It's Different This Time

by Nino Boezio

In the last few years we've heard that the old rules and paradigms of invest-ment strategy and caution may no longer be applicable in today's finan-cial environment, because things were "different this time." Some of the argu-ments included:

- Inflation is now subdued through global competition, which has kept labor market demands and product/commodity prices low.

- New production techniques such as just-in-time-inventory management have reduced the overall required amount and thus cost of capital.

- The globalization of the world economies has produced an environment in which poor economies can be supported by strong economies through floating exchange rates, thus improving overall trade. Globalization has also resulted in intense competition, resulting in lower product prices and lower inflation.

- World peace has promoted economic stability, facilitated by the fact that there is only one military superpower left (the U.S.).

- Capitalism is the undisputed best economic guiding force in financial affairs.

The Objective (Function) of Asset/Liability Management

by David N. Becker

Two paradigms have been identified for use in asset/liability management. These two paradigms differ in the choice of objective function and the framework for analysis; that is, one is a simulation of the firm as an external observer (for example, shareholder) would view it and the other is a "still life" at a given moment from an internal viewpoint. These two perspectives, clearly, are very different. It is useful and important for the user to understand exactly what each measures in order to apply it meaningfully. The two paradigms are referenced as "OAVDE analysis" and "market-value analysis" or "fair-value analysis."

OAVDE Analysis

Let the company be a U.S. stock life insurance company. If the discussion is referencing a block of business, let the block be part of a U.S. stock life insurance company.

Be careful to distinguish between the viewpoint of the company, that is, internal view of the company, and the viewpoint of the shareholder of the company, which is external. The shareholder view is the only one that matters for this discussion.

"Cash" to the shareholder means free cash flows, that is, amounts of money that are available to be paid as shareholder dividends or used to fund new business. Cash that is received by the company (internally) but isn't *free* as described above (for any reason whatsoever) isn't "cash" from the shareholders' point of view. While free cash flows are "pretax" to the shareholder, the free cash flows are after income taxes and capital gains taxes have been paid at the company level.

From finance theory the intrinsic value (or fair value) of a security is the risk-adjusted present value of the security's free cash flows (Copeland and Weston).

Recall from finance theory (Copeland and Weston) that a dollar of shareholder dividend is equivalent to that dollar withheld and reinvested in new business if the new business earns the cost of capital of the company. So there is no loss of generality in assuming all free cash flows are paid as shareholder dividends. Price appreciation of a security derives from anticipation of higher future dividends from internal reinvestment of free cash flows

In This Issue

Downside Risk on Your TV Screen

Richard Q. Wendt

Now that we've gotten past the season of football playoffs, bowl games, and the Super Bowl, I'm reminded that football contains excellent examples of downside risk. While some analysts may dismiss downside risk as purely an "ivory tower" exercise, it does have very practical application in the real world.

Assume that you are the statistical consultant for the Schaumburg Actuaries (my apologies to non-football fans for the statistical analysis and to football fans for creating such a team name), and your computerized database shows the statistics in the table to the right. Based on that data, a statistician (not an actuary, of course) might advise the use of short passes, because that strategy has the highest expected result per play. In real life, we know that teams use a variety of plays, depending on the down and distance and game situation and a number

	Average Gain for Running or Completed Pass	Percentage of Pass Completions	Average Gain per Pass Attempts or Runs
Quarterback sneak	1	N/A	1
Running play	3.5	N/A	3.5
Short pass	8	75	6
Long pass	15	33	5
"Hail Mary"	75	5	4

of other factors.

But when it's fourth down and a yard to go for a first down and the coach decides to try for the first down, a very common strategy is the quarterback sneak, even though it has a lower expected result than the other strategies. Why does that make sense? Well, it's downside risk raising its head; the quarterback sneak has the highest probability of achieving the immediate goal, a first down. It doesn't get you much further down the field, but it is effective for its purpose.

Similarly at the end of the game, with Schaumburg 90 yards away from the goal line and time running out, a common strategy is the "Hail Mary" option—a very, very long pass, with a low probability of success. If the expected result is only a four-yard gain, how can that strategy make sense? Once again, as you guessed, it's downside risk. The Hail Mary play has the highest probability of getting the touchdown. Completing a short pass will fail to score a touchdown, because time will run out.

These two examples illustrate a simple axiom of downside risk: if the target is easy to attain (for example, one yard away), then a conservative strategy gives the best chance of success; if the target is difficult to attain (for example, 90 yards away), then the most aggressive and risky strategy gives the best chance of success.

So as you sit back and enjoy the Schaumburg Actuaries in the next Super Bowl, be sure to watch downside risk in action.

Richard Q. Wendt, FSA, is Principal at Towers Perrin in Philadelphia, Pennsylvania and Co-editor of Risks and Rewards.

Strategy for Investing Surplus

by David N. Ingram

Insurance companies, in general, have not placed particular focus on how their surplus is invested. The trend has been to allocate surplus into the product portfolios to the extent that there is a RBC or internal required surplus target for the product. Many companies have parents that make sure that there is little additional capital available. When there is additional surplus, it has generally been invested in one or more asset types not seen as appropriate for backing liabilities, such as equities or real estate.

The emphasis on increasing company surplus, which started with the high-profile company failures in the early 1990s and, for some companies, the shift to variable products, has led to the buildup of significant "excess capital" in some companies—hence the need to develop a strategy for investing surplus.

A surplus investment strategy for a company can be developed from these three principles:

- The surplus investment strategy should be based on the risk/return preferences of the client, just as with any other portfolio strategy decision. Here the client is some combination of management, the board, and shareholders.
- All surplus should be considered open to this process. While it is fundamental that a company has one or more asset pools equal to the liabilities, the attribution of surplus to products is a choice made to facilitate surplus management and financial reporting. Asset liability management and valuation actuary opinions deal with asset pools equal to liabilities. Required surplus invested in the portfolios is quite often invested very conservatively, reducing risk but not necessarily improving the risk/return profile of the company. Bringing the entire surplus investment strategy out of product lines and into corporate arena allows the company sufficient flexibility and bulk to have a significant impact on the risk/return profile of the company through the surplus investment strategy.
- The surplus investment strategy should be developed in the light of all company risks, especially all product risks. Product risks should be determined after the application of asset/liability management techniques to optimize each product's risk/return characteristics. Thus, surplus investment strategy can be developed so that it complements the product risks in a way that coincides with the risk/return preferences of the client. If the product risks emphasize interest rate risk, management can choose to avoid interest rate risk with surplus investments or to emphasize more interest rate risk if it particularly favors the return possibilities associated with those risks.

Other constraints that often seem to dominate this type of discussion have been deliberately left out at this point. They include statutory investment restrictions, RBC constraints, and rating agency leanings. It will be a useful exercise to see where a unfettered analysis of what should be done to maximize returns for the level of risk acceptable by the company would lead. The results can then be modified to conform with the other constraints if necessary.

Inherent in this process is the need to systematically quantify the various risks. Two general processes come to mind. The first I will call "Asset Substitution." In the asset-substitution process, each asset/liability portfolio would be modeled as one entity. A set of typical investments would then be developed to replicate the profit and loss streams expected from the asset/liability portfolios. That is, the substituted asset portfolio, if held directly, would produce very similar results in terms of profits and losses to the company. The process of formulating surplus investment strategy would then proceed as any other portfolio strategy discussion. This approach has particular appeal if the ultimate decision making is to be done by the chief investment officer, because it puts everything in terms that are most familiar to an investment professional.

Putting together the substitute assets is a revealing process in several ways.

First, the combination of investments needed to replicate the risk return characteristics of the products may provide interesting insights to the risks of each product. Second, the magnitude of the portfolios may be very surprising. A company with billions of liabilities and millions of surplus may not think that the surplus investment decision is an extremely important one and may find that substitute assets are of a fairly similar magnitude to the surplus of the company, making the surplus investment decision just as important as product pricing and profitability decisions.

For example, consider a variable annuity portfolio of $10 billion. The product has a gross margin of 125 basis points and annual expenses of $100 million, including amortization of DAC. The expenses could be replaced by debt of $1.25 billion with an 8% interest cost.

> ***"Inherent in this process is the need to systematically quantify the various risks."***

In the short term, the gross margin could be replaced by an HTM [1] bond of $1.5625 billion at 8% and a stock portfolio of $125 million. (During the next year, the company will collect 1.25% on the $10 billion of account values plus 1.25% of the gain or loss in the account values. You can think of this as a guaranteed revenue of $125 million, hence the $1.5625 billion bond, and a stock portfolio equal to 1.25% of the account values.) If you believe that the terms and characteristics of the debt representing the expenses and the bond representing the base revenue are essentially the same, they can be offset producing a substitute asset portfolio of a $312.5 million HTM bond and a $125 million stock portfolio. Quite a difference from $10 billion of stock market-based liabilities.

Strategy for Investing Surplus

There are at least two additional considerations for this product. If you are looking at a longer time frame than one year, the stock market returns compound and therefore the substitute stock portfolio grows. This could be dealt with by using a substitute stock asset that mimics the average equity exposure over your time horizon or by using a more complicated series of investments. The second additional consideration is the expected impact of a stock market downturn on surrenders. If you believe that poor stock market results will lead to increased surrenders, the allocation between the HTM bond and the stock portfolio needs to be adjusted in favor of the stocks. The amount of the adjustment depends on how sensitive you think that surrenders will be to stock performance.

Similar thinking can be applied to most products to produce substitute assets. An SPDA portfolio, with its short straddle characteristics, would be modeled by some combination of bonds in a trading portfolio and interest rate options which would lose money when rates fell. C-2 risks could be substituted by commodities futures where there is a possibility of constant statistical fluctuations and rare disasters.

Once the substitute portfolio is constructed, the current surplus investments could be combined and the portfolio stress tested in various ways until the risk return characteristics can be made clear to the client. To the extent that the risk return profile of the combined substitute portfolio and surplus portfolio does not fit the desired risk return profile of the client, adjustments can be made in the surplus portfolio. If you try this type of calculation, you may

FIGURE 1
Product EAR

be surprised by how similar in size the substitute portfolio and the surplus portfolio can be. This shows the vital importance to company risk management of the investment strategy of the surplus portfolio.

