

**RECORD OF SOCIETY OF ACTUARIES  
1995 VOL. 21 NO. 2**

**MONITORING, MANAGING, AND  
CONTROLLING DERIVATIVE INSTRUMENTS**

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*The teaching session will demonstrate how to implement systems and policies that will track performance and ensure that the correct type and amount of derivatives are in place.*

MR. RANDALL L. BOUSHEK: Joining me on the panel, with more complete introductions later, are Dave Hall from ITT Hartford Life and Doug George from Avon Consulting. By way of personal introduction, I am a vice president and bond portfolio manager for Lutheran Brotherhood, a fraternal benefit society headquartered in Minneapolis with approximately \$15 billion in total assets under management. My general responsibilities include managing all trading, research, and portfolio management in the life company bond portfolio; serving as the investment division liaison on asset/liability management issues; and overseeing all quantitative research, including work on derivatives, across our fixed-income portfolios.

The outline that I'd like to follow for this session begins with a few introductory comments, a brief overview of the subject at hand, and a review of definitions to guide our discussion. Following my remarks, Dave will address more specifically the implementation of policies and procedures designed to ensure sound management practices in the use of derivatives. Finally, Doug will finish off with a review of systems and information needs for overseeing derivative exposures and integrating them into the asset/liability management function.

Anytime that I am called upon to speak on the subject of derivatives, whether to a management committee, to a board of directors, to the media, or to a conference audience such as this, I make it a practice to clarify at the outset just exactly what we mean to include by the term "derivative." For purposes of discussion, I prefer to classify derivatives into one of three distinct categories—mortgage-related investments, contractual instruments, and structured securities. Technically, all mortgage-backed securities—pass-throughs, collateralized mortgage obligations (CMOs), and interest-only (IO)/principal-only (PO) trusts—are derivatives in the sense that their cash flows (performance) are linked to a separate or underlying index or instrument, in this case pools of residential mortgage loans. Most frequently, however, "mortgage-related derivative" tends to be synonymous with CMO. The CMO market is a huge (\$800 billion) market comprising securities with a wide array of risk and return characteristics. While a small high-risk segment of this market has deservedly garnered its share of headlines, all too often the entire universe is unfortunately painted with the same "high-risk derivatives" brush. CMOs provide fertile ground for discussion; however, for the most part, mortgage-related investments are outside the scope of our comments on derivatives today.

The second category of derivatives—contractual instruments—includes such things as options, futures, forwards, swaps, caps, floors, and all combinations and permutations thereof. This category is the primary focus of our comments today. Unlike the other types of derivatives, these instruments do not represent so much a class of investments (as in

investment in derivatives) but rather a set of contractual agreements used to alter the cash flow or risk characteristics of individual securities or portfolios.

The final category of derivatives is what I refer to as structured or synthetic securities. These are bonds or notes that link either the payment of interest or repayment of principal to some type of index—interest rate, equity, currency, or commodity—external to the instrument itself. Other names for this type of derivative include equity-linked securities, principal-protected notes, and a raft of creative acronyms developed by Wall Street. As with mortgage-related investments, these type of instruments are generally outside the scope of our discussion.

There has certainly been a fair amount of discussion in board rooms and management suites as well as in the media in the last year about well-publicized problems and losses arising from "bad derivatives." However, in keeping with our topic, I would suggest to you that "bad derivative" is a misnomer and that the more appropriate term is generally "bad management." Table 1 summarizes some of the higher profile cases of derivative problems or losses grabbing headlines in the last year. While each of these cases did involve derivatives of some type, I would say the real common thread is a fundamental management error manifested in one of three areas—monitoring, control, or disclosure. Derivatives are neither "good" nor "bad" in and of themselves. The label is ultimately determined by the use, and it's the presence (or absence) of proper policies and management practices that govern the use.

