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COURSE 230 "LITE": A "LESS FILLING" OVERVIEW OF THE FELLOWSHIP EXAM ON PRINCIPLES OF ASSET/LIABILITY MANAGEMENT

Instructors: CHERYL A. KRUEGER
WARREN R. LUCKNER
Recorder: WARREN R. LUCKNER

During the past several years, the Fellowship syllabus has been strengthened with a number of exams on investment and finance topics. This teaching session will introduce Course 230 to "seasoned" actuaries who missed the opportunity to study this material on their road to Fellowship. Topics include asset management and tools and techniques. Given the time frame, the focus of this session will be only to expose the various subjects covered, identify reading materials, and highlight a few topics. No pop quizzes, we promise!

MR. WARREN R. LUCKNER: Cheryl Krueger is a consulting actuary with Tillinghast in Chicago, and I am a research actuary on the staff of the Society of Actuaries. First, I want to comment upon the content of the program. This is fairly elementary. We will mostly give an overview of some interesting concepts that might be challenging to think about. The key to the content of this session is in the sentence: ". . . the focus of this session will be only to expose the various subjects covered, identify reading materials, and highlight a few topics." I will be the one who's exposing the subjects and identifying and highlighting the reading materials. Cheryl will discuss one of the topics in more depth.

I'd like to review and give some rationale for why the Society of Actuaries has a course such as 230. Consider the mission statement of the Society of Actuaries. The SOA is an educational, research and professional membership organization whose purposes are to promote high standards of competency and conduct among its members and to advance the state of actuarial science. Members of the Society of Actuaries, who currently practice primarily in the areas of life insurance, health and retirement systems, and investments in the U.S. and Canada, are skilled in the evaluation of contingent events, in structuring models to describe and measure risk, and communicating the resulting implications. Representing its members, the SOA is a part of the worldwide actuarial profession.

Traditionally, actuaries have been well known, and considered expert, with respect to liability calculations and management. Recently, we've become aware that there's some need to look at asset quantification and management, and what's more important is to look at assets and liabilities together. And that's what 230 is a first course in: asset and liability management.

The list of primary areas of practice of SOA members includes investments. That's another reason why the SOA is starting to do more with investments. There is a finance specialty track in the SOA Education and Examination system. Also, a recently approved investment track will become operational beginning with implementation of a new course this fall. We anticipate that the first people to go through the investment track will come out of the Fellowship Admission courses in the spring of 1996.

Finally, I would note "structuring models to describe and measure risk." That's generally what we do in all our actuarial work: describe and measure risk. There is risk with assets, liabilities, and the matching of assets and liabilities.

The SOA Planning Committee, of which President-Elect Sam Gutterman is the chairperson, is considering what type of organization the Society of Actuaries is or should be. As part of that consideration, there may be a restatement of the mission statement. A few specific issues have arisen. The mission statement references U.S. and Canada, but there is a significant SOA membership in others parts of the world. How do we service those members with education, research, and membership services? Second, perhaps we shouldn't specify any particular practice area, because it may preclude consideration of applying actuarial techniques in other practice areas. You will be hearing more about the restatement of the mission statement.

You may recall that a couple of years ago there was a contest to select a new motto for the Society of Actuaries. And, of course, the old motto won. It's a good motto in that it applies to all science: "The work of science is to substitute facts for appearances and demonstrations for impressions." I suspect what concerned some people and was part of the motivation for having this contest is that the motto doesn't suggest anything that's unique about actuarial science compared with other sciences.

I like one of the candidates for a new motto: "The work of an actuary is to identify, quantify, and manage risk and uncertainty to the benefit of society." "Society" can be the policyholders of an insurance company, the stockholders of an insurance company, the participants in a pension plan, or the general public. Traditionally, actuarial work has focused on quantifying the risk. As the scope of actuarial activity broadens, the work of the actuary might include identifying and managing risk. The statement is good in that it's general enough to allow for new applications of actuarial techniques, yet specific enough to suggest a particular, unique expertise.

Now, I'll first give you a general overview of the topics covered on 230. Then I will go into a little more detail by highlighting some of the main ideas in each of the readings. There are three categories of topics in Course 230: asset management; pricing, valuation, and product design issues; and tools and techniques.