The second method of quantifying the company's risk is to use a variation on the VAR (value at risk) idea. With VAR, day-traded assets are evaluated in terms of the negative tail of their distribution of possible values over a time period of several days. VAR is often defined as the loss experienced at the 95% confidence interval. All risks are brought together into the VAR calculation, necessitating a knowledge of the correlation between the risk factors that have an impact on the value. The September 1997 *The Actuary* contains an article on VAR by Harry H. Panjer and Harry S. Panjer.
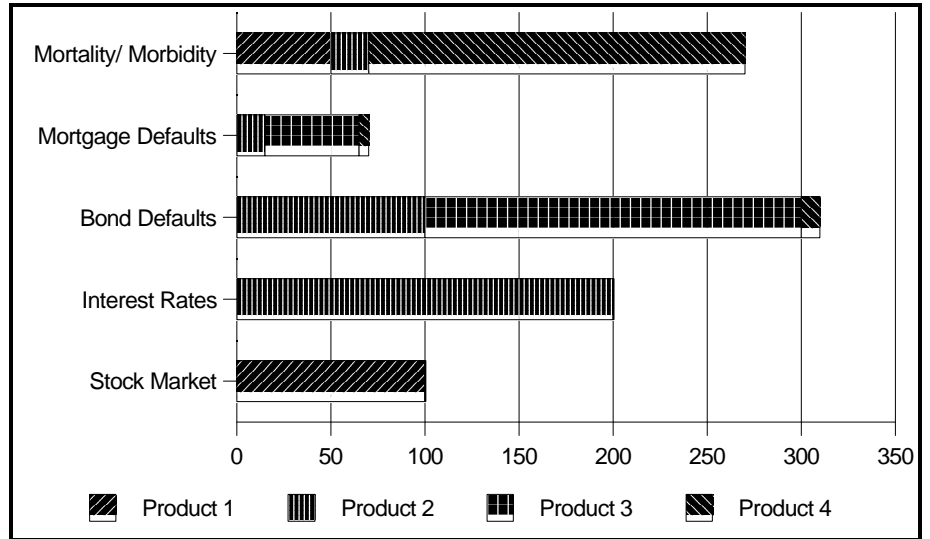
It is troublesome in several ways to apply the VAR concept "as is" to insurance company risks. First, most insurance company risks are not valued daily and cannot be unwound quickly. At many companies, "value" is not a concept that creeps often into management decision making. On the other hand, "earnings" are a hard reality that drive most corporate decisions. Therefore, I suggest the use of "earnings at risk" or EAR as our risk measure. The time period for measurement of EAR should be either quarter or year, whichever gets the most emphasis in the company. The confidence interval can be 95% or 99%. For the purpose of looking at surplus strategy, I also suggest that the risks be looked at separately. There is just not sufficient data to calculate accurate correlation coefficients among most of the risk factors of insurance companies. Then the problem of insufficient correlation data for some risks can be ignored. This may also lead to a better discussion of the results by focusing on each risk factor separately.

The person doing the EAR calculation can work

TABLE 1
Product EAR

	Average Earnings	Stock Market	Interest Rate	Bond Defaults	Mortgage Defaults	Mortality/ Morbidity
Product 1	75	100	0	0	0	50
Product 2	100	0	200	100	15	20
Product 3	125	0	0	200	50	0
Product 4	90	0	0	10	5	200
Surplus Bonds	10	0	50	25	–	–
Surplus Stocks	15	50	25	–	50	–
Surplus Mortgages	12	–	–	–	–	–

Strategy for Investing Surplus
continued from page 4

with the valuation actuary to determine the 95% worst scenario for each product portfolio for each risk factor. Often, this will mean looking at the scenario at the 5% tail of the distribution of scenarios. For instance, if rising interest rates cause losses, often a greater increase causes greater losses. Therefore, it may be possible to look at the rising interest rate scenario at the 5% tail of the distribution of interest rate scenarios and then calculate the loss for that scenario. Portfolio managers can also provide statistics of that type.

When the calculations are complete, they can be put into a chart similar to Table 1 on page 4. The table could be graphed (Figure 1) to better illustrate the relative magnitudes.

After looking at this figure, this company could want to emphasize either mortgages or stocks with its surplus

investments if it wants to complement its product risks.

There is a third way of dealing with this question that a few companies are using. In the style of banks, they are modeling their assets and liabilities completely separately and then looking at the risk-return profile of the resulting combination. For this process, there is no specific distinction made between assets backing liabilities and surplus. The strategy for investing surplus is therefore implicitly determined in a way that conforms with our three principles.

Finally, a comment on line-of-business reporting. The product required surplus and earnings thereon are included in determining earnings and equity of each line of business so that the ROE calculation for each product line is determined correctly to reflect current-year activity and the full impact of the product line on the entire enterprise.

Product line managers and actuaries may want to determine their own strategy for investing surplus. The product pricing may be based on a certain expected investment strategy and results from the investment of required surplus. In this case, the company may have to decide between optimizing the risk return profile of the entire company and the product line financial results.

END NOTE

1. HTM means "hold to maturity." It's an AICPA term for classifying bonds for marking them to market. HTM bonds do not have to be marked to market because the holder does not intend to take them to market.

David N. Ingram, FSA, a consulting actuary at Milliman & Robertson Inc., in New York, New York.

It's Different This Time
continued from page 1

- Demographic changes have promoted an excess of savings over spending.

- The expectations that any serious economic events, such as occurred in Mexico a few years ago and Asia lately, can be supported through bail-out packages through such organizations as the International Monetary Fund (IMF).

Unfortunately, human behavior has not changed. Greed can drive prices to excesses, and fear can drive prices to extreme lows. We have seen both sides of the spectrum in the past 12 months in the Asian economies and markets. And until recently, complacency artificially drove up asset prices all over the world, reducing expected returns and the so-called "risk premium." This lack of risk recognition was often referred to as liquidity, conjuring up the notion that investment activity was now safer—not that risk was just being unwisely assumed or underpriced (but there may have been simply no other place to park investment funds).

Why Things May Be Different This Time

Anyone who follows investment markets eventually realizes that the markets can never be fully understood. I often like to picture the stock market as a dragon looking for a way to kill its potential slayer. Markets find ways to deceive and trick even the most cunning and savvy professional. Now that central banks worldwide believe that they have gotten monetary policy under control and have beaten inflation, they begin to sense that they may have been fighting the last war. Deflation, which has never been directly fought and successfully beaten, may be a real possibility. It has crippled Japan in the 1990s; it is now killing the rest of Asia; and it battered the whole world in the 1920s. Some claim that only World War II saved the world from the ongoing depression.

Ironically, too much money to invest can lead to problems. As occurred in Japan in the late 1980s and the Far East in the early 1990s, if too much money is available to invest in projects, plants and factories (infrastructure), we could reach a point at which the

vigorous economic activity generates more product supply than product demand. Even if prices fall in order to stimulate demand (potentially causing deflation), the fall in prices may reach a point where it is no longer possible to pay back loans or provide a reasonable return on investment for shareholders and financiers. This will cause investment to dry up as return prospects diminish. Unfortunately, however, the strong yen policy supported by the U.S. and Japan over the past few years (a policy at least partly aimed at limiting the amount of Japanese trade surpluses incurred at the cost of the U.S.) has helped to exacerbate the problem.

As Japan has seen, lowering interest rates in the old Keynesian style to stimulate the economy does not solve the problem, as overcapacity can remain for a very long time (long-term nominal bond yields in Japan have been in the 1–2% range for quite some time). If Asia is able to export its goods and services to North America (and at cheap prices, helping to keep the U.S. rate of inflation and wage escalation rate low),

It's Different This Time

we may in turn find, as some are warning, that overcapacity may one day haunt North America as well. If this overcapacity ever arises, and the response is to lower product prices, then we may witness the new era of stock investment coming to an abrupt and perhaps nasty end, as gains in corporate earnings will change to losses. As past stock markets have declined partly due to the specter of higher interest rates, we may find, as was the fear this fall, that the next stock market decline will be under the backdrop of declining interest rates, and the realization that too much production and technology has more than adequately met consumer demand, hence beating the ability of corporations to generate increases in earnings.

The world is currently watching North America and particularly the U.S. quite closely. It may actually be good news if inflation in the U.S. comes back. It will perhaps signal that Asian deflation has not been exported to the Western economies. It will also enable central banks and governments to follow the old paradigms of monetary and fiscal policy. However, there is still a danger—if the recently strong demand of the U.S. and U.K. is eventually checked by central bank intervention (or lack of easing thereof) to keep economic growth controlled, this may inadvertently cause supply to overtake demand, allowing these economies to be more vulnerable to deflationary pressures. European recovery may be the deciding factor.

If inflation does not increase, however, and we find that imports, cheap goods, price pressure, and overcapacity are becoming a worldwide problem, then brace yourself for corporate

earnings declines, major stock market declines, and a dramatic downturn in economic activity worldwide. Democracy may also become a serious letdown for those former communist countries that have now embraced it. The former stability of communism may be preferred over any unpredictable chaos of capitalism.

The Threat to Pension Plans

If worldwide deflation becomes a reality, then pension plans will be seriously threatened on the investment side. Money purchase pension plans have had major appeal partly because of the belief that investment returns will be high enough to provide a large asset accumulation and hence can purchase a good pension benefit at retirement. But if equity returns stay depressed, as they have been in Japan for almost a decade, and fixed-income returns fall very low as interest rates are cut worldwide in order to stimulate economic growth (and this growth does not materialize), then the required investment returns and the resulting accumulated assets required to purchase a satisfactory retirement pension for most individuals will not be there. The long-term investment horizon argument used to justify investing in stocks may prove to be a much longer period than most people initially realized. A 15- to 25-year investment view may be too short for most individuals to accumulate the assets required to achieve an attractive retirement pension, and this will be of major importance to the baby boomers who may have started their investment program rather late.

Defined-benefit pension plans may then have renewed appeal because the pension benefit can be tied in some way to final salary, not investment returns.

However, the employer will still have the same problem of achieving sufficient investment returns to pay for the pension benefit; hence providing a pension for employees will still be an expensive proposition. The portability argument used against defined-benefit pension plans may no longer have teeth in a deflationary environment, as the accompanying slow economic growth will result in a significantly less mobile workforce.

The Dilemma

The next six to 18 months should be quite interesting to watch. Deflationary forces will not be clearly visible in North America until the second half of 1998. How the world's stock markets react and how central banks respond through interest rates will be worthy of note. The wrestling match between demand and supply during the next several quarters will certainly require many to take a front seat and watch the "fun" if more uncertainty and fear lead to further market gyrations. I suspect that demand will win out, but then again, do I need to acquire more than two cars and two TV sets in order to keep this economy going? And can the average Thai, Chinese, or South Korean afford their first one of each? There is still a great dichotomy of wealth, wants, and needs among the countries of this world. Those that can generate the demand to absorb excess supply can least afford it, and those that can afford it may not have any incentive to do so. Only time will tell the final result.

Nino Boezio, FSA, is a Principal at Matheis Associates Benefits Consultants, Inc., in Pickering, Ontario.

