessions and seminar topics, and any of us would welcome your input for the 2001 planning, but be sure to give us lots of lead time!

"The SOA meeting staff pulled all of the session descriptions together for the next planning committee meeting in February. All of the wording was subject to SOA guidelines and went through a consistent overall look and feel."

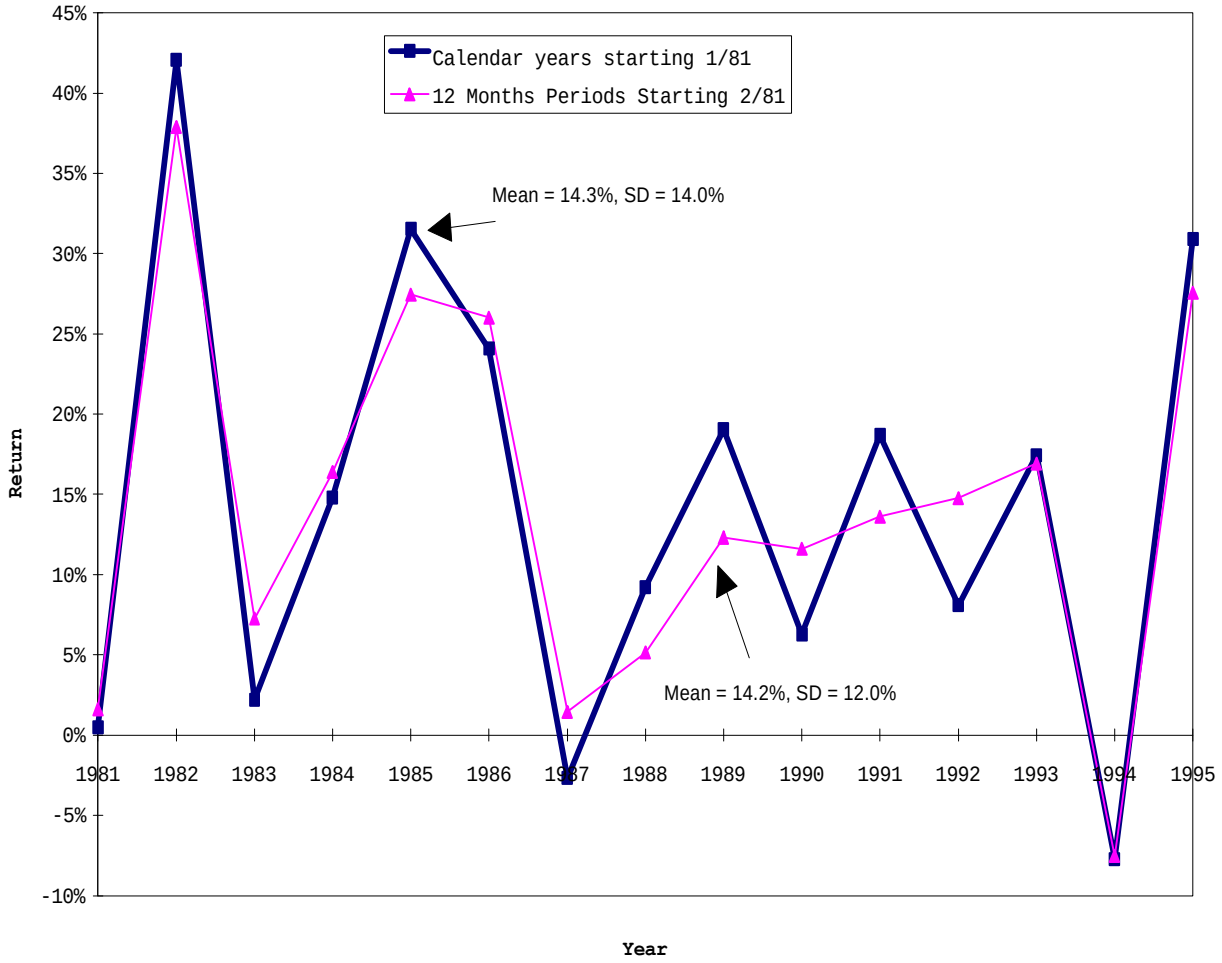
Peter D. Tilley, FSA, MAAA, is vice president of Asset & Liability Management at Great-West Life & Annuity Insurance Company in Englewood, CO, and vice-chairperson of the Investment Section Council. He can be reached at pdt@gwl.com.