In asset management there are several references: three chapters from *Managing Investment Portfolios: A Dynamic Process* by J.L. Maginn and D.L. Tuttle (2nd ed. Boston, MA: Warren, Gorham & Lamont, 1991), which is also in the Chartered Financial Analyst (CFA) course of reading, and three study notes. The chapters in the Maginn and Tuttle text cover the issues of investor objectives, portfolio monitoring and rebalancing, and construction and evaluation of the performance of equity portfolios. The first two study notes cover foreign investment and currency management. The third covers defaults and return on high-yield bonds.

Under pricing, valuation, and product design issues, there's currently only one reading. It's a case study of the immunizing investment for the insurance liabilities that result from single-premium deferred annuities (SPDAs). It was a study note that was developed by staff at Morgan Stanley.

Three texts are listed in the tools and techniques section. A chapter from the Maginn and Tuttle text covers fixed-income portfolio construction. Three chapters from *Investments* by Z. Bodie, A. Kane, and A. Marcus (Burr Ridge, IL: Richard D. Irwin, Inc., 1993) cover the topics of option pricing and futures. The *Handbook of Fixed-Income Securities* by F.J. Fabozzi (Burr Ridge, IL: Richard D. Irwin, Inc., 1993) covers the topics of option-adjusted spread analysis and interest swaps. The final reading is the study note 380-24-92 "An Actuarial Layman's Guide to Building Stochastic Interest Rate Generators" by Jim Tilley. It is a paper published in the *Transactions* [XLVI, 1992, p. 509] that won the annual prize for papers.

Now I'd like to highlight each of the readings. Chapter 4 from the Maginn and Tuttle text covers portfolio policies. One of the key developments in this reading is the discussion of the building blocks of an investment policy, which is necessary before constructing and managing the portfolio. The first building block is to identify the investor's objectives with respect to risk and with respect to return, recognizing that there's a risk and return tradeoff in virtually any investment.

Next is consideration of the constraints for the investor. Different investors have different liquidity requirements. The time horizon may be important, depending upon the investor. There are taxes and other regulatory and legal considerations. Finally, there are unique needs, circumstances and preferences, depending upon whether the investor is a bank, a life insurance company, a casualty insurance company, or a pension fund. After all these issues are considered, you're ready to establish the investment policy to meet the objectives, given the constraints.

Chapter 9 of the Maginn and Tuttle text is titled "Equity Portfolio Management." One of the main points it makes is about portfolio optimization. Some of you may be aware that studies have indicated that the most important investment decision is the allocation among the various asset types. Stocks, bonds, and cash are the main categories. It has been estimated that 80–90% of the return results from the decision about the allocation. Once that decision about allocation has been made, an important decision to make is how to structure the portfolio for each of the asset types. This chapter addresses those issues for a portfolio of equities.

With respect to any portfolio, there's the question of active management, passive management, or some combination. Historically, there has been some thought that excess returns result from active management because of a superior selection of individual stocks. Unfortunately, most of the research indicates that active management barely meets the cost of such management. So passive management or index funds have become popular, particularly with institutional investors in the late 1980s.

Chapter 13 of the Maginn and Tuttle text covers the important issue of monitoring and rebalancing the portfolio. You don't just establish the portfolio and then leave it the same for all time, because that ignores the uniqueness of each client. The client's risk aversion or preferences may change over time, as may the economic, the political, and the regulatory environment. So it's important to monitor and rebalance the portfolio to meet the objectives of the established investment policy.

Study Note 230-25-93, "Currency Exchange Rate Forecast and Interest Rate Differential" discusses studies that have considered the conventional wisdom that as the interest rate

differential between two countries increases, the currency of the country with a higher short-term interest rate appreciates relative to the other currency. If that's not true, then there's no merit to investing in currencies as a separate asset class. The studies that have been done have not been able to refute this conventional wisdom. That suggests to the author that foreign currency can be a highly desirable asset class in and of itself. It is, he claims, the most liquid asset class, with $1 trillion in trading. The study note also goes into alternative ways to construct a currency portfolio that might give excess return from this asset class.