KWEL-*Project Web Site Announced*

K ortanek and Medvedev are pleased to announce a web site for the KWEL Project in the College of Business at the University of Iowa, Iowa City. The project focuses on the term structure of interest rates, the spot rate, and replications of thinly traded options.
The web address is: http://www.biz.uiowa.edu/kwel/kwel/

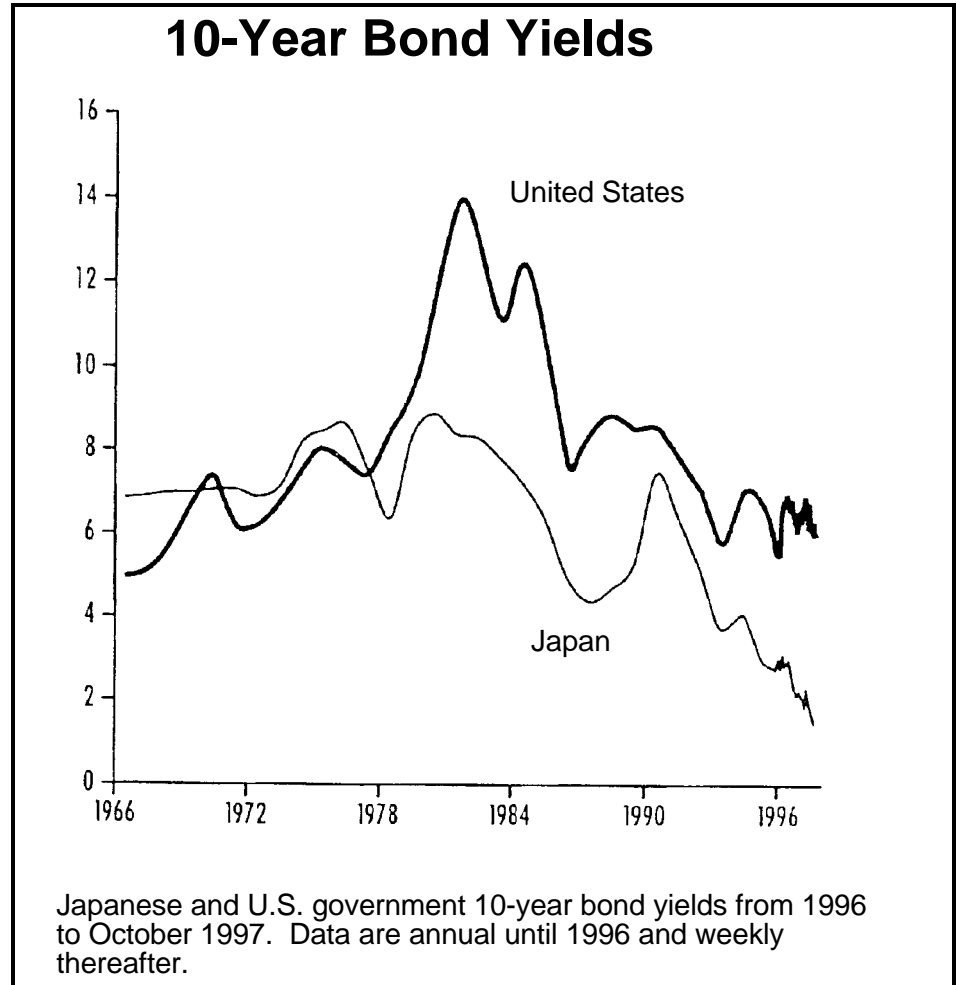# *Japanese Savers Yield to Low Returns on 10-Year Bonds*

by Christopher J. Neely

Editor's Note: *The following article originally appeared in the November 1997 issue of* International Economic Trends, *and is reprinted courtesy of the Federal Reserve Bank of St. Louis.*

❦ ❦ ❦

In October 1997, nominal yields on 10-year Japanese government bonds declined to a modern international record low of 1.605% per year. The yield on a bond on a given day is the average annual return on the bond if it is held from that day to its maturity. The *Financial Times* reports that these yields were the lowest yields on any long-term security since 17th-century Genoa [1]. The figure shows that the Japanese long-bond yield is now well below both its historical levels and the yield on a comparable U.S. government bond.

Why are yields so low? Long-term bond yields primarily reflect expectations of two factors: inflation and real economic activity. Lower expected inflation tends to reduce interest rates because borrowers need to compensate savers less for declines in purchasing power. After rising faster than 3% in 1990 and 1991, the Japanese CPI inflation rate fell to virtually zero in 1996. Lower expected output growth tends to lower interest rates by reducing investors' demand for credit. Real output was also relatively strong in 1990 and 1991 but has grown at only a 0.96% annual rate since January 1992. The current very low yields on 10-year Japanese bonds probably reflect expectations that these recent inflation and output trends will continue. In addition, the depressed state of the Japanese stock market and the heavy regulation of Japanese financial markets have contributed to low yields on long-term bonds by reducing the alternatives to savers who wish to seek a better return on long-term investments.

10-Year Bond Yields

Japanese and U.S. government 10-year bond yields from 1996 to October 1997. Data are annual until 1996 and weekly thereafter.

Still one might ask: Why have Japanese bond yields declined further to record lows only in the last few months? Several special factors explain this timing. First, the unanticipated magnitude of the contraction in output in the second quarter of 1997 (–11% at an annual rate) may have reduced projections of future growth. Second, the decline in the government deficit has led to decreased issuance of 10-year bonds, driving down yields. Finally, the prolonged stagnation of the Japanese economy may have made Japanese investors more willing to accept very low returns

on very safe investments like the 10-year bond.

It seems likely that, as the Japanese economy recovers and the financial sector is deregulated, yields on 10-year bonds will again rise. Returns to investment rise with the level of economic activity, and deregulation will permit Japanese savers other options for their investment decisions.

END NOTE

1. The *Financial Times,* August 22, 1997, "Japan's Stormy Weather," by Gillian Tett.

The Objective

in projects earning the cost of capital. Thus price appreciation is already reflected in the "cash only" stream of free cash flows.

It is a *fact* that in the U.S., some state regulations specify that a stock life insurance company may not pay a shareholder dividend greater than its statutory net income (SNI). Regulations also mandate various liabilities (policy reserves, deficiency reserves, interest maintenance reserves, asset valuation reserves) and a minimum level of required surplus, for example, risk-based capital (RBC) at the company action level. These regulations affect the amount of capital employed to support the company or block on which a return must be earned.

Prudent management, however, may decide to hold a higher level of RBC; for example, a scientifically determined RBC formula based on a statistical confidence level acceptable to management may

> *"It is a fact that in the U.S., some state regulations specify that a stock life insurance company may not pay a shareholder dividend greater than its statutory net income (SNI).*

indicate a higher level of RBC than the company action level. Additionally, the RBC target may be dictated by the desire to maintain a given NAIC RBC percentage, a given Best's rating, S&P rating, Moody's rating, or Duff & Phelps rating. However determined, the choice of the RBC level to be maintained is decided by prudent management.

Combining the regulatory constraint on shareholder dividends with a prudent RBC level results in a formula for free cash flows (FCF) for period *t* for a block of business in a U.S. stock life insurance company. This is:

$$FCF_t = \ SNI_t - \Delta_t \ (RBC).$$

The term *distributable earnings* is used to describe these free cash flows.

If a complete financial model of the block, that is, liabilities, supporting assets, statutory accounting rules and federal income tax requirements, policyholder behavior, borrower behavior, competitor behavior and company management behavior (interest

crediting rate policy, other nonguaranteed element policy, reinvestment and disinvestment) is built, then this model coupled with a scenario of future yield curves allows one to project the distributable earnings that would emerge each period into the future for the block of business managed as prescribed. The present value of the periodic distributable earnings is referred to as the *discounted distributable earnings* for that scenario. If scenarios are generated in a stochastic manner with each scenario assigned a probability, then the probability weighted arithmetic average of the discounted distributable earnings by scenario is called the *option-adjusted value of distributable earnings* (OAVDE). OAVDE is the objective function to optimize.

OAVDE represents the intrinsic value or fair value of the "security" (block of business and supporting assets) whose free cash flows are the shareholder dividends that can be paid to the security's owner(s) after taking into account the exercise of embedded options in both the assets and liabilities over possible future interest rates.

It is important to note that this value is the result of a simulation of the overall management and resulting financial performance of the business into the future. It explicitly includes reinvestment and disinvestment decisions.

Is the limitation on free cash flows/distributable earnings imposed by regulation arbitrary? Yes. Is it real? Yes! Why? Because it does affect the availability of free cash flows to shareholders and it is the free cash flows to shareholders that determine the intrinsic or fair value of the security.

Does this have a legitimate meaning to a mutual company? Yes. The internal rate of return on distributable earnings represents the maximum growth rate of the mutual company that can be funded from internal sources.

How does this fit with regard to a publicly traded U.S. company that is a noninsurance company? In general, a publicly traded U.S. company is only affected by GAAP accounting. Under GAAP accounting it is possible for a company to have negative earnings, be

borrowing money, and still be able to pay a shareholder dividend. (It may or may not be prudent to do so.) It is not even required that the company still have positive surplus after the shareholder dividend is paid as long as there remains a positive balance of "paid in capital." Therefore, under GAAP there is only the most modest limitation on paying shareholder dividends. Management discretion is virtually unlimited.

What about an otherwise similar life insurance company in another jurisdiction, for example, Canada? In this situation management would have to develop an agreed-upon choice of objective function. Such objective function would have to reflect the cost of capital that supports the business, all internal cash flows (including taxes), any limitations that the jurisdiction places on the payment of shareholder dividends, and a prudent release of capital. If the limitations are as loose as in U.S. GAAP, then management would have to determine a prudent basis upon which shareholder dividends would be paid and couple it with a prudent risk-based capital requirement.

But doesn't this mean that the value of an otherwise similar Canadian stock life insurance company could be different from the U.S. stock life insurance company? Yes. Why? Because the timing of the free cash flows to the shareholders of each company could be different. Is timing that relevant to this issue? Absolutely. Besides the direct negative impact of higher capital requirements, consider the fact that if, due to timing implications of these requirements, funds in the U.S. company must be paid out later, then the investment income earned by those funds while held internally to the company will be taxed at the company level. Only the after-tax income, which has a lower return than the company's cost of capital as these funds are invested in typical fixed income and equity securities, is then available to be paid to shareholders in the future. So there are real differences due to timing; and these differences are further affected by taxes

The Objective

internally to the company. This is why timing differences, capital requirements, and taxes at the insurance company level have a significant impact on the intrinsic or fair value of the company.

The validity of this approach is confirmed by the methodologies that arose during the 1980s from the merger/acquisition market. (For example, see the candidate readings from the Association for Investment Management and Research for CFA Level I and Level II exams.) These methods attempt to model the relevant aspects of the business and create an objective function that represents what the company can actually pay to the owners. It is true that the leveraged buyout (LBO) specialists tend to take a very aggressive view of what can be paid out. The price the prospective owner will pay reflects the aggressiveness of the objective function for shareholder dividends.

The cash flows that are important are the cash flows to shareholders, not the cash flows that are internal to the company, which may or may not be payable to shareholders at the time the company receives them or at all. Free cash flows, that is, distributable earnings, are the basis for economic value.

Using OAVDE as the objective function enables management to analyze the company's risk/return profile from period to period, to assess if the increase in return compensates them for additional risk and to identify superior strategies, that is, how better to manage the business (reinvest, disinvest, credit interest, and so on), from the perspective of optimizing value for shareholders. OAVDE can also be the foundation for an option-adjusted economic value-added accounting system.

An issue sometimes raised is the choice of a discount rate for OAVDE analysis. Since OAVDE represents the fair value of the security the discount rate chosen should be equal to the investors' return requirement. This could be a specific hurdle rate. Another choice is the cost of capital for the company. (The life insurance industry has had a stable cost of capital for some time. There is research by Ernst & Young, McKinsey & Co., and so on, on this topic.) For an acquisition, different choices of hurdle rate provide information to the user about the upper bound on what should be paid in order to ensure the desired return.

A constant discount rate (cost of capital or hurdle rate) can be used. Alternatively, one can express the rate as a spread-to-Treasuries. One method for estimating the spread is to use the CAPM to uncover an equity risk premium. Multifactor models, for example, using such variables as price/earnings and price/book, can also be used. Expressing the return requirement in the form of a spread is preferable, because the use of a fixed rate can overstate or understate value depending on the interest rate paths.