TABLE 1  
DERIVATIVE PROBLEMS

Company	Fundamental Management Error
Barings Bank	An absence of checks and balances
Orange County	Leveraging with borrowed funds to make a bullish bet
Proctor & Gamble	Market speculation unrelated to core business and expertise
Piper Capital	Concentration of risk beyond reasonable expectations (leverage plus high-risk mortgage-related derivatives)
Metallgesellschaft	A dramatically mismatched hedge
Odessa College	High-risk mortgage-related derivatives in inexperienced hands

During the past three years, I have been involved in the ongoing process of establishing and refining Lutheran Brotherhood's internal policy statement on derivatives. In the course of our work, we've identified what we think are the seven key elements of such a policy—a statement of statutory authority and our interpretation of that statute; a summary of permitted uses; a summary of permitted instruments; market risk exposure limitations; counterparty (credit) risk exposure limitations; delineated trading and trade approval authority; and delineated monitoring and reporting requirements. I don't have time to go through each of these elements in detail, but I would note that as part of the summary of uses and instruments, our policy also includes a statement of scope, that is, a definition of what is and is not covered by the policy. For example, our investment policy deals explicitly with contractual instruments and structured securities in the section on

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derivatives, but addresses mortgage-related derivatives in a separate section under bonds. This distinction is specifically noted in our policy statement on derivatives. Also, within the summary of permitted uses, we spell out clearly what we mean by the term "hedging," as this can be a point of contention of confusion at a later date.

Before turning the panel over to Dave, I'd like to share with you a summary of recommendations on derivatives prepared in 1993 by a consortium of international commercial and investment bankers, academics, and government central bankers known as the "Group of Thirty" (G-30). The G-30 report, entitled "Derivatives: Practices and Principles," was produced by a specially constituted global derivatives study group as both a compendium of current derivatives activity and a guide to developing sound risk management practices for derivatives. Included in that report are 20 specific recommendations for derivative dealers and end users and four recommendations targeted specifically to legislators and regulators. As with our policy provisions, time does not permit me to review these recommendations in any detail. However, I would like to summarize them for you with the following five consolidated guidelines:

1. Use in a manner consistent with board-approved risk management and capital policies.
2. Designate trading authority and establish independent market and credit risk management functions.
3. Make clear and sufficient disclosure, employ appropriate accounting methodologies, and value fairly.
4. Use a consistent measure to calculate risk exposures and regularly perform stress test simulations.
5. Ensure sufficient systems capability and professional expertise.

At this point I'd like to call on Dave Hall to speak to some of the practical policy and procedural management issues with derivatives. Dave is senior vice president and director of invested assets at ITT Hartford. In that role, he is responsible for all general account and guaranteed separate account assets. He is also a former President of the Investment Section of the Society of Actuaries. Dave and I have shared several panels in the past, and I am sure that you will find his comments both insightful and entertaining.

MR. DAVID A. HALL: ITT Hartford Insurance Companies has been involved with derivatives before they were even called derivatives. I imagine that five years ago, if you were even talking about derivatives, you would never have conjured up any investment theme related to that at all. Back then it was simply futures, options, and swaps. In the last year, I haven't really been managing derivatives that much. Rather, I've been managing derivatives relations and talking about managing derivatives.

There are the four areas I want to address—policy, controls, compliance, and reporting. What are the key ingredients for derivative policy? This may repeat what Randy said, but I think it's important. I'd like to phrase the ingredients in the form of questions. First, what are the objectives you have for your derivatives portfolio? Second, what, if any, are the limitations on your use of derivatives? How do you define the magic word *nonspeculative*? Third, what are your documentation standards? What type of paper trail do you maintain for subsequent management and audit? And finally, what is your compliance process?

How do you make sure that you're doing what your policy says you're supposed to be doing?