In Study Note 230-26-93, "Investing Abroad: A Review of Capital Market Integration and Manager Performance," covering investments internationally, the key issue underlying the discussion is the question of market efficiency. You may be familiar with the three versions of the efficient market hypothesis: weak, semistrong, and strong. The weak, efficient market hypothesis suggests that any past information is reflected in the current prices of stocks, and there's no merit to using technical analysis to suggest future value. The semistrong statement of the hypothesis is that *all* publicly available information is automatically reflected in the stock prices, and there's no additional excess return that results from active management. The strong form of the efficient market hypothesis suggests that public and private inside information is reflected automatically and instantaneously in stock prices. So there's no excess return possible beyond that from a fund that reflects the market.

There are a number of anomalies that contradict the efficient market hypothesis. For example, there is the January effect, the day-of-the-week effect, and the small-company effect, which suggest that there are excess returns from certain strategies relating to January, the day of the week, and small companies. The study note makes the case that there are some inefficiencies in markets across borders, and therefore, there is excess return that can be obtained from investing across borders.

Ed Altman has done a lot of work on defaults and returns on bonds. Study Note 230-27-94 "Defaults and Returns on High-Yield Bonds: Analysis Through 1992" is a recent extension of some of his previous work. The results suggest a significant difference between the 1991 and 1992 experiences. Some think we're returning to what's called normalcy in the high-yield bond market. However, if you consider his definition of default losses to be reasonable, the 1.9% for 1992 is still higher than the spread received on high-yield bonds, although 1.9% is much better than the 7.2% in 1991.

Study Note 230-22-91 "Finding the Immunizing Investment for Insurance Liabilities: The Case of the SPDA" is the only reading for the topic of pricing, valuation, and product design issues. The study note defines immunization as the market value of the assets tracking the market value of liabilities as interest rates change, so that the investor is not affected adversely by interest rate changes. The study note discusses two strategies for immunizing the profitability of the SPDA: constant maturity and duration matched. Duration is somewhat of a misnomer. In this context, duration is the sensitivity of price to a change in an interest rate.

Chapter 8 of the Maginn and Tuttle text covers portfolio construction for fixed-income securities. The two dominant themes are the characteristics of fixed-income investments and the procedure for portfolio construction. One of the advantages of fixed-income

portfolios is that they bridge the return and risk characteristics between cash equivalents and stocks while offering special features not found in either.

Chapter 19 of the Bodie, Kane, and Marcus text introduces options. An important relationship is put/call parity; that is, parity between the pricing of "put" and "call" options. If violated, there are arbitrage opportunities. An arbitrage opportunity is to effectively have a zero net investment and make a profit. If investors start taking advantage of such opportunities, eventually they'll disappear because of the action of the market.

Chapter 20 of the Bodie, Kane, and Marcus text covers option valuation. A key concept is that the value of an option is equal to the intrinsic value, which is the stock price minus the exercise price, plus the time value. Note that this is not the familiar time value of money, but the value that results from the time to expiration.

Chapter 21 of the Bodie, Kane, and Marcus text discusses the futures markets. Forwards and futures are very similar. The main distinction is standardization and the "marking to market" of the futures market. The distinction between futures and forwards and options are more substantive. Options are a right to exercise that which does not have to be exercised. Futures and forwards require fulfillment of contract obligations at a future date. There is a "spot/futures parity" equation. "Spot" means the cost if you purchased now. "Futures" means the cost if you agree to buy sometime later. Again, if this parity is violated, an arbitrage possibility exists.

Chapter 29 of Fabozzi's text covers option-adjusted spread (OAS) analysis. This is the topic that Cheryl will be talking about in some detail.

Chapter 30 of Fabozzi's text discusses option-adjusted spread and effective duration. Some bonds, such as callable bonds, have embedded options. There is a problem in terms of how to value such a bond because of the uncertain maturities that are dependent upon the level of interest rate, the exercise price, and the market price. The option-adjusted spread is a measure that accounts for the value of special features, and the effective duration is a measure of the price sensitivity, accounting for such features.

Chapter 57 of Fabozzi's text covers interest rate caps, floors, and compound options. A key concept is that the result is asymmetric interest rate risk management, because there's upside potential and a limit on the downside risk. However, there are costs involved.

The last reading is Tilley's paper. There are two environments that he discusses. Arbitrage-free settings are important when pricing interest-rate contingent cash flows, and "real-world" settings are important when considering the risk and reward trade-off.

Now Cheryl will share her remarks.

MS. CHERYL A. KRUEGER: There are several reasons why I'm here. I think I took this examination when it was V380. I became a member of the Examination Committee when it became a core examination (230). And finally, it was the only way Warren could get me to class.