When discounting the pathwise distributable earnings, one should use the classical discounting method only if there are no changes in algebraic sign in the distributable earnings. If there are, then the method developed in my paper "A Generalized Profits Released Model for the Measurement of Return on Investment for Life Insurance" [*Transactions*, Vol. XL (1988), Part I, pp. 61–114], should be used. The main result of this paper is really a theorem on capital budgeting. The paper uses the flat rate approach for presentation, but it is easily restated for the spread-to-Treasuries approach by substituting the risk free rate plus the spread in place of the flat rate. If this method is not used, then in certain cases the OAVDE value is overstated.

"Market Value Analysis" or "Fair Value Analysis"

The objective function under this approach is simply the "market" (that is, fair) value of existing assets (FVA) less the "market" (i.e., fair) value of existing liabilities (FVL) at the date of valuation. This is sometimes referred to as the "market value of surplus," "fair value of surplus" (FVS) or "economic surplus."

This objective function is a "pure-cash" definition and ignores any cost of capital. It represents cash from the internal view of the company, not the external or shareholder view of the company. This definition is pretax at the company level; that is, it does not reflect federal income taxes or taxes on realized capital gains and losses.

Similar to value-at-risk (VAR) measures, this objective function can be used to create a relative measure of risk, and it has limitations similar to those of VAR measures. But this objective function is not an adequate tool for determining risk/return profile (neither are VAR measures) or for identifying robust strategies for optimizing the value of the firm because it is an internal view of cash and not an external or shareholder view. Some problems with "fair value of liability" and its associated "fair value of surplus" are described below.

First, there are epistemological difficulties with the "fair value of liabilities." For fixed-income securities, option-pricing models are calibrated by using observable prices for known securities in the secondary market. This calibration is the spread-to-Treasuries that reproduces the market prices of the known securities. This spread can then

> *"Using OAVDE as the objective function enables management to analyze the company's risk/ return profile from period to period, to assess if the increase in return compensates them for additional risk and to identify superior strategies, ..."*

be used with the option-pricing model to estimate the fair value of an security whose market value is unobservable but have cash flow characteristics similar to that of the security whose market value is observable.

There does not exist, however, a secondary market for insurance liabilities in the same manner as for assets. (Note: the buying/selling of blocks of insurance among insurance companies is *not* a secondary market for liabilities in the same sense as for assets. Insurance companies buy the liabilities plus the supporting assets in exchange for the stream of distributable earnings that will emerge over time.) No market, then no market values. So no unambiguous

The Objective
continued from page 9

choice of spread. Therefore some arbitrary choice must be made.

The choices for spread include: zero spread; fixed positive spread; spread that reflects the debt rating and/or claims-paying ability/insurance financial strength rating of the company; option-adjusted spread of the supporting assets; and cost-of-funds spread, that is, the spread that discounts future liability cash flows to the initial net cash received at the inception of the block.

The above analysis indicates that FVL is a relative number at best. It can be used for period-to-period comparisons, but it doesn't have an absolute meaning. If the FVL is a relative number, then the option-adjusted duration of liabilities computed from it is also a relative number. The degree of relativity can be seen from considering the following example.

For a multibillion-dollar block of deferred annuities, the FVL was estimated by using option pricing

---

"FVL when applied to universal life can produce very small, zero or negative durations of liabilities."

---

techniques and applying different spreads from 0 to 250 basis points in 50-basis-point increments. This range of spreads reflects reasonable choices for spreads as identified above. The resulting FVLs were used to compute the duration of liabilities for the various choices of spread. The ratio of the longest resulting duration to the shortest was slightly over 7. This means, for example, if the shortest duration was 0.5, then the longest was 3.5! If one is managing interest rate risk by matching durations, then what value from 0.5 to 3.5 do you tell your investment professionals to use? Individuals using different choices for spread will invest differently, each believing that he/she is minimizing risk.

Second, what does matching durations have to do with optimizing the value to the shareholders? The answer is that it may or may not have anything to do with optimizing the value to shareholders. In my paper "The Value of the Firm: The Option Adjusted Value of Distributable Earnings" (in *The Fair Value of Insurance Liabilities*, edited by

I.T. Vanderhoof and E.I. Altman, published by Klewer Academic Publisher, Norwell, Mass. 1998), I presented an example of how the wrong decision would be made in hedging a SPDA by using *FVL* and *FVS* instead of OAVDE. The problem is that the objective function inherent in $FVS = FVA - FVL$ is the wrong objective function for measuring the value of a firm. Therefore, using *FVS* as the objective function would optimize the value of the firm only by chance and could suboptimize the value of the firm.

Third, *FVL/FVS* analysis is not a simulation. *FVS* is a "snapshot" at a moment in time, that is, $FVS = FVA - FVL$. *FVA* is a "time 0" number. It is not a simulation. The assets and liabilities are computed on a stand-alone basis; the interaction of the asset cash flows and liability cash flows is ignored. Therefore, one does not need to know the strategy for reinvesting or disinvesting in order to compute *FVS*. To determine the free cash flows of the company, one must know the entirety of how the block/company will be managed into the future.

A further limitation of *FVL/FVS* analysis not being a simulation is that it often leads to total reliance on some form of duration matching for investment strategy. In doing so, it fails to encompass the trade-off between risk and return, the costs of rebalancing and the fact that a simulation of future environments might uncover investment strategies more robust to ongoing changes in the economic environment. This occurs as duration matching reflects a single period frame of reference and not a multiperiod frame.

Fourth, *FVL/FVS* analysis is not robust with regard to products or product features. *FVL* seems to have theoretical problems when applied to pure risk products. For example, consider an ART policy with annual premiums adequate to compensate for benefits, acquisition costs, expenses, taxes, profit, etc. Under these circumstances $FVL < 0$. This is the result of treating future premiums as negative liability cash flows and suggests that the present value of renewal premiums should be considered as an asset.

FVL, when applied to universal life, can produce very small, zero or negative durations of liabilities. This issue makes it difficult to duration match assets and liabilities or even to explain why one would. The anomaly is often dismissed by stating that derivatives can have negative or small positive durations. That is not an explanation or justification.

FVL/FVS analysis has difficulties even when applied to investment-only products which have renewal premiums. Part of the ambiguity stems from the aforementioned issue of whether the renewal premiums are treated as reductions to liability cash flows or as asset cash flows. The very fact that this ambiguity exists suggests there is a fundamental problem.

If one assumes renewal premiums are reductions in liability outflows, then they are discounted at the liability spread. If renewal premiums are assumed to be asset cash flows, then at what spread should they be discounted? In the latter case an argument can be made that the spread should be zero because the premium flow is assumed with certainty to be received by the company (subject to policyholder behavior assumptions); after all, the liability outflows assume the premiums were made subject to the same policyholder behavior assumptions.

If the latter assumption is made, then a large part of the assets will be the present value of renewal premiums. In the early to middle years of such a product, the assets will be dominated by the renewal premium asset. If duration matching is used, then it might not be effective because the invested assets are the smaller part of the total assets whose duration will be most influenced by the renewal premium asset. If the renewal premium are offsets to liability outflows, then the duration of liabilities is reduced and problems similar to that for universal life or pure risk products occur. Again, duration matching becomes ambiguous.

The issue with renewal premiums may be reflective of the issue that

The Objective

FVL/FVS analysis is a "time 0" analysis. Renewal premiums, like reinvestment and disinvestment, are aspects of a total simulation.

It has been observed that *if* there were a true secondary market for liabilities, then market efficiency would force a convergence of the results of these two paradigms. But there is no true secondary market for liabilities, and it is highly uncertain that one would ever develop. (Please see Appendix C of the paper "The Value of the Firm: The Option Adjusted Value of Distributable Earnings" for a discussion on this.) Also, all the assumptions behind efficient markets would have to be reasonably true. It is instructive to carefully examine each of those assumptions for its validity for a secondary market, if one existed, and the impact on the convergence assertion between these two paradigms if each isn't valid. Such an examination shows the tenuousness of stretching the analogy between fixed-income securities and insurance liabilities too far.

It is unfortunate that these two paradigms have been referred to in the literature as the "actuarial appraisal method" (OAVDE) and the "option-pricing method" (FVL). Both of these methods can be implemented using option-pricing theory; they differ in the critical choice of objective function. This terminology confuses the real issue and introduces value-laden overtones.

This situation has even led to the attempt to embed the OAVDE approach within a market value context by expressing the discounted distributable earnings as the sum of the market value of required surplus, a tax-adjusted "market value of assets less liabilities" plus a tax adjustment. The more complete expressions of this approach have epistemological and mathematical difficulties. But putting aside these issues, there is the fact that the approach redefines the "market value of liabilities" to include the distributable earnings via a "cost of capital" variable, which redefinition is not consistent with the fair value of liabilities paradigm. The result, even if all the epistemological issues and mathematics could be successfully resolved, then becomes the assertion that the discounted distributable earnings equal the discounted distributable earnings. This may further obscure the issues.

In contrast, OAVDE focuses on external or free cash flows; thus it is a measure of the value of the firm enabling the assessment of risk *and* return and their trade-off. OAVDE analysis is a simulation, thus facilitating the identification of robust strategies. OAVDE analysis can be comprehensively and meaningfully applied to all products and all product features.

David N. Becker, FSA, is Vice President and Chief Actuary at Lincoln National Life Insurance Company in Fort Wayne, Indiana.

Call for Papers: "Risks in Investment Accumulation Products of Financial Institutions"

The creation and issuing of new forms of contract structure by financial institutions, containing various guarantees relating to the investment performance of some blocks of assets, raise many new challenges for management. The design of these new structures, which include "variable" and "indexed" products, was intended to insulate financial institutions from most market risks. However, embedded guarantees and product features may engender some form of residual risk. The guarantees provided are linked to interest rate returns and/or equity returns. The techniques for managing interest-sensitive liabilities require expansion to provide the basis for stronger management of these new complex products.

In light of the dramatic need to more thoroughly understand the risks in investment accumulation products, the Actuarial Foundation and Nationwide Financial Services are jointly sponsoring a call for papers. Submissions will be reviewed by a panel chaired by Irwin T. Vanderhoof, The Stern School of Business, New York University. The Actuarial Foundation intends to present the accepted papers at a public symposium and to publish in a symposium proceedings.

The deadline for submission of papers is September 1, 1998. The detailed call for papers can be downloaded from the Research section of The Foundation's web site (www.soa.org/foundation), or contact Joyce Lewis at The Actuarial Foundation for more information, phone 847–706–3535, fax 847–706–3599 e-mail jlewis@soa.org.

Inflation-Protected Securities—A Further Look

by Chris K. Madsen

It has been almost a year since the U.S. Treasury launched the first Treasury Inflation-Protected Securities (TIPS). This article offers a look into the mechanics of how TIPS have fared so far and how they may fare in the future.

In my article, "Inflation-Indexed Bonds—How Attractive Are They?" in the March 1997 issue of *Risks and Rewards,* I focused on the cash flow of TIPS and demonstrated that for a taxable "buy-and-hold" strategy, these securities did not necessarily offer the inflation protection that they advertise. This is because of the front-loading of taxes, while inflation-adjusted payments are deferred until TIPS maturity. I concluded that the issues would likely attract tax-exempt institutions or investors, as well as speculators, who want to speculate on price moves resulting from changes in inflationary expectations.