That last question brings up the subject of controls. From my perspective, the first area of control is competence. I think that in many respects it's probably more important to have competent people running your derivatives portfolio than it is to have the right processes in place. And the greater the breadth of your expertise the better. Many of the problems in derivatives arise when all the duties are centralized on one or two people, and nobody else in the company has any idea what he or she is doing. The greater breadth of experience and competence you can have in your staff, the better. I would look for competence in several areas—trading, portfolio management, settlement and processing, accounting, legal, credit risk management, and general risk management. The more people who really understand the context in which derivatives are used in your company, the more decentralized your processing can be; and the greater the awareness of your policies and procedures in derivatives throughout the organization, the less likely you will develop an untimely surprise. To build competence you generally have to learn, and unfortunately you must start somewhere. Fortunately, I think one of our benefits at Hartford was that we started dealing in derivative transactions well before they were on the radar scope, so to speak, so we had the ability to learn without the scrutiny that one might have today in pursuing an "adventuresome" strategy.

The second area of control is clearly position management. There are several aspects of control to consider here. First, how do you control the front end of your trading, enter your trades into a system, confirm the trade? How do you make sure that the rogue trader, for example, doesn't do a trade and put it in a desk drawer until it becomes discovered? Second, how do you process your margin flows on derivatives and cash flows on swaps? Third, how do you track the linkages in your derivative positions? This is important. To the extent that you have some sort of a derivative, and it's linked to an asset or a liability (or both), do you have a data base that has the right pointers so that you can tell, when you're looking at an asset, that there is some derivative linked to it? Or, when you pull up a derivative, that it relates to a particular asset or liability? Fourth, there is effectiveness tracking. How do you keep your eyes on what your derivatives are supposed to be doing to make sure that they continue to be effective? The fifth aspect of control is hedge accounting tracking, and the sixth is documentation, which is something we all sort of hate to do but is very critical from a compliance standpoint. Seventh is management reporting, which can be a big challenge. How do you depict your derivative activity in a way in which your senior management and your board can both gain comfort that you're doing something, and have any clue what it is you're really doing? Finally, there is general disclosure, both internal and external. I see the last two of these aspects—reporting and disclosure—as control issues because public relations control over your derivatives exposure, that is, making sure people are comfortable with your activities, can sometimes be just as important as financial control.

Moving on to compliance, you need to have approved strategies that your derivatives are following. What is your trade authorization process? How do you identify who's authorized to make trades and under what circumstances? How do you monitor that? Inventory control is an issue. Sometimes putting on a trade at the front end is easy, but then keeping track of what you have can be difficult. Correlation and effectiveness testing is important.

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All these are issues that I categorize as dealing with compliance, making sure that you're doing what you're supposed to be doing. In a moment, I'll tell you how we have addressed this broad compliance area at Hartford.

Finally, with respect to reporting of derivatives, we have several different constituencies to deal with. First, there's the regulatory world. We now have an expanded Schedule DB in the statutory annual statement. I like to tell people that it provides all sorts of data but very little information. Those of you who are involved with stock companies probably have to file public statements with the Securities and Exchange Commission. That was a real interesting exercise for us this year, as we got to do some educating of the SEC, which is both good and bad. On the one hand, it gives you a chance to coach SEC members as they learn, which is good. On the other hand, you're also dealing with people who are nervous first and interested second, which is not so good. The SEC has really put the thrust of derivatives reporting on disclosure, on being able to convey, to the extent you're using derivatives, how you are using them. Quite frankly, they're imposing much more rigorous standards on disclosure for derivatives than on anything else in the company, which seems a bit unfair but it nonetheless may be appropriate. Rating agencies have also noticed derivatives and are now asking for a lot more information as well.

Internal management and boards of directors form another type of constituency. For these audiences you generally need to figure out how to report with pie charts and bar charts, because they tend to prefer pictures over numbers. Finally, there is risk-based reporting. Much of what we report to the outside and the inside is colorful but not particularly useful. How do you come to a more useful risk-based disclosure of derivatives? The answer, I think, is that you can't do it. You must look at your derivatives in the context of your overall assets and liabilities and do a full-fledged risk-based analysis that doesn't focus on the derivatives themselves but rather on the sources of net risk in your portfolio to see if they are adequately controlled or bounded.