I'm going to go over a sample problem from a recent examination. Your handout has a question from an old V380 examination. I want to use it as an example, because it's

fairly straightforward. You'll notice that it's a four-point question, and you normally assume about three minutes per point when taking an actual examination. So it's a twelve-minute question. If you get started now, you ought to be done in about 12 minutes, right? But first, I want to review the concepts behind this question.

Warren mentioned that there are differences between option-adjusted spread analysis and traditional yield analysis or traditional spread analysis. Going back to traditional yield calculations, when you say that a bond is yielding 7% or 8%, what does that mean if the coupons are 6% or 10%? Yields for bonds are traditionally calculated in terms of a yield to maturity (YTM) or a yield to the first call date. And then a number may be quoted, which is called the yield to worst, which is the lower of those two yields. And depending on where you're at in terms of current interest rates, the lower yield could be one or the other.

For the traditional yield analysis, take the present value of the future payments and discount at the yield rate that gives a present value equal to current market value of the bond (or whatever asset you're looking at). For example, consider a five-year callable bond with a thousand-dollar par value. Assume that it's callable in three years for the par value, which means that in three years if the company that issued the bond can finance debt at a lower interest rate, it is able to pay you the par value and any interest that it owes you and go find financing somewhere else.

EXAMPLE 1
5-YEAR CALLABLE BOND, $1,000 PAR
CALLABLE IN 3 YEARS FOR PAR VALUE
ANNUAL COUPONS AT 7%
CURRENT MARKET VALUE: $960
YIELD TO MATURITY: 8%
YIELD TO FIRST CALL: 8.56%
YIELD TO WORST: 8%
EXTRA RETURN OVER TREASURIES IS CONSIDERED THE "SPREAD"

The coupons are at 7%, and assuming annual coupons, a $70 coupon is paid at the end of each year. The current market value is $960. All we need to do to calculate the yield to maturity is solve for an interest rate such that the present value of the future payments (coupons and maturity value) is equal to $960. If we assume the maturity date five years from now, the interest rate that discounts to the market value is 8%. To calculate the yield to first call, rather than waiting for five years to get our principal back, we get it back in three years. So we discount over three years and assume that after that we get the par value and no more coupons. If we solve for an interest rate to calculate that present value, it would be 8.56%. By definition, the yield to worst would be 8%. In this interest rate environment, where interest rates are higher, it is less advantageous for us to be stuck with an 8% investment.

Then, we compare the yield with a Treasury curve to calculate the spread over treasury. We compare with a five-year Treasury because it's a five-year asset. If the treasury is at 7.75%, the extra return over the Treasuries is 25 basis points, or .25%, and that is our spread (under the traditional method). Are there any questions so far?

FROM THE FLOOR: How is this different from Course 140?

MS. KRUEGER: Not very different at all. This is mainly background so far. I wanted to review the traditional method and compare it with the option-adjusted method. Also, as Warren mentioned, problems with the traditional analysis include that it ignores the term structure of interest rates. In other words, it ignores the fact that the cash flow of $70 that you get a year from now should probably be discounted at a one-year rate, and the cash flow you get five years from now should probably be discounted at a five-year rate. That is totally ignored in this yield-to-maturity calculation.

Also, the choice of the comparable Treasury may be arbitrary or even misleading. What if the bond doesn't have characteristics similar to a Treasury? For example, this is an annual coupon bond; a Treasury would be a semiannual coupon bond. It also ignores the effect of interest rate volatility that certainly is present in the market on securities with interest-rate-contingent cash flows. For example, when we're calculating the yield to worst, the interest rate environment is such that our lowest return is if we have the asset out there for five years. We certainly know that interest rates are going to change between now and three years from now. That's really not taken into account; we're looking at one point in time to make the measurement.

Now we're getting to what actually would be the focus in the examination material, which is option-adjusted spread analysis. Example 2 shows the same bond with a Treasury yield curve including a one-year rate at 5% and a 5-year rate at 7.75%. Here, we do the discounting of our cash flow by using the time-adjusted yields. In other words, we discount the first cash flow of $70 at the one-year rate, plus a spread, which is our option-adjusted spread. And then we discount the second cash flow at the first-year rate and the second-year rate and calculate our present value on the basis of the different timing of the cash flows that we're going to receive.