Time Track: Analyzing Historical Asset Returns

by Richard Q. Wendt

Is the standard deviation of Long Government Bonds 14% or 12%? A small difference in the measurement period can make a major difference in the calculated standard deviation. For example, for the 15 calendar years ending December 1995, the standard deviation of bond returns is 14%, while shifting the time periods forward by one month yields a standard deviation of 12%. Figure 1 shows the historical results for the two periods:

Figure 1 **Comparison of Historical Returns**
Long Government Bonds



Traditional analysis of historical results has focused on the calendar year results, calculated over a small number of time horizons. For instance, the standard deviation over the last 10, 25 and 50 calendar years is typically presented. Closer analysis of the data shows that the calendar year view is extremely limiting. Some analysts look to “pure” monthly data for information on standard deviations and correlations; unfortunately, the monthly data approach is not effective for time series with significant serial correlation.

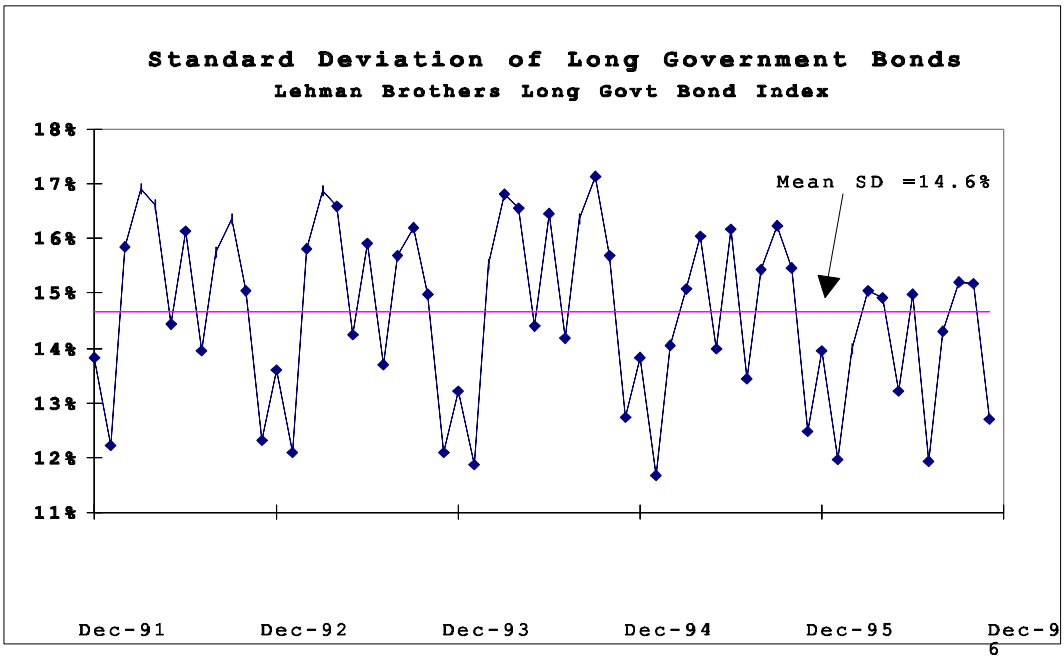
This paper proposes a more detailed analysis of history — the Time Track approach — rolling 12-month periods instead of calendar years. The inclusion of all monthly data provides 12 times as many observations and provides a track of trends in the statistics. Applying this analysis to standard deviation, correlation and risk premium clarifies the interpretation of historical data.