Let me talk a little specifically about how we at ITT Hartford have addressed some of these issues. We have a policy statement in which the purposes of derivatives are clearly stated, in which we set out the approval process for the strategies we use, in which we define the position of a compliance officer, and in which we discuss the benefits of derivatives. For derivatives usage, our policy says that any derivatives transaction must satisfy at least one of three criteria. Probably the most sweeping and the most common criteria is that the transaction should manage surplus volatility arising from changes in interest rates, foreign currency, or equity risk. The other two criteria are to manage liquidity or to control transaction costs. We kept these fairly general. If you think about the different types of things you can do with derivatives, it's actually hard to conjure up something that wouldn't satisfy one of these.

We have chosen, for disclosure purposes, to break our strategies into four categories—anticipatory hedges, liability hedges, asset hedges, and portfolio hedges. Anticipatory hedges are probably the cleanest, plain vanilla type of hedge. A typical example would be buying a futures contract to lock in an interest rate on an investment purchase that you're expecting to make at some point in the near future. If you're at all active in issuing GICs or single-premium deferred annuities (SPDAs) or anything in which you've made a commitment in advance of receiving or investing funds, you may frequently want to hedge

off your interest rate exposure in this way until the funds are invested. Much of our derivatives activity is anticipatory hedging. We maintain a rolling book of hedges, which means there's generally a very constant amount there.

Liability hedges are derivative transactions that are specifically in place to modify the risk characteristics of a liability. For example, some of our insurance and annuity products offer long-term interest rate guarantees of 4% or 3%. We have, on occasion, purchased some interest rate floors to try to protect against a sustained dramatic decline in rates. Essentially, these hedges reduce the impact of long-term interest rate guarantees on our liabilities. There are many other examples for liability hedges. Asset hedges are those where there's a direct linkage between one or more derivative instruments and one or more cash instruments on the balance sheet. For example, you may buy a floating rate bond and enter into an interest rate swap to convert it to a fixed-rate bond. Finally, portfolio hedges are those that are not specific to an individual asset or liability but rather apply to an entire portfolio of assets and liabilities. It could be the purchase of interest rate floors as a general hedge against higher prepayment rates in a declining rate environment or the use of futures to adjust the duration gap between assets and liabilities.

The compliance officer is a position that we decided to add last year, and it was with a little bit of trepidation. The idea is to have an organizationally independent officer who's responsible for making sure that you do what you say you're going to do. We call him the hedge police. We say that jokingly, but our concern was that we didn't want to establish this position as someone who was going to come in and throttle down our derivatives activities or reduce our ability to make effective use of derivatives. Our compliance officer's primary duty is to review and coordinate strategy documentation and approval. Every derivative strategy that we use today has to be documented in advance, reviewed by tax and accounting personnel, and signed off on by the risk management people. This can easily turn into a time-consuming process, so we've put into place a process with our compliance officer that enables us to quickly do a brief write-up, run it up the flagpole, and obtain the necessary approvals.

The compliance officer's second role is trade review. He is responsible for reviewing every trade involving a derivative within 24 hours to make sure that it appears to be in conformance with the stated strategy and policy. To the extent that anything looks unusual, his job is to shoot up a flare and to speak to somebody about it. Many times it's just a misunderstanding; that is, he'll catch things that are fine, but we want that, too. We want somebody looking at these transactions critically to make sure that all the pieces are in order. The compliance officer is also responsible for what I call rudimentary position monitoring; for example, making sure that a bond and a derivative maintain appropriate linkages.

The compliance officer has independent reporting responsibilities. He is part of the investment operations and reports to the chief investment officer, but he reports independent of the trading and portfolio management group. Thus, he has no reporting lines to anybody who's involved in putting these derivative strategies in place. I think that from both a regulatory standpoint and a rating agency standpoint, just having this type of an internal compliance process has certainly been comforting. Even from an internal standpoint, it's good to know that there are people looking at these things.