EXAMPLE 2
OPTION-ADJUSTED SPREAD ANALYSIS
CONSIDER SAME EXAMPLE BUT WITH
THE FOLLOWING TREASURY
(RISK-FREE) YIELD CURVE:

- 1-YEAR: 5%
- 2-YEAR: 5.75%
- 3-YEAR: 6.25%
- 4-YEAR: 7.25%
- 5-YEAR: 7.75%
- $MV = 70/(1+.05+s) + 70/[(1+.05+s)(1+.0575+s)] + \ldots$

The attractiveness of interest-rate-contingent decisions may also be taken into account in the discounting.

If we know the option-adjusted spread, our market value (*mv*) equals the discounted value of the payments. When you have a market value that's changing constantly, you don't always know what the option-adjusted spread is. So the problem becomes kind of the inverse: from what is our market value to what is our spread? So what is the technique to calculate the spread? Basically, we calculate the spread by generating a lot of interest rate scenarios. Then we discount cash flows (as shown in the example) at each point *t*. And

over the average of multiple scenarios, we calculate s, so that the average present value under all the interest rate scenarios is equal to the current market value.

The option-adjusted spread approach takes into account that interest rates are going to change. Depending on what the interest rate is four years from now, maybe the issuer will skip its option in three years, but four years from now the interest rate will be such that it will want to call. This method takes into consideration that those calls are going to happen at different times, depending on what the interest rate looks like in each scenario that has been generated. So when you're calculating present values, you take into account the interest rates and when the call is likely to happen, which isn't possible under the traditional methods of calculating spreads.

In summary, you can think of a traditional spread as the spread off of a single point on the Treasury curve. The option-adjusted spread is the average spread over the entire Treasury yield curve.

SAMPLE QUESTION: OPTION-ADJUSTED SPREADS
(4 POINTS) XYZ ISSUED FIVE BONDS ON JUNE 1, 1989

BOND NAME	TYPE	SALES PRICE	COUPON	TRADITIONAL SPREAD OVER TREASURIES	OPTION-ADJUSTED SPREAD
A	Callable	$103	9.50%	1.80%	1.43%
B	Noncallable	107	9.75	1.80	1.74
C	Noncallable	109	9.50	1.63	1.43
D	Noncallable	103	9.50	1.80	1.67
E	Noncallable	103	9.75	2.35	1.87

These bonds are identical in all other respects.

(I) Discuss the differences between a security's traditional spread over Treasuries and its option-adjusted spread over Treasuries.

(II) Outline the process for determining the option-adjusted spread over Treasuries.

(III) Calculate the cost of bond A's call provision in terms of price and spread.

SOLUTION

(I) Differences in the Traditional Spread and the OAS

1. Traditional Spread over Treasuries

A security's traditional spread over Treasuries equals the difference in the yield to maturity (YTM) of the security and the YTM of a "comparable" Treasury.

It ignores the term structure of interest rates, as the same discount rate is used to discount cash flows at different points in time.

It also ignores the effect of interest rate volatility on securities with interest-rate-contingent cash flows.

The choice of comparable benchmark Treasury against which the security's yield is compared can be arbitrary and/or misleading. For example, a zero-coupon, 10-year bond and a coupon-paying, 10-year bullet bond would be compared with the 10-year Treasury, although the cash-flow patterns of the two securities are very different.

2. Option-Adjusted Spread

The OAS measures the extra return a security provides to an investment in Treasuries (which is assumed to provide the risk-free rate of return) after factoring out the effects of interest rate volatility on the security. Alternatively, the OAS can be thought of as the average incremental return over Treasuries after factoring out the effects of embedded options.

Interest rate volatility is factored into OAS by allowing random fluctuations in discount rates and, for interest-rate-contingent cash flows, calculating the security cash flows separately for each interest rate path.

The traditional spread is a spread off a single point on the current Treasury curve. The OAS can be viewed as an average spread over the whole Treasury curve.

For securities with fixed cash flows, the OAS is typically very close to the traditional spread.

(II) Process for Determining the OAS

Specific steps in process:

1. Randomly generate a sufficient number of interest rate paths.

2. Calibrate paths so that "on-the-run" Treasuries have an option-adjusted spread of zero.

3. Project cash flows for the security along each interest rate path, taking into account the interest-sensitive nature of its cash flows.