Bankers Trust [1] states a similar observation in the *Economics and Risk Focus* newsletter by R. McFall Lamm, Jr.:

> "TIPS are consequently disadvantaged because of taxation on 'phantom profits.' For this reason, they are appropriate only for tax-exempt funds, unless short-term trading is the goal."

The yield on TIPS relative to the yield on a conventional nominal bond can be described by the following relationship:

Nominal Bond Yield = TIPS Yield
    + Expected Inflation
    + Inflation Risk Premium
    – Liquidity Premium

Writing this differently:

TIPS Yield = Nominal Yield
    – Expected Inflation
    – Inflation Risk Premium
    + Liquidity Premium

It is expected that the liquidity premium will disappear over time as the U.S. Treasury strives to make the market more liquid by continuing to issue TIPS. So far, the U.S. Treasury has been right on schedule with all the planned TIPS offerings (see Table 1).

This adds to the credibility of the Treasury and to the TIPS. The Treasury has an incentive to issue these types of securities, because it is cheaper financing of national debt. The Treasury can pocket the inflation-risk premium.

There is also the issue of Treasury cash flow [2]. The Treasury will not actually make any inflation-adjusted payouts until the bonds mature. Until maturity of the TIPS, the Treasury is paying out much less cash than with nominal coupon bonds.

Inflation-protected securities have already been issued in Canada, Australia, the U.K., and New Zealand. Most of these countries have indicated a desire to continue the issuance of these securities. The U.K. has announced that 20% of the gilts (U.K. government bonds) it issues will be index-linked, up from last year's 16–17%. Canada

announced that it plans to double the issuance of Canadian inflation-linked bonds. In addition, France and Mexico have also expressed interest in issuing inflation-linked bonds [3].

The U.S. Experience

Combing through a year's worth of press releases, I was not surprised to see that analysts' opinions are mixed on the future success of TIPS. But it certainly appears that it is an asset class that is here to stay.

Table 1 summarizes statistics from the first U.S. TIPS auctions, as well as corresponding nominal yields and inflation.

A 30-year TIPS auction has been announced for April 1998. By the end of 1998, the U.S. Treasury expects to have three-year TIPS added to the menu. Continuous quarterly offerings of existing issues are also expected, as Treasury attempts to take advantage of the relatively lower TIPS yields.

With conventional bonds, owners experience a price gain from falling nominal yields. Holders of TIPS experience price appreciation when the price change due to the combined impact of actual inflation and changes in *real yields* is positive [9]. Real yields, as previously pointed out, depend on *expected* inflation. Ignoring inflation risk and liquidity premiums, real yields decline whenever a drop in nominal yields exceeds a drop in inflationary expectations.

TABLE 1

Date of Auction	TIPS Maturity (Years)	Auction Size ($ Billions)	Trailing 12-Month Inflation [4] (Percent)	Auction Yield (Percent)	Nominal Bond Yield (Percent)	Difference (Percent)
January 1997	10	$7	3.0%	3.48%	6.56% [5]	3.08%
April 1997	10	8	2.5	3.59	6.89 [6]	3.30
July 1997	5	8	2.2	3.74	6.14 [7]	2.40
October 1997	5	8	2.1	3.60	6.01 [8]	2.41

Inflation Protected Securities
continued from page 12

Nominal Bond Return = Income
+ Price Change from Change in
   Bond Yield (Nominal)

TIPS Return = Income
+ Price Change from Change in
   Bond Yield (Real)
+ Inflation

As an example, look at the 10-year TIPS issued in late January 1997 compared to a similar conventional bond. By December 15, the nominal U.S. Treasury bond had gained 4.6% (price only), while the TIPS had lost 1.8% (price only). What happened?

The actual 1997 inflation was less than expected.

Real yields have increased since the January auction [10]. This suggests that inflationary expectations have dropped faster than nominal yields. Inflationary expectations have still further to drop before they catch the actual level of inflation. The expected inflation is currently less than 2.33% [11] with current inflation at 1.8% [12]. Inflation expectations (ignoring risk and liquidity premium) still exceed experience by 50 basis points.

It seems the time to buy these instruments for short-term price gain is when inflationary expectations fall below actual experience (the author will not refund any losses from following this strategy). In short, a speculator expecting future inflation shocks would be a buyer of TIPS for price appreciation.

R. McFall Lamm, Jr. points out in his article [13] that there may be a temporary opportunity to reap superior risk-adjusted returns; as the liquidity premium fades, the market learns how to use these new instruments. This seems reasonable, but as we have seen in 1997, it does not guarantee a substantial return.

Asset Allocation

TIPS have some interesting characteristics, which make them viable candidates for asset allocation. Real yields have historically been less volatile than nominal yields. Thus, although the duration of TIPS is actually higher than the duration of nominal bonds of the same maturity, TIPS tend to be less volatile than nominal bonds on an annual basis. In a stable inflation and interest rate environment, the TIPS return should be less than that of a nominal bond because of the inflation-risk premium. However,

FIGURE 1
TIPS and No TIPS Asset Efficient Frontiers for a 10-Year Time Horizon
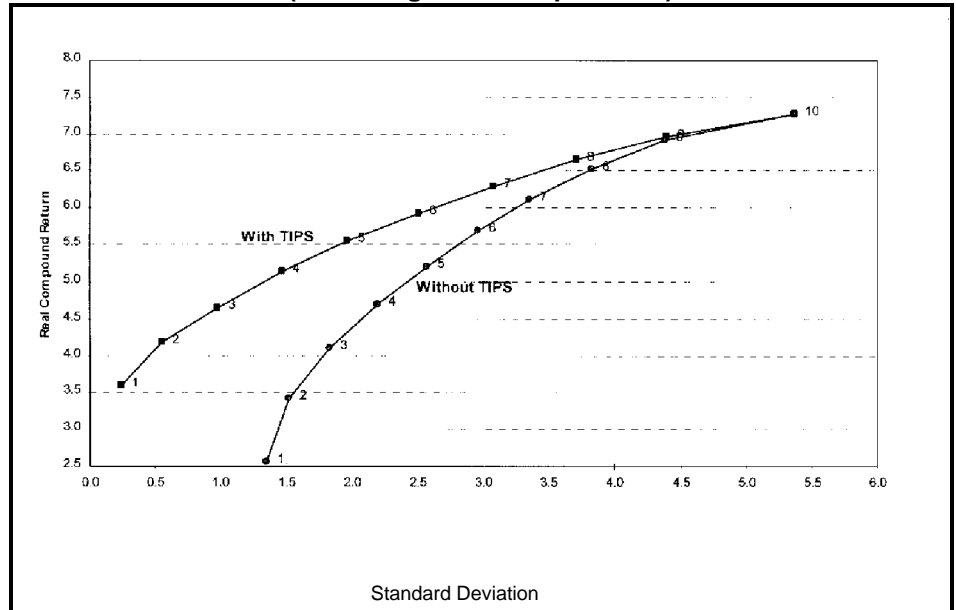**(Assuming Tax-Exempt Status)**

FIGURE 2
TIPS and No TIPS Asset Efficient Frontier for a 10-Year Time Horizon
(Assuming Tax-Exempt Status)
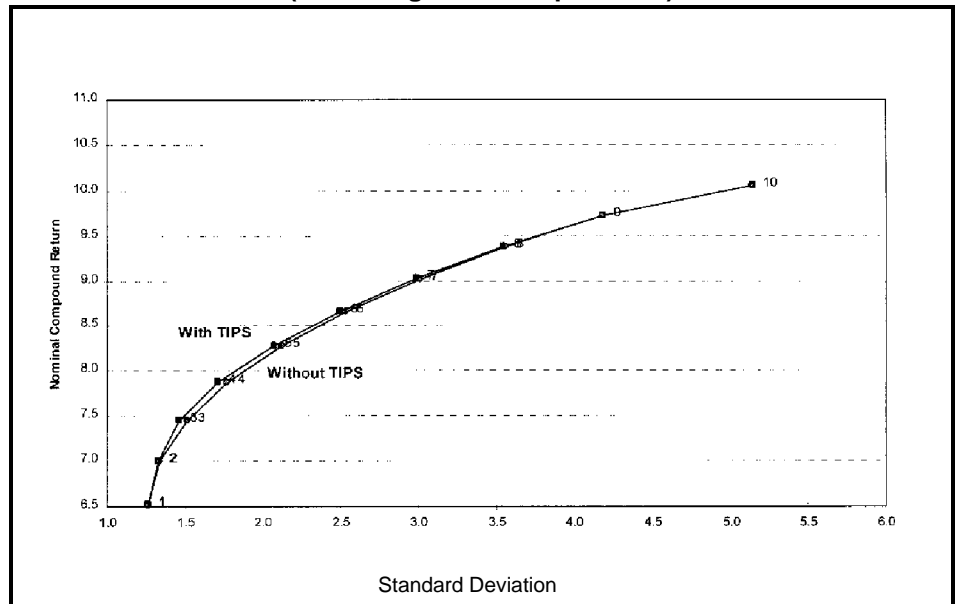
TIPS will likely outperform other asset classes in a high inflation period [14].

The real value of TIPS appears, not surprisingly, when returns are viewed on an inflation-adjusted basis. Figures 1 and 2 show efficient frontiers on a nominal and inflation-adjusted basis. The efficient frontiers were developed using Towers Perrin's Global CAP:Link [15] model and Towers Perrin's Basis Expectations

assumptions [16] as of December 1, 1997. On the conservative end of the inflation-adjusted efficient frontier, TIPS add significantly to the

Inflation Protected Securities

risk/reward trade-off. In contrast to this, the aggressive investor does not see much benefit from TIPS over the stated time horizon. Neither does the nominal-return investor, regardless of his or her risk aversion.

The role of TIPS further depends on the time horizon. On a short-term basis, TIPS tend to move in the same direction as nominal yields, because there is no change in inflationary expectations. This makes TIPS less attractive in an asset-allocation framework with a short time horizon. However, on a longer-term basis, TIPS are highly correlated with inflation. The volatility of nominal compound returns of a conventional bond is higher compared to the volatility of TIPS on a short-term basis. On a longer term basis, the volatility of TIPS is actually greater than that of nominal bonds because the cash flow on nominal bonds is fixed, but the cash flow of TIPS varies with inflation (Figure 3).

Closing Comments

If we are indeed entering a low inflation era, and much currently points to this, then the government treasuries across the world have an added incentive to issue these instruments. If inflation is a no-show or the treasuries/central banks believe inflation can be managed, then treasuries can pocket the risk premium and finance their government debt at lower yields.

There is much left to be learned about TIPS. Further study will include how TIPS might fare when optimized on an asset/liability basis. The more liabilities tend to move with the Consumer Price Index, the more attractive TIPS are likely to be. One must distinguish between TIPS' price change, pre-tax cash flow, and post-tax cash flow. The main advantage of TIPS is on an inflation-adjusted basis. As the Treasury continues to issue TIPS, liquidity should increase, but interest in these instruments will most likely be subdued until inflationary expectations surface.