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What are our benefits from using derivatives? Clearly, derivatives allow us to access a broader array of investment opportunities. Ten years ago you needed to look for assets that matched up well against your liability needs. You no longer need to do that. You can buy the asset sector that you think is cheap on a risk-adjusted basis, sell the product lines configured in a way that you think is most efficient, and use derivatives to bridge that gap. Derivatives also provide risk management efficiencies. It's easier and more efficient to adjust your duration by buying and selling futures than it is by buying and selling assets, particularly in a market where the supply of attractive assets has been very tight lately. You hate to part with something that has an attractive spread and is not in any distress but just happens to have some feature that doesn't meet your need of the day. Derivatives provide the ability to create customized assets and liabilities, with a special emphasis on liabilities. We can now structure insurance and annuity products in ways that are somewhat different and not particularly well aligned with any asset class and use derivatives to convert them into a very generic risk profile. The more you can differentiate your products in this way, the easier it is to compete on something other than just price. Finally, just having access to and understanding the derivatives markets gives you an improved understanding of capital market pricing relationships. By being able to price derivatives and understand how to use them you are better able to assess relative value in the capital markets. When you see a security with any sort of nonintuitive risk profile, you can use derivatives to price the cost of hedging out the risks and thereby discriminate between attractive and unattractively priced risks.

I'd like to close with some practical advice. First, don't transact if you don't understand. That one should be self-explanatory. Second, impose controls but remain flexible and nimble. You want to make sure that you're operating in a controlled environment, but the greatest opportunities in capital markets involve new and innovative uses of assets or derivatives that need to be acted on before the pricing advantage contracts. Third, be willing to learn by doing. In derivatives, as in just about anything, you seldom can really understand everything about what you're doing by reading or modeling alone. You have to be willing at some point to step up and get the money invested and learn by actually having to manage day by day. Fourth, accept mistakes as critical learning tools. Start small and make your mistakes early, when you can afford to regroup and go forward. Finally, commit appropriate resources. If your derivative activities are light, you probably don't need many resources. But you must be careful because derivatives are sort of like bacteria. Once they start, they tend to grow in your portfolio as you discover more and more opportunities to make efficient use of them. The key is to make sure that what's growing is not a bacterial infection but rather the good type of bacteria, such as the kind that makes yogurt.

MR. BOUSHEK: Our final speaker is Doug George. Doug is a partner with Avon Consulting Group. He has broad experience with asset/liability management and cash-flow testing, corporate modeling for financial forecasting and capital planning, company appraisals for mergers and acquisitions, and product development. Doug specializes in development and implementation of systems to perform financial analysis, including asset/liability strategies using derivatives. He will discuss the implementation of systems to monitor and manage derivatives and the types of analyses that these systems can perform.

MR. DOUGLAS A. GEORGE: As I look at the actuarial software available to develop an integrated system to manage and control derivatives, I have a number of concerns. First is the interest rate generation process. The processes that are available in many systems tend to be too simple to really pick up the nuances of options in particular. Second is asset modeling capability. The modeling for CMOs in particular is often very limited, and prepayment models can frequently be oversimplified. Third is computer run time, which is dependent among other things on the choice of programming language. Finally, there is the potential for consistency problems if the assets I'm creating in my actuarial software don't look the same under the analysis that my investment people are doing when they're trading the portfolio.

Similarly, as I look at available asset-management software I also have some concerns. Embedded liability modeling capabilities, when available, are generally very crude. Accounting capabilities critical to earnings projections and statutory surplus analysis are generally absent or lacking. Interactive asset/liability crediting strategies cannot be modeled in most systems, and few systems allow for future trading activity or new business growth.

More often than not, building a good derivatives monitoring system involves integrating existing asset/liability systems. At the core is a good option pricing model, where I tend to favor the models from Wall Street. I also need a good accounting model to do earnings analysis and basic reporting; here I more generally favor the actuarial models. Among the concerns in integrating models are the timing of projected cash flows in each. Some systems produce midmonth cash flows while others use the end of the month or even the end of the quarter. Interest rate definition may also be a concern. Some models use a spot rate, while others use bond-equivalent yields. As a practical matter, however, these and other concerns, including the challenge of establishing and maintaining linkages among the systems, are far outweighed by the advantages of an integrated system.