Description of the Time Track Methodology

The basic approach is to slice monthly return and inflation data into rolling periods of 12 months and calculate year over year returns for each period. Periods starting in January would obviously be a calendar year; however, we also include periods starting in February, March, etc. Once the "annual" returns are calculated, we use a 15-year horizon for calculation of the statistics.

Although there is substantial overlap in the time periods (179/180 months are identical), the "slicing" process injects considerable variation into the statistics. For example, for the 60 periods ending between December 1991 and November 1996, the average standard deviation is 14.7%, but the values range between 11.7% and 17.1%. The "standard deviation of the standard deviation" is 1.6%. Figure 2 highlights this period:

Figure 2



Note that the traditional analysis of referencing the standard deviations for periods ending in December would give a standard deviation about one percentage point below the average standard deviation of all the periods. (Astute readers may notice that monthly patterns appear in the chart. This is apparently due to outlier results that persist for 15 years.)

(continued on page 18)

Time Track...Analyzing Historical Asset Returns

continued from page 17

A second type of traditional analysis is to look at the standard deviation of monthly returns. For this analysis, the convention is to convert the monthly standard deviations to annualized standard deviations by assuming independent distributions and multiplying by the square root of 12. However, if there is substantial serial correlation between months, then the annualized monthly standard deviation will be quite different from the annual standard deviation. (As stated in Ibbotson, the annualizing formula assumes that there is no monthly autocorrelation. *Stocks, Bonds, Bills and Inflation 1997 Yearbook*. (Ibbotson Associates: Chicago, 1997, p 106.) Figure 3a compares the annualized monthly standard deviation to the annual standard deviation for Long Government Bonds:

Figure 3a

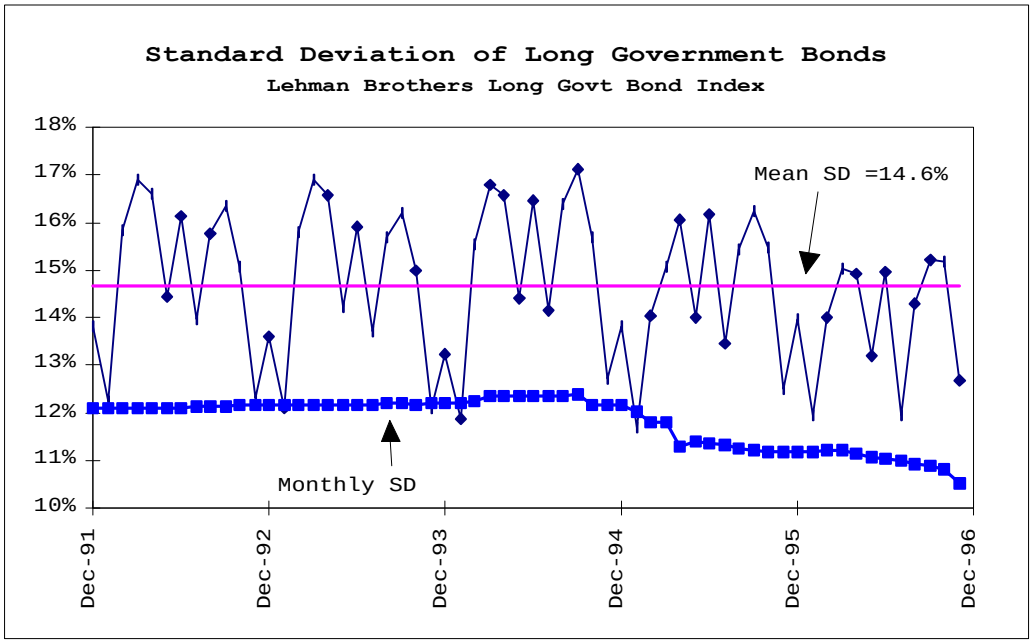
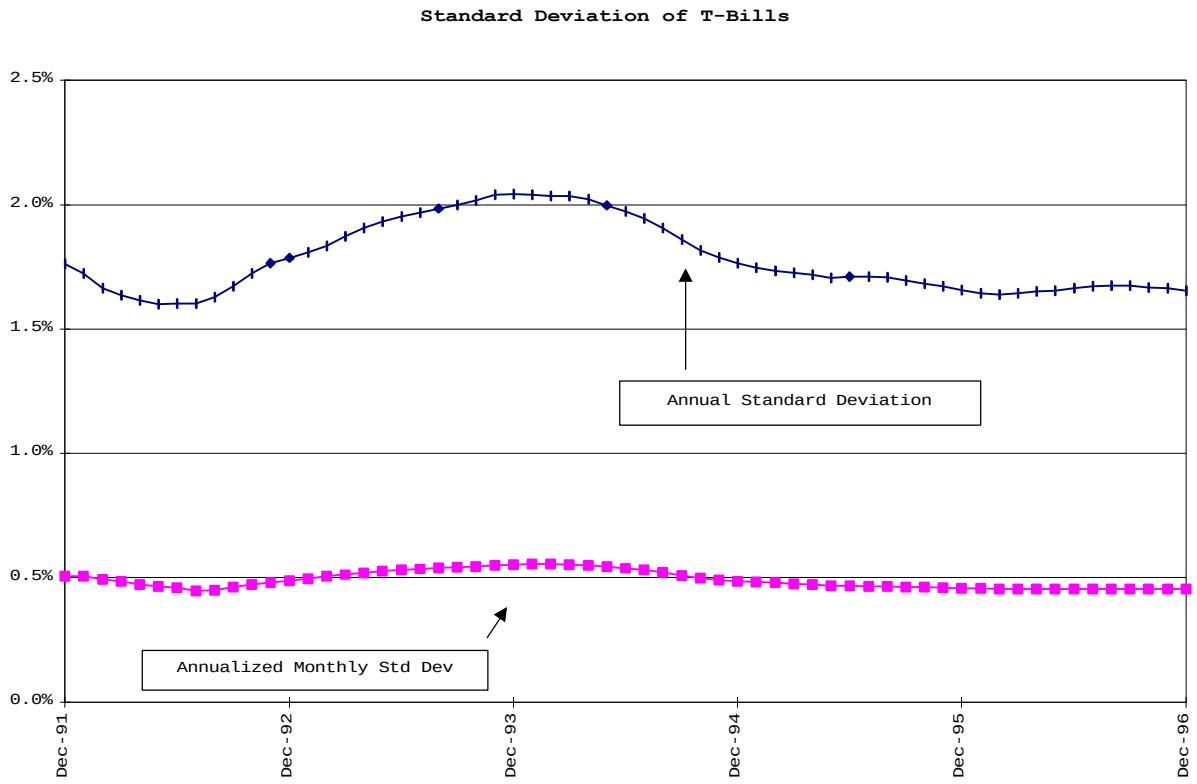


Figure 3b illustrates the difference between the annualized monthly standard deviation and the true annual standard deviations for Treasury Bills. Since the serial correlation in monthly T-Bill returns is extremely high, the annualized monthly statistic is significantly lower than the annual standard deviation.

Figure 3b



Changes Over Time

By extending the analysis to include longer time periods, we are able to see significant trends in standard deviations and other statistics. The moving average of standard deviations for the last 60 periods provides a reliable indication of the trend. Figure 4 shows standard deviations for Long Government Bonds for returns starting in 1926.

(continued on page 20)