END NOTES

1. Bankers Trust New York Corp. offers some TIPS research and data on its web site at www.bankerstrust.com. Access is restricted, but I spoke to Mr. Steve

FIGURE 1
U.S. 10-Year Nominal T-Bond Versus
TIPS Compound Returns Basic Expectations
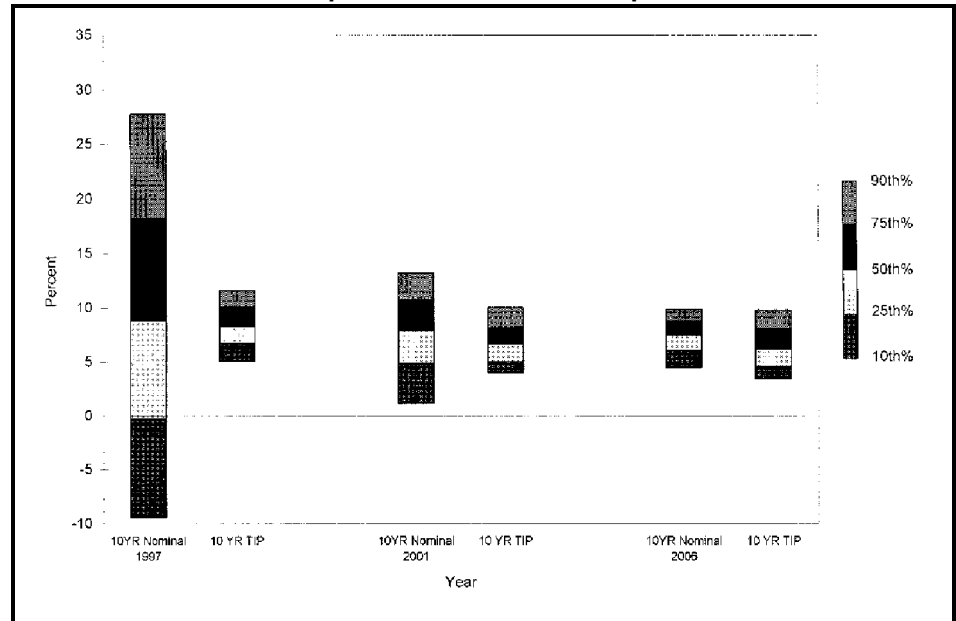
Salvadore, who generously offered me access. The site is geared for institutional clients. For further information, contact Mr. Salvadore at (212) 250–TIPS.

2. *Risks and Rewards,* March 1997: "Inflation-Indexed Bonds—How Attractive Are They?"

3. *Wall Street Journal,* March 14, 1997.

4. Calculated as the ratio of the Consumer Price Index—All Urban Consumers City Average, Bureau of Labor Statistics, U.S. Department of Labor.

5. Average yield on 10-year nominal U.S. Treasury bond for the week ended January 17, 1997, Federal Reserve H.15 Release.

6. Average yield on 10-year nominal U.S. Treasury bond for the week ended April 18, 1997, Federal Reserve H.15 Release.

7. Average yield on five-year nominal U.S. Treasury bond for the week ended July 18, 1997, Federal Reserve H.15 Release.

8. Average yield on five-year nominal U.S. Treasury bond for the week ended October 17, 1997, Federal Reserve H.15 Release.

9. The comments here ignore that the U.S. Treasury guarantees that no

TIPS will mature at less than par value.

10. As of December 1, 1997, the yield on the original January 10-year TIPS was 3.53%.

11. As of December 1, 1997, the yield on the conventional January 10-year bond was 5.86%. [5.86% – 3.53% = 2.33% (see Equation (1)].

12. Year-over-year change in CPI ending in November 1997.

13. *Economics and Risk Focus:* "The Exotica Portfolio: New Financial Instruments Make Bonds Obsolete," R. McFall Lamm Jr., Bankers Trust New York Corp., 5/9/97.

14. On a price basis. This should not be confused with after-tax cash flows to the taxable investor, which may not be favorable—even in a high-inflation environment.

15. Global CAP:Link is a stochastic scenario generator—see *Interfaces* (An International Journal of the Institute of Operations Research and the Management Sciences), Volume 26, Number 2, March-April 1996: "Generating Scenarios for the Towers Perrin Investment System," John M. Mulvey.

Inflation Protected Securities

16. Towers Perrin's basic-expectations assumption set reflects probability distributions built around the current long-bond yield. Other probability distributions are based on historical yield spreads and inflation-adjusted returns.

BIBLIOGRAPHY

The Federal Reserve Bank of St. Louis, *Monetary Trends,* September 1997: "Indexed Bonds and Falling Inflation Expectations."

Investment Policy, July/August 1997: "Protecting a Portfolio Against Inflation Risk," Steve Strogin, Melanie Petsch.

Economics and Risk Focus: "The Exotica Portfolio: New Financial Instruments Make Bonds Obsolete," R. McFall Lamm Jr., Bankers Trust New York Corp., 5/9/97.

Risks and Rewards, March 1997: "Inflation-Indexed Bonds—How Attractive Are They?" Chris K. Madsen.

FRBSF (Federal Reserve Bank of San Francisco) *Economic Letter,* Number 97–04, February 7, 1997: "Inflation Targeting," Chan Huh.

The Journal of Fixed Income:, December 1996, "U.S. Treasury Inflation-Indexed Bonds: The Design of a New Security," Richard Doll

Goldman Sachs Investment Research/Fixed Income Research, October 1996: "Treasury Inflation Protection Securities: A Useful Too, But Not a Cure-All."

Journal of Pension Plan Investing, Summer 1997, "Inflation-Indexed Bonds: Shifting the Efficient Frontier," Raymond T. Dalio, Daniel S. Bernstein.

Guide to Inflation-Linked Securities, Barclays de Zoete Wedd, 2nd Edition, 1993.

Wall Street Journal, 1997.

Chris K. Madsen, ASA, is Associate Consultant at Towers Perrin in Philadelphia, Pennsylvania.

Thanks to Our 1997 Authors!

A ny publication is only as good as its contents. The Investment Section is most fortunate to have members who are willing to share their knowledge and expertise. Following is a list of authors who contributed articles to *Risks and Rewards* in 1997. Our heart-felt thanks goes out to each one.

MARCH 1997 ISSUE

- Albert, Faye S., "The Necessary Advance in Scenarios for Asset/Liability Modeling Interest Rate Scenarios for Low Discrepancy Sequences"
- Boezio, Nino, "Behavior Finance and Its Implications for Investment Management"
- Fen, Allan, "1996 Economic Triathlon—The Winner Is …"
- Griffin, Mark W., "Asset Allocation—The Macro Perspective"
- Kwan, Simon H., "On the Relation between Stocks and Bonds—Part I"
- Lord, Graham, "The Necessary Advance in Scenarios for Asset/Liability Modeling Interest Rate Scenarios for Low Discrepancy Sequences"
- Madsen, Chris K., "Inflation-Indexed Bonds—How Attractive Are They?"
- Salisbury, Dallas L., "A Framework for Comparing Social Security Reform Proposals—An Introduction"
- Shimpi, Prakash A., "Chairperson's Corner"
- Strommen, Stephen J., "First Conference on Actuarial and Financial Modeling a Success"
- Tan, Joseph H., "Investment Sessions Scheduled for the 1997 Palm Desert and Montreal Spring Meetings"
- Vanderhoof, Irwin T., "The Necessary Advance in Scenarios for Asset/ Liability Modeling Interest Rate Scenarios for Low Discrepancy Sequences"
- Wendt, Richard Q., "How to Win the Triathlon"
- Wendt, Richard Q., "The Pension Insurance Modeling System—PBGC's New Forecast System"
- Wendt, Richard Q., "Taking Stock: Actuarial and Economic Models"

SEPTEMBER 1997 ISSUE

- Babcock, William L., "Review of Financial Journals"
- Becker, David N., "Measuring and Communicating Risk/Return Performance"
- Bilodeau, Marlyn, "Assessing the Option Premium in Pension Plans"
- Boezio, Nino, "Portfolio Insurance—Revisiting Paradise Lost"
- Cohen, Michael, "Assessing the Option Premium in Pension Plans"
- Dardis, Anthony, "Taking Stock: Equities"
- Dardis, Anthony, "Time to Dig Out the Old Dividend Discount Model?"
- DeLisse, Adam, "Time to Dig Out the Old Dividend Discount Model?"
- Farrell, Richard D., "Risk/RewardTradeoffs among Equity-Indexed Annuities"
- Martin, Edwin A., "Review of Financial Journals"
- Modugno, Vic, "Report from the SOA Spring Meeting in Montreal"
- Yoo, Peter, "A CPI-Based Bias for GDP?"

Portfolio Yield? Sure But …

by Thomas M. Grondin

What measure should be used for weighting? Traditionally, book values or market values have been used as weights. The problem is these measures provide only the yield earned on the portfolio at a moment in time. They do not take into account the distribution of the portfolio's assets. When using a portfolio-yield technique (average money technique) to determine crediting rates on new business for pricing or modeling, we implicitly assume all assets contribute the same amount of income dollars over the life of the liability.

If we introduced a new measure such as weighted average dollar duration (WADD) book yield, then we directly take into account the distribution of the assets in the portfolio. If the term implied by the duration of our asset portfolio resembles the term of the liability used, we are assured that using a WADD book-yield measure as our basis for determining the crediting rate will provide the income our spread dictates.

Example 1

Assume that our portfolio is made up of three assets: a $150 million (in terms of book value), 30-year strip yielding 7%; a $100-million seven-year Treasury yielding 6%; and a $250-million bond maturing in three days with a book yield of 12%. Further assume the durations of each asset are 30, 5, and 0, respectively. The book value weighted yield is 9.3%. Using a crediting spread of 130 basis points, the traditional method would result in a crediting rate of 8%. It is easy to see the duration of the assets is 10 years. Assuming the $1 million liability issued has the same duration as the portfolio, the present value of incoming payments on the liability would be $800,000. For simplicity, if we assume any excess asset cash flows are reinvested to maintain the portfolio's duration and dollar duration weighted-portfolio book yield, the actual income earned per $1 million of assets is $690,000. Thus, using a book-value weighted-portfolio yield as the basis of our crediting strategy has generated a loss of $110,000.

Using a WADD book yield as the portfolio yield crediting strategy, the WADD book yield equals:

$$\frac{(150\times 30\times 7\%)\ (100\times 5\times 6\%)\ (250\times 0\times 12\%)}{(150\times 30)\ (100\times 5)\ (250\times 0)} = 6.9\%$$

Therefore, the crediting rate would have been 5.6% and the present value of income payments on the liability would have been $560,000 for a present value profit of $130,000. This result is intuitive since, given $1 million of business with a gross spread of 130 basis points, you must make $13,000 each year of the life of the liability on a gross basis.

This is a result that can close the gap between spread-management-oriented banking-type insurance executives and actuaries.

When trying to back out the effects on earnings of temporary positions taken by a portfolio manager against the target portfolio, the use of a straight book-value-weighted book yield advantage is misleading.