I've put together an example of integrated analysis for a SPDA portfolio. Chart 1 presents a price behavior curve for two SPDA products, one with a bailout provision and one without. The duration of each product is demonstrated by the slope of each line. Note that the SPDA with bailout has a slightly steeper slope, and thus higher duration, than the one without bailout. The curvature of each line indicates the convexity of each product. Note that the SPDA with bailout has somewhat greater curvature, and thus greater convexity, than the one without bailout.

Looking at my whole portfolio, I might get a picture that looks like Chart 2. Here we have both assets (the top line) and liabilities (the bottom line). The difference between the lines is economic surplus. Once again, duration and the convexity are demonstrated by the slope and curvature of the lines. In this example, the liabilities have a duration of 1.1, and the assets have a duration of 4.3. As you can see, to the right of the zero shift this can be a real problem. As interest rates rise, economic surplus disappears. The graph makes it easy to see this. The general idea with price curves is to line them up as best as possible, rebalancing assets, restructuring liabilities, or looking for hedges that soften your asset/liability risk.



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CHART 1  
SPDA PRICE CURVES

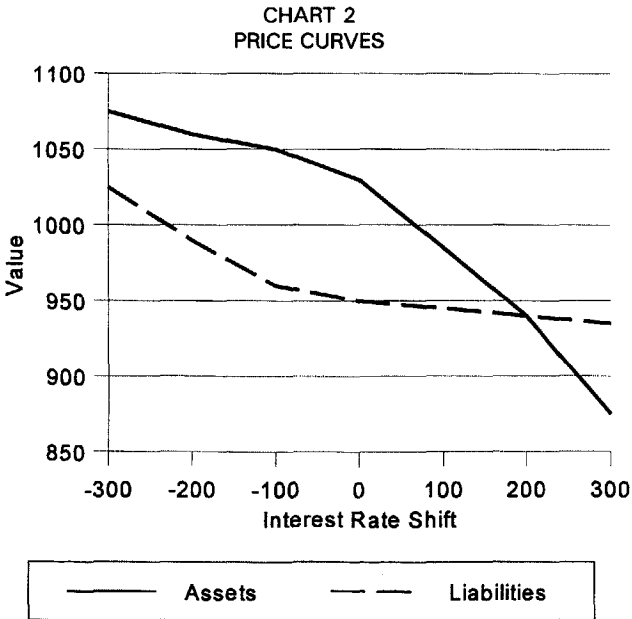
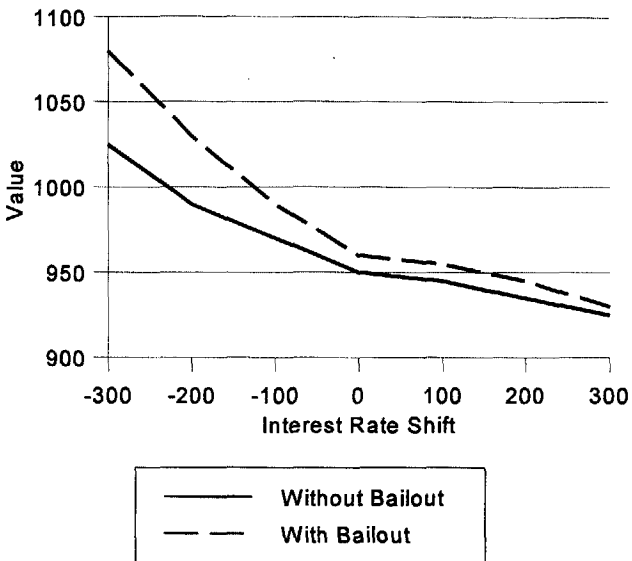
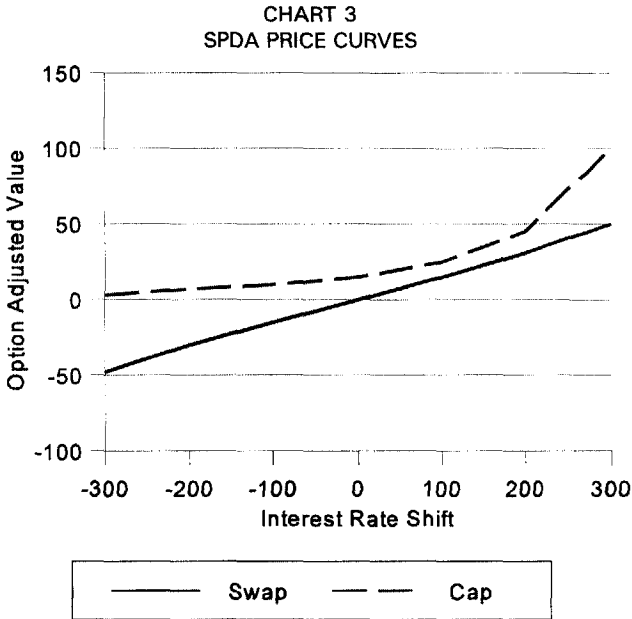