Time Track...Analyzing Historical Asset Returns

continued from page 19

Figure 4

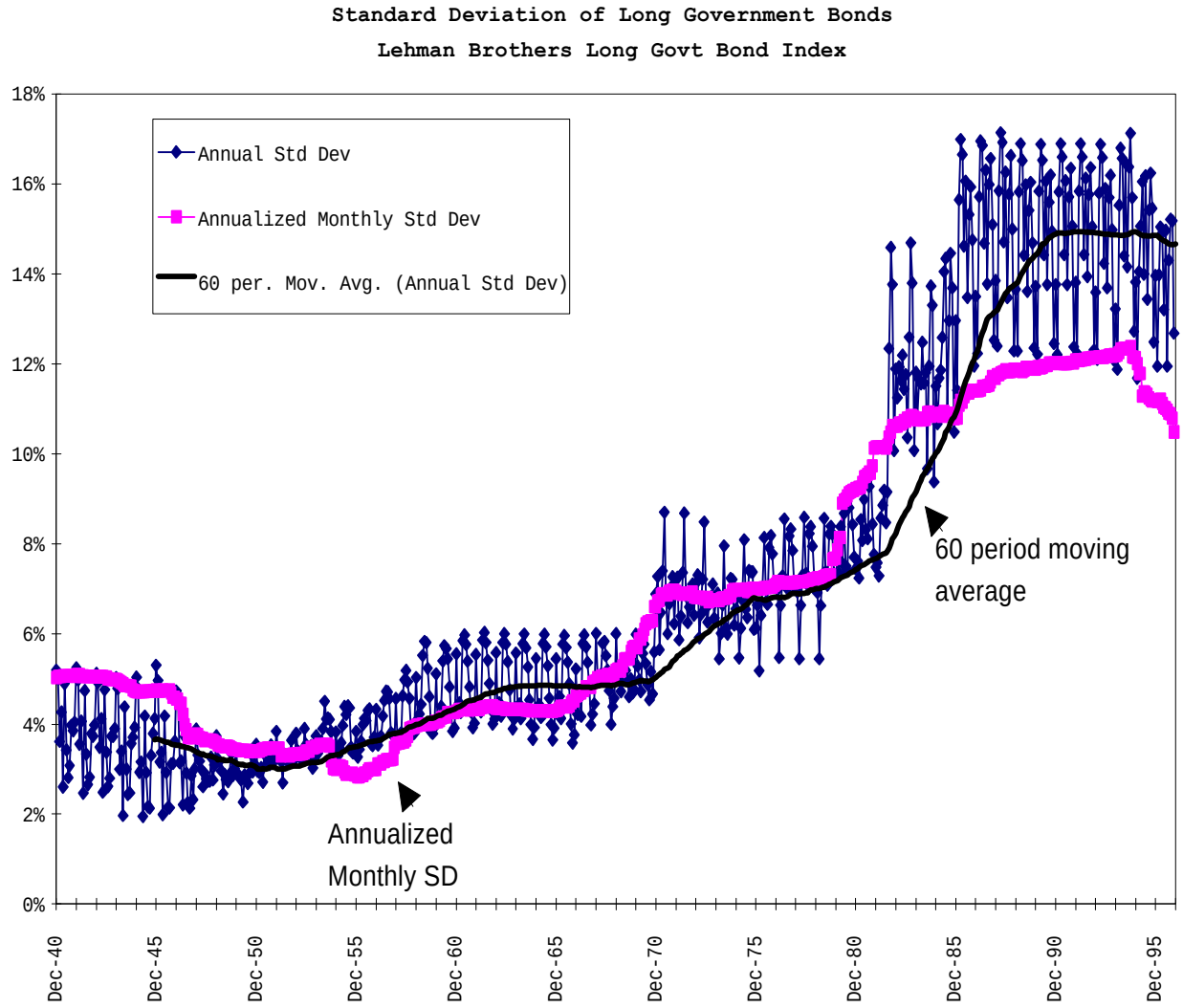


Figure 4 shows dramatic changes in the standard deviation of Long T-Bonds over the last 70 years. From 1926 to about 1960, the annual standard deviation was below 4%. Starting in 1960, the volatility increased, hitting 10% by 1985 and 15% by 1990. The standard deviation has leveled off to the 15% neighborhood for the 90s.

Summary

This article uses the Time Track methodology to analyze historical statistics. This method is superior to either pure calendar year data or annualized monthly data. For time series with substantial serial correlation, such as inflation and T-Bill yields, Time Track overcomes the limitations of the annualization formula. For all asset classes, Time Track provides a better indication of temporal patterns than alternative measures.