Example 2

This example is based on the performance methodology used in some companies. I am assuming a total rate of return basis with a target basket curve used for valuing the performance and releasing earnings to the income statement. Assume a new money-fund portfolio manager has a yield disadvantage over his target fund and assume the same assets as in the previous example. The manager believes spreads are going to widen. Further assume the target portfolio comprises the same types of assets as the actual portfolio, except the target's 30-year strip is a lower quality earning 9%. Using a weighted-book-yield approach, the actual portfolio is deficient in yield by 60 basis points. This would translate to an estimated present value impact on earnings of $30 million (0.006 × 10 years × $500 million). The WADD book yield of the target portfolio is 8.7%. This compares to the actual portfolio WADD book yield of 6.9%, which translates into a present value hit to earnings of $90 million [(0.087 – 0.069) × $500 million durations]. Because this concocted example is simple, we know exactly what the temporary position is and can therefore confirm our results. In practice, we generally do not have specific knowledge of the temporary position except perhaps the sector and from which part of the curve the position was taken. Continuing, we know the position is on the 30-year strip with a duration of 30 and a yield shortfall of 200 basis points on the full $150 million invested. This easily translates to a present-value impact of $90 million. Note, for this example, that we have ignored the projection of defaults because it would only have complicated the matter and given further support to the WADD approach.

Some uses of WADD book yields:

- To determine crediting rates for average money portfolios. The technique displayed can be further refined to handle liabilities of various terms that are credited from the same average money portfolio. One would only need to look at the assets and the weighted-average-dollar key rate duration yields for the term desired.

- To determine the true yield earned over the life of a heterogeneous pool of mortgages created for pass-through.

- To determine the present-value impact of a yield advantage/disadvantage a portfolio manager has over the target portfolio because of a temporary position taken in lower/higher quality issues.

- Along with the WADD crediting yield on a block of liabilities, to determine the present value of future income at any time.

- The spread between the asset WADD yield and liability WADD yield can be used as a management statistic on existing and new business.
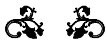
Thomas M. Grondin, FSA, is with Tillinghast-Towers Perrin in Buffalo Grove, Illinois.

Measuring Financial Risk

The Layperson's Introduction to Value at Risk

by Barry Schachter

V alue at risk (VAR) is much on the minds of risk managers and regulators these days, because of the promise it holds for improving risk management. It is common to hear the question asked, could VAR have prevented Barings, or Orange County, or Sumitomo? No answer to questions of that sort will be attempted here. Instead, this article will take a normative approach. My purpose is more modest, namely, to provide the reader with some background by describing VAR and its evolving role in risk management. Because of its technical nature, it is customary to begin any discussion of VAR with a definition. I offer three equivalent definitions:

- A forecast of a given percentile, usually in the lower tail, of the distribution of returns on a portfolio over some period, similar in principle to an estimate of the expected return on a portfolio, which is a forecast of the 50th percentile.

- An estimate of the level of loss on a portfolio which is expected to be equaled or exceeded with a given, small probability.

- A number invented by purveyors of panaceas for pecuniary peril intended to mislead senior management and regulators into false confidence that market risk is adequately understood and controlled.

The Quest for the "Holy Scale"

Folklore (if it is fair to attribute as folklore that which only dates back five years) tells us that VAR was developed to provide a single number which could encapsulate information about the risk in a portfolio, could be calculated rapidly (by 4:15), and could communicate that information to nontechnical senior managers. Tall order, and not one that could be delivered upon with compromises.

Modern portfolio theory (MPT), as taught in business schools, tells us that the risk in a portfolio can be proxied by the portfolio standard deviation, a measure of spread in a distribution. That is, standard deviation is all you need to know in order to (1) encapsulate all the information about risk that is relevant, and (2) construct risk-based rules for optimal risk "management" decisions. (The more technically proficient will please forgive my playing somewhat fast and loose with the theory in the interests of clarity.) Strangely, when applied to the quest for the Holy Scale, standard deviation loses its appeal found in MPT. First, managers think of risk in terms of dollars of loss, whereas standard deviation defines risk in terms of deviations (!), either above or below, expected return and is therefore not intuitive. Second, in trading portfolios deviations of a given amount below expected return do not occur with the same likelihood as deviations above, as a result of positions in options and option-like instruments, whereas the use of standard deviation for risk management assumes symmetry.

An alternative measure of risk was therefore required. Why not measure the spread of returns, then, by estimating the loss associated with a given, small probability of occurrence? Higher spread or risk should mean a higher loss at the given probability. Then senior management can be told that there is a 1 in 100, say, chance of losing *X* dollars over the holding period. Not only is this intuitively appealing, but it's easy to show that when returns are normally distributed (symmetric), the information conveyed is exactly the same as where standard deviation is employed, it's just that the scale is different. This approach can be consistent with MPT. It seems then that perhaps the Holy Scale has been found in VAR.

The Slip 'twixt Cup and Lip

It's perhaps too easy to criticize efforts to implement the VAR concept. It takes some courage to venture into unfamiliar terrain and missteps are inevitable. The VAR paradigm is still evolving (as is that of financial risk management in general), and experimentation should be encouraged. To speak of "best practices" is surely premature.

The general approaches to VAR computation have fallen into three classes—parametric, historical simulation, and Monte Carlo. Parametric VAR is most closely tied to MPT, as the VAR is expressed as a multiple of the standard deviation of the portfolio's return. Historical simulation expresses the distribution of portfolio returns as a bar chart or histogram of hypothetical

> *"The general approaches to VAR computation have fallen into three classes—parametric, historical simulation, and Monte Carlo."*

returns. Each hypothetical return is calculated as that which would be earned on today's portfolio if a day in the history of market rates and prices were to repeat itself. The VAR then is read from this histogram. Monte Carlo also expresses returns as a histogram of hypothetical returns. In this case, the hypothetical returns are obtained by choosing at random from a given distribution of price and rate changes estimated with historical data. Each of these approaches has strengths and weaknesses.

The parametric approach has as its principal virtue speed in computation. The quality of the VAR estimate degrades with portfolios of nonlinear instruments. Departures from normality

Measuring Financial Risk
continued from page 17

in the portfolio return distribution also represent a problem for the parametric approach. Historical simulation (my personal favorite) is free from distributional assumptions, but requires the portfolio be revalued once for every day in the historical sample period. Because the histogram from which the VAR is estimated is calculated using actual historical market price changes, the range of portfolio value changes possible is limited. Monte Carlo VAR is not limited by price changes observed in the sample period, because revaluations are based on sampling from an estimated distribution of price changes. Monte Carlo usually involves many more repricings of the portfolio than historical simulation and is therefore the most expensive and time-consuming approach.

Rule or Tool?

It seems that VAR is being used for just about every need: risk reporting, risk limits, regulatory capital, internal capital allocation, and performance measurement. Yet, VAR is not the answer for all risk management challenges. No theory exists to show that VAR is the appropriate measure upon which to build optimal decision rules. VAR does not measure "event" (for example, market crash) risk. That is why portfolio stress tests are recommended to supplement VAR. VAR does not readily capture liquidity differences among instruments. That is why limits on both tenors and option greeks are still useful. VAR doesn't readily capture model risks, which is why model reserves are also necessary.

Because VAR does not capture all relevant information about market risk, its best use is as a tool in the hands of a good risk manager. Nevertheless, VAR is a very promising tool—one that will continue to evolve rapidly because of the intense interest in it by practitioners, regulators, and academics.

Barry Schachter is Vice President, Market Risk Portfolio Manager at Chase Manhattan Bank. He maintains a web page of VAR resources at http://pw2. netcom.com/~ bschacht/varbiblio.html.

Seven Quantitative Insights into Active Management—Part 5
Data Mining Is Easy

by Ronald N. Kahn

Editor's Note: *The following article originally appeared in the Winter 1998 issue of the Horizon, a publication of BARRA, Inc., and is reprinted with permission.*

❧   ❧

Why is it that so many strategies look great in backtests and disappoint upon implementation? Backtesters always have 95% confidence in their results, so why are investors disappointed far more than 5% of the time? It turns out to be surprisingly easy to search through historical data and find patterns that don't really exist.

To understand why data mining is easy, we must first understand the statistics of coincidence. Let's begin with some noninvestment examples. Then we will move on to investment research.

The Statistics of Coincidence

Several years ago Evelyn Adams won the New Jersey state lottery twice in four months. Newspapers put the odds of that happening at 17 trillion to 1, an incredibly improbable event. A few months later, two Harvard statisticians, Percy Diaconis and Frederick Mosteller, showed that a double win in the lottery is not a particularly improbable event. They estimated the odds at 30 to 1. What explains the enormous discrepancy in these two probabilities?

It turns out that the odds of Evelyn Adams winning the lottery twice are in fact 17 trillion to 1. But that result is presumably of interest only to her immediate family. The odds of someone, somewhere, winning two lotteries— given the millions of people entering lotteries every day—are only 30 to 1. If it wasn't Evelyn Adams, it could have been someone else.

Coincidences appear improbable only when viewed from a narrow perspective. When viewed from the

correct (broad) perspective, coincidences are no longer so improbable. Let's consider another noninvestment example: Norman Bloom, arguably the world's greatest data miner.

Norman died a few years ago in the midst of his quest to prove the existence of God through baseball statistics and the Dow Jones average. He argued that "BOTH INSTRUMENTS are in effect GREAT LABORATORY EXPERIMENTS wherein GREAT AMOUNTS OF RECORDED DATA ARE COLLECTED AND PUBLISHED" (capitalization Bloom's). As but one example of thousands of his analyses of baseball, he argues that the fact that George Brett, the Kansas City third baseman, hit his third home run in the third game of the playoffs, to tie the game at 3–3, could not be a coincidence—it must prove the existence of God. In the investment arena, he argued that the Dow's 13 crossings of the 1,000 line in 1976 mirrored the 13 colonies which united in 1776—which also could not be a coincidence. (He pointed out, too, that the 12th crossing occurred on his birthday, deftly combining message and messenger.) He never took into account the enormous volume of data—in fact, an entire New York Public Library's worth—he searched through to find these coincidences. His focus was narrow, not broad.

With Norman's passing, the title of world's greatest living data miner has been left open. Recently, however, Michael Drosnin, author of *The Bible Code,* seems to have filled it.

The importance of perspective to understanding the statistics of coincidence was perhaps best summarized by, of all people, Marcel Proust—who often showed keen mathematical intuition:

> The number of pawns on the human chessboard being less

Seven Quantitative Insights

than the number of combinations that they are capable of forming, in a theater from which all the people we know and might have expected to find are absent, there turns up one whom we never imagined that we should see again and who appears so opportunely that the coincidence seems to us providential, although, no doubt, some other coincidence would have occurred in its stead had we not been in that place but in some other, where other desires would have been born and another old acquaintance forthcoming to help us satisfy them. (*The Guermantes Way, Cities of the Plain,* Volume 2 of translation of Marcel Proust's *Remembrance of Things Past* [New York: Vintage Books, 1982], p. 178.)

Investment Research

Investment research involves exactly the same statistics and the same issues of perspective. The typical investment data mining example involves *t*-statistics gathered from backtesting strategies. The narrow perspective says, "After 19 false starts, this 20th investment strategy finally works. It has a *t*-statistic of 2."

But the broad perspective on this situation is quite different. In fact, given 20 information-less strategies, the probability of finding at least one with a *t*-statistic of 2 is 64%. The narrow perspective substantially inflates our confidence in the results. When viewed from the proper perspective, confidence in the results lowers accordingly.