Chart 3 shows two hedges that can be used to help me fix, if you will, my asset/liability risk picture. One hedge—an interest rates cap—helps alleviate the convexity mismatch by

adding positive curvature to my assets. The second hedge—an interest rate swap—helps alleviate the duration mismatch by adding negative duration to my assets. Combining these, I can come up with an asset portfolio price curve similar to that in Chart 4. Clearly, price curve analysis shows me that I've successfully reduced my asset/liability risk to economic surplus. Unfortunately, I'm not sure if I've hedged at a profit. Also, I know that I've reduced my risk to parallel interest rate shifts, but what about my risk to nonparallel shifts?



Earnings analyses are a necessary complement to price curve analysis. So is key rate duration analysis. Key rate durations break down a parallel shift duration into the exposure at various points on the yield curve. Table 2 shows a key rate duration analysis for our (presumably) hedged asset/liability portfolios. Note the mismatches at the various points on the yield curve. Despite our earlier efforts, a steepening or flattening of the yield curve could have a significant impact on both our price curves and economic surplus.

Another approach for evaluating various derivative strategies is efficient frontier analysis. In Chart 5, each point represents a different derivative strategy. Strategies 2, 5, and 3 in this diagram comprise the efficient frontier. These are my optimal points for a risk/return tradeoff. Strategy 2 would be the most hedged position, because I have a very small standard deviation of return on investment (ROI) over different stochastic scenarios. However, this strategy also gives me the lowest expected ROI. Strategy 3, on the other hand, would give me the highest expected ROI, but it would also have the most risk. That would be my least hedged position on the frontier.

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CHART 4  
PRICE CURVES

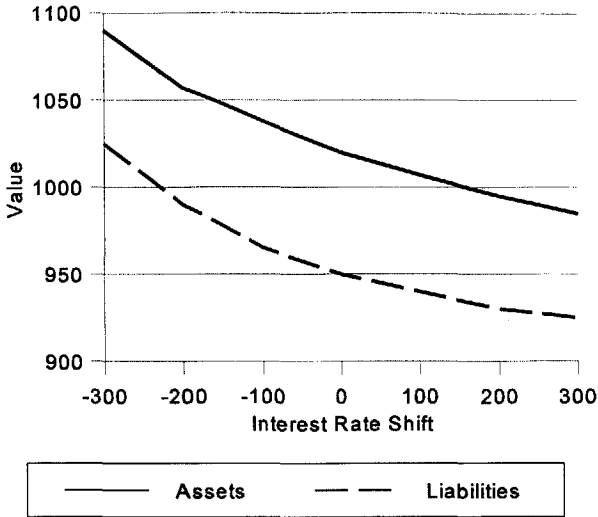


TABLE 2  
KEY RATE DURATION ANALYSIS

Shift	SPDA	Portfolio	Mismatch
Effective	1.84	1.84	0.00
1 year	0.07	0.67	0.60
3 years	0.29	0.18	-0.11
5 years	0.83	0.14	-0.69
7 years	0.97	0.22	-0.75
10 years	-0.43	0.42	0.85
20 years	0.11	0.21	0.10

CHART 5  
MEAN/VARIANCE ANALYSIS