Richard Q. Wendt, FSA, CFA, is a principal at Towers Perrin in Philadelphia, PA. He is also the chief editor of this issue. He can be reached at wendtd@towers.com.

Investment Section Sponsors Seminar

by Max J. Rudolph

For an actuary working in the financial risk management field there is no bigger issue than communication of results. Face time with senior management is limited, whether you are an internal or external risk manager. It must be used wisely to show the value added by the work that is completed. It was in this context that the "Investment Communication in Risk Management for Life/Annuity Insurers" seminar was held in early June.

A strong panel was assembled by Section Council member Rick Jackson, FSA, CFA, MAAA. Except for the binders showing up in Boston at the GAAP seminar by mistake (they arrived in Tucson for the second day), the seminar went off without a hitch. Breakout sessions were included and were favorably received as a chance to ask questions in a smaller setting and do some networking as well. About 10 attendees stayed for a visit to Kartchner Caverns following the seminar for additional networking.

Leading off the seminar was John L. Maginn, CFA, who recently retired as chief investment officer of the Mutual of Omaha Companies and is past president of the Association for Investment Management and Research (AIMR). John discussed the investing environment as it has pertained to life and annuity insurers over his career and suggested ways that asset and liability specialists can work together to manage balance sheet risk. He went on to identify the key risk management players and develop a context of what, when, and to whom communication of results should occur.

Tony Dardis, ASA, MAAA, a consultant in the Dallas office of Tillinghast-Towers Perrin, reported on the current status of the SOA-sponsored Risk Report Survey. While results of the survey will be presented at the Annual SOA Meeting in Chicago this fall, Tony facilitated an interactive session to discuss the specific topics. While much has been done, and more research is being completed all the time, the consensus was that the key is to create reports that produce actionable items. In other words, the report gives you information, but what action should be taken as a result of that information? Risk reports must go beyond gathering information to help a company manage its risks.

Alton Cogert, CFA, CPA, with Strategic Asset Alliance, covered how to communicate investment results. His directive, focusing on benchmarks and creating understandable reports for senior management, is that you should be able to boil your message down to one page. He also discussed some asset-related issues that actuaries need to be aware of to understand balance sheet risk.

The seminar's second day focused on applications. Tony Dardis started off with some fixed annuity examples and discussed an appraisal situation that he had been involved with. Scudder Insurance Asset Management's Rick Jackson then shared some real life examples that he had seen, focusing on graphical presentation of sensitivity results. As a consultant, he stressed the need to understand the criteria that management will use to make decisions. If management is used to seeing cash flow testing results, for example, it is helpful to use that format to show results from alternative investment strategies.

Attacking the topic from an international perspective was Ken Mungan, FSA, MAAA, an ALM consultant in the Chicago office of Milliman & Robertson. He discussed the benefits of diversification across borders and some of the pitfalls awaiting the unsuspecting. Ken also shared a case study focusing on the acquisition process using a hypothetical Japanese company as the target firm.

The seminar was very well received. Although it was not taped, binders containing all of the handouts can be purchased from the SOA through *www.soa.org*.

Max J. Rudolph, FSA, CFA, is first vice president and actuary at Mutual/United of Omaha Insurance Company in Omaha, NE. He can be reached at max.rudolp@mutualofomaha.com.

1999 Investment Section Record Sessions on the Web as of July 2000

Atlanta Spring Meeting, May 1999

21PD Performance Management (and Anxiety!)

Panelists discuss the measurement of financial performance in life insurance companies today. Topics include the relative merits of GAAP, economic value-added, balanced scorecard and other methods. Benchmarking of investments performance is also discussed.

24PD Balancing Risks

What is the approximate mix of financial risks? Should a company take more credit risk versus interest rate risk? How should a company manage the uncertainty of policyholder behavior? Panelists discuss a comprehensive risk management approach to quantify the risk exposure from various risk contributors.