Four Guidelines for Backtesting Integrity

Given that data mining is easy, how can we safeguard against it? Here are four guidelines for data mining integrity:

- Intuition
- Restraint
- Sensibility
- Out-of-sample testing.

The *intuition* guideline demands that researchers investigate only those strategies with some *ex ante* expectation of success. Investment research should never involve free-ranging searches for patterns without regard for intuition.

The *restraint* guideline attempts to minimize the number of strategies investigated—that is, to keep the broad and narrow focus similar. In the best case, researchers decide *ex ante* exactly which strategies and variants they will investigate, run their tests, and look at the answers. They do not go back and continually refine their investigations.

The *sensibility* guideline deletes results that seem improbably successful. Observed, *t*-statistics that are too large may signal database errors or an improper methodology rather than a new strategy.

The fourth guideline, *out-of-sample testing,* is the statistician's answer to the curse of data mining. Coincidences observed over one dataset are quite unlikely to reoccur in another independent dataset.

Conclusions

Many backtesting results are not foolproof demonstrations of strategy value but merely coincidence. Four backtesting guidelines can help avoid data mining.

Ronald N. Kahn is Vice President and Director of Research at BARRA in Berkeley, California.

Integrated Approaches to Risk Management in the Financial Services Industry—A Seminar

December 8–9, 1997
Atlanta, Georgia

Anna Rappaport

This program, held at Georgia State University, was very significant in helping us to advance the work of risk measurement. All present gained by having dialogue with a diverse group of professionals, both in and outside the actuarial profession. We reviewed value at risk as well as other approaches for risk measurement.

The program planning arose out of our discussion of "gap analysis." In the 1996–97 Strategic Planning Committee, we focused on what needed to be done to make the mission and vision of the actuarial profession become a reality. The discussion of that issue, applied to the area of finance and investment, led to a discussion of value at risk. Planning Committee members Cindy Forbes and Irwin Vanderhoof then determined how to work on closing the gap, leading to a call for papers and then the seminar.

This program was truly a team effort sponsored by the Finance Practice Area and the Investment Section with leadership from Cindy Forbes, who heads our Finance and Investment Practice Area, and Irwin Vanderhoof. Other members of the Project Oversight Group were John Aquino, Harry Panjer, Bill Panning, and Jim Tolliver. Sheri Abel, Jackie Bitowt and Zain Mohey-Deen provided staff support.

As the financial services industry changes, the work of actuaries changes. Key changes include new approaches to the handling and management of risk on both the asset and liability sides of the balance sheet. The traditional disciplines of actuaries and other financial

Integrated Approaches

managers are coming together to build new ideas and develop new tools so all can do a better job.

The program was significant in that:

- There is much new development in this area. A number of people who were at the conference are involved in research on different aspects of the topic. Papers, in the aggregate, are a nice addition to our knowledge base. This was a chance to exchange ideas.

- Value at risk measures, as applied in banks, are essentially one-day or 10-day horizon measures; they are not long term. We did not get into any of the issues of which horizon is appropriate or whether it matters. Perhaps this is an area we need to investigate further.

- Value at risk focuses on the largest amount that can be lost, in all but a very low probability, over the time period in a portfolio context. One use is to help set minimum capital requirements or to maintain risk exposures within existing capital resources.

- The idea of value at risk can be applied well to insurance companies, but on a much longer term basis. This is another way to look at risk theory. Many of the papers investigated issues involved in applying value at risk to life and casualty insurance and some companies are attempting to implement it.

- The ideas provide some different ways to look at portfolios and to integrate the asset and liability sides of insurance. The ideas also provide a way to look at insurance and other financial products in a unified way.

- There are several different methodologies for doing calculations; none are perfect. Ongoing work focuses on practical methodologies, the theory supporting the calculations, and also the difficulties inherent in developing models, collecting data, and implementing them. The papers spanned all these issues.

- A diverse group of people, including actuaries and others working in risk measurement and management, participated. There was a healthy mix of academics and representatives of insurance companies, investment houses, and other financial institutions. The conference attracted a few participants from Europe and Australia.

- The ideas and contacts will be very helpful to those who are continuing to do work in this area. This should also expand our pool of topics and speakers for SOA meetings.

- The exchange of information enhanced the visibility of actuaries within the financial community.

Overall, the papers were very interesting. The papers and tapes will be available for purchase through the SOA. Selected papers in edited form will appear in a special issue of the *North American Actuarial Journal.* Below is a list of papers that were presented.

"An Overview of Value-at-Risk," by Peter Zangari and William Mason, J.P. Morgan Securities, Inc.

"The Strategic Uses of Value at Risk" by William H. Panning, Willis Corroon

"Applying VAR Analytics to the Investment Cycle of an Insurer," by Thomas S.Y. Ho, Ph.D., Global Advanced Technology

"A VAR Model of the Operational Risk of an Investment Cycle," by Thomas S.Y. Ho, Ph.D., Global Advanced Technology

"Cash-Flow Valuation and Value at Risk," by Allan Brender, Ph.D., William M. Mercer Ltd.

"Enterprise Risk and Return Management for Financial Institutions," by Mark Griffin and Rick Boomgaart, Goldman Sachs & Co.

"A Bridge Too VAR," by Colin McKee, Bank for International Settlements

"New SEC Market Risk Disclosure Rules," by Thomas J. Linsmeier, University of Illinois

"Coherent Capital Requirements," by Philippe Artzner, Universite Louis Pasteur

"Extreme Value Theory as a Risk Management Tool," by Paul Embrechts, Sidney Resnick, and Gennady Samorodnitsky, ETHZ

"Evaluating the Risks of Modeling Assumptions Used in Risk Measurement," by Teri L. Geske, Capital Management Sciences

"A Value at Risk Calculation of Required Reserves for Credit Risk in Corporate Lending Portfolios," by Ronan O'Connor, University College Dublin, and James Golden and Robert Reck, Irish National Treasury Management Agency

"Raising Value at Risk," by Julia Lynn Wirch, University of Waterloo

Anna M. Rappaport, FSA, is Principal at William M. Mercer Inc., in Chicago, Illinois and 1997–1998 President of the Society of Actuaries.

SOA Library, March 1998

Thanks to the generosity of the Investment Section members, the SOA library has added these new titles to its collection of significant works in Asset/Liability.

Advances in Behavioral Finance, Thaler, Richard H. Ed. Russell Sage Foundation, 1993 (HG 4515.15.A38)

Advances Interest Rate & Currency Swaps, Dattatreya, Ravi E. Irwin, 1994 (HG 3853.A648)

Asset Allocation for Institutional Portfolios, Mark Kitzman, Irwin, 1990 (HG 4521.K74)

Dynamic Asset Pricing Theory, 2nd ed., Darrell Duffie, NJ: Princeton Univ. Press, 1996 (HG 4637.D84)

Dynamic Asset Allocation: Strategies for the Stock, Bond and Money Markets, David A. Hammer, Wiley, 1991 (HG 4529.5.H36)

The Econometric of Financial Markets, Campbell, Andrew, & Mackinley, NJ: Princeton Univ. Press, 1997 (HG 4523.C27)

Financial Calculus: An Introduction to Derivative Pricing, Martin Baxter, NY: Cambridge Univ. Press, 1996 (HG 6024.A3.B39)

Financial Dynamics of the Insurance Industry, Ed.I. Altman, & I.T. Vanderhoof, ed. Irwin, 1995 (HG 8522.5.F88)

Global Asset Allocation: Techniques for Optimizing Portfolio Management, Jess Lederman & R.A. Klein. Ed. Wiley, 1994 (HG 4529.5.L43)

Handbook of Fixed Income Securities, 5th ed., Fabozzi et al, Irwin, 1997 (HG 4651.H265)

Interest-Rate Option Models: Understanding, Analyzing and Using Models for Exotic Interest-Rate Options /Riccardo Rebonato, Wiley, 1996 (HG 6024.5.R43)

Introduction to Futures and Options Markets, 3rd ed., John C. Hull, Prentice-Hall, 1998, (HG 6024.A3.H84)

Investments, 3rd ed., Bodie, Kane & Marcus. Irwin, 1996 (HG 4521.B564)

Investments, 5th ed., Sharpe and Alexander, Prentice-Hall, 1995 (HG 4521.S48)

Life Insurance Accounting, 3rd ed., Brenner, et al. 1994 (HG 8848. L48)

Modeling Fixed Income Securities and Interest Rate Options, R.A. Jarrow, OH: McGraw-Hill, Inc., 1996 (HG 6024.5.J37)

Modern Portfolio Theory and Investment Analysis, 5th ed., Elton and Gruber Wiley, 1995 (HG 4529.5 .E47)

New Corporate Finance: Where Theory Meets Practice, D.H. Chew, Jr. 1993 (HG 4011. N44)

Option Embedded Bonds, Nelkin, Lederman and Klein ed., OH: Irwin/McGraw-Hill, 1996 (HG 4651.O68)

Options, Futures and Other Derivatives, 3rd ed., John C. Hull. Prentice-Hall, 1997 (HG 6024.A3. H85)

Practical Risk Theory for Actuaries, Daykin, C.D., Chapman & Hall, 1994 (HG 8781. D28)

Principles of Corporate Finance, 5th ed., Brealey & Meyers, McGraw-Hill, 1991 (HG 4026.B667)

Return Targets and Shortfall Risks: Studies in Strategic Asset Allocation, Leibowitz, Bader & Kogelman, Irwin, 1996 (HG 4529.5. L45)

Risk Management for Financial Institutions and Derivative Credit Risk, London: UK: Risk Publications, Published in Association with Price Waterhouse, 1997

VAR: Understanding and Applying Value-At-Risk, London:UK: Risk Publications, Published in Association with KPMG, 1997 (HG 6024.3.V37)

SOA Library Circulation and Loan Policy

Some items in the library's collection will not be circulated including titles listed on the current syllabus of required reading for the SOA courses (unless the library has duplicate copies), archival materials, ready reference sources, Ph.D. theses from the SOA Research Department, and entire issues of periodicals. Selections from these noncirculating items are photocopied upon request if it is within the copyright permission. Circulating materials may be borrowed directly from the library at no cost by SOA members and staff. Nonmembers of the SOA may borrow from the collection via InterLibrary Loan. Items borrowed by SOA members, staff and OCLC InterLibrary Loan member libraries are usually mailed via first class or UPS for a loan period of four weeks within the U.S. and Canada and six weeks outside the U.S. and Canada. Borrowed items can be renewed for an additional loan period if there is no one on the waiting list. If the loan period has passed and materials have not been returned, the library staff will inform the member via fax, telephone, or letter.

For more information, please contact Ellen Bull, phone (847) 706–3575 or e-mail ebull@soa.org or Sara O'Connor, phone (847) 706–3538 or e-mail soconnor@soa.org.

Greetings from D.C.

Judy Strachan, incoming chairperson, presents a plaque of appreciation to outgoing chairperson Prakash Shimpi at the SOA Annual Meeting in Washington, D.C., in October.

The Investment Section Council investing time and energy in planning the Section's activities for the coming year. Standing from left to right are: Josephine Mark, Martin Leroux, Klaus Shigley, and Pierre Caron. Seated left to right: Judy Strachan, Prakash Shimpi, Susan Watson, and Joe Tan.