25PD Investment Manager Searches for Insurance Companies

Panelists discuss the process of selecting outside investment managers, developing requests for proposals, formulating the list of potential managers or consultants, and evaluating the proposals and comparing performance.

35PD Translating Bond Default Experience Studies into a Pricing Deduction

The panel discusses methods used in recent industry-wide bond default studies for public and private bonds to develop risk deductions for product pricing.

37CS Year 2000 and Beyond: SOA New Course 7 Applied Modeling Demonstration

Note: this session was repeated at Session 83CS at the Seattle Spring Meeting, June 1999

This session is a preview of an actual Course 7. Common actuarial models are covered and attendees participated in a demonstration of a case study with hands-on experience in looking at a problem, discussed various possible models, and analyzed the results.

61PD Insurance Company Failures of the Early 1990s — Have We Learned Anything?

The panel looks back at the failure of three major North American life insurance companies in the 1990s, the settlements of these insolvencies and how policyholders fared. They also discuss the impact of future insolvencies and tries to assess the likelihood of a major failure in the future.

73PD Does Anyone Here Speak Greek? Hedging Your Equity-Indexed Products

Equity-indexed products require an asset strategy that matches the equity options embedded in the liability. The panelists discusses two asset strategies: purchasing equity options that match the liability options and dynamic hedging using the mathematics of "The Greeks" and the accounting issues with these strategies.

75CS Cash-Flow Testing Issues for Equity-Indexed and Variable Products

The valuation actuary faces challenges when performing cash-flow testing on equity-indexed and variable products. Panelists discuss solutions and sources of information.

76CS Model Risk

The results of models are only as good as the assumptions and inputs. Do the commonly used generators develop an appropriate distribution of possible outcomes? The presenters demonstrate the potential risks of relying blindly on our models without sensitivity testing.

1999 Investment Section Record Sessions on the Web as of July 2000

Atlanta Spring Meeting, May 1999 (continued)

87PD Convertible Bonds: A Valuable Asset Class Ignored by the Insurance Industry
Panelists discuss the value of convertible bonds as an asset class for insurance companies, including different kinds, their historical performance, and the role in a company portfolio.

88PD Bells and Whistles or Time Bombs: The Cost of Longer-Term Guarantees
For decades, insurance companies have sold products with features that seemed minor at the time. With interest rates reaching all-time lows and continuing mortality improvements, have these features moved up to the major leagues? The panel discusses the risk of some of these guarantees and the potential costs.

90PD Guarantees on Variable Products: How Are Companies Assessing the Risks?
There has been a proliferation of guarantees on variable annuities and competing investment products. Companies have moved away from stochastic modeling to capital market pricing approaches to estimate costs of these benefits. The panel of experts identify the various risks associated with these guarantees, discuss different pricing methodologies, and forecast the next wave of guarantee designs.

San Franciso Annual Meeting, October 1999

4PD Fair-Value Reporting — Is There a "Fairer" Way?
The panelists reviewed emerging proposals for reporting liabilities at "fair value." Some of the topics covered included the measure and objectives of fair-value reporting, the implication for the income statement and balance sheet, the alternatives to fair-value reporting such as embedded value and the impact on asset/liability management.

35PD Equity-Linked Notes — What's New?
The panel discussion included recent developments in the equity-linked note marketing, including new structures that allow active management, trade-offs affecting participation rates, accounting issues, tax issues, and risk-based capital issues.

36PD The New European Union
The introduction of the Euro dollar in 1999 and new economic relationships in Europe present new challenges and opportunities for American insurance and financial institutions.The panelists consider investment challenges in the new European Empire, impacts on the insurance and pension markets, increased competition from European companies, and hedging with the new currency.

12PD A Retrospective on 50 Years of Advances in Theory and Practice of Finance
The past half century's advances in finance are discussed, including immunization and hedging theory, modern portfolio theory, capital asset pricing model, option-pricing theory and term structure of interest rates models.

475 North Martingale Road, Suite #800
Schaumburg, IL 60173-2226
(847) 706-3500
Website: *www.soa.org*