4. For a chosen incremental spread over Treasuries, determine present values for the cash flows along each interest-rate path by discounting by the short-term Treasury rate along the path plus the spread.

5. The average of these present values over all possible interest rate paths is the theoretical security value corresponding to the given spread over Treasuries.

6. Find the incremental spread over Treasuries that makes the average present value of the security equal to the market price of the security. This is the option-adjusted spread.

(III) Option Costs

1. Callable bond = Implied Noncallable Bond − Call Option

   The cost of the call provision, the "option cost," can be found by recognizing that the callable bond consists of an "implied noncallable bond" (a noncallable bond that is otherwise identical to the callable bond) and a call option owned by the issuer of the bond.

2. Therefore, Option Cost = Implied Noncallable Bond Price − Callable Bond Price where the price of the implied noncallable bond and the callable bond are based on the same OAS.

3. Callable Bond (bond A) = $103 with an OAS of 1.43%

   Bond C can be treated as the implied noncallable bond, for it is identical to the callable bond in all respects except for the call provision and has the same OAS as the callable bond. Its sale price was $109 with an OAS of 1.43%.

4. Option Cost = $109 − $103 = $6

5. The option cost in spread terms equals the difference between the OAS of an implied noncallable bond with the same market value as that of the callable bond and the OAS of the callable bond.

6. Here bond D can be treated as an implied noncallable bond that is identical to the callable bond in all respects except for the call provision and has the same sale price as the callable bond. Its sale price was $103 with an OAS of 1.67%.

7. Option Cost = 1.67% − 1.43% = 0.24%

Part C of the question addresses some of the numerical aspects of the material. I'll go through the solution to give an idea of the concepts being addressed by the question.

The price that the issuer is paying to have the option of calling the bond is the options cost. To calculate the options cost, you calculate the OAS of a callable bond. Use the option-adjusted spread to find the implied value of an otherwise identical noncallable bond, and the difference is the option cost in dollars.

For this example, we calculate the option-adjusted spread of the callable bond (bond A); the option-adjusted spread is 1.43%. We use that to find the implied value of the otherwise identical callable bond. When you look at the possible solutions to the problem, the 1.43% also appears under noncallable bond C. The difference is the option cost. So when we calculate the cost of bond A's call provision in terms of price and spread, we

can compare the prices of the noncallable bond C with the callable bond A, and we find that the option price is $6. The cost (in dollars) of the ability to call the bond is $6.

To calculate the cost in terms of spread, we just go backwards by using the same approach and a different bond. We calculate the option-adjusted spread of a noncallable bond by using the price of the callable bond. So now, notice that the price of bond A is $103. To calculate the option-adjusted spread, we look at the noncallable bonds and find that there are a couple of them (D&E) that have the same price as our callable bond. But we want the bond to be otherwise identical. So we look for a coupon rate that's the same as it is for bond A. And that would be bond D. And we would find (in terms of spread) that the option cost is 0.26%.

That's one sample question, and I realize I very quickly went over the types of things that might be covered on a problem in Course 230. Do you have any questions?

FROM THE FLOOR: There weren't any scenarios presented to calculate the option cost.

MS. KRUEGER: Everything has already been calculated in the question. So there's not a whole lot of math here.

MR. JEREMY J. BROWN: When you put up that formula on the option-adjusted spread, you divided the second-year cash flow by the Treasury yields. Is that really exactly right?

MS. KRUEGER: It would be a forward rate.

FROM THE FLOOR: Okay, but that isn't what you used in the example.

MS. KRUEGER: They should be forward rates.

MR. LUCKNER: The Course 230 topics relate to the idea that the work of an actuary is to identify, quantify, and manage risk and uncertainty to the benefit of society in several ways. First, consider the topic of option-adjusted spread. I view that as a measure that helps identify the value of what is received on an investment. The traditional spread is a measure of compensation received for taking on the additional risk of an investment that is not a risk-free investment; that is, a measure of the reward received for the risk taken. The option-adjusted spread provides some better features than the traditional spread to more appropriately measure or quantify the risk, because some assets have embedded options that have value.

MS. KRUEGER: I would add that this part of the material is a building block for doing more option-adjusted analysis, in terms of pricing. For example, I've rarely looked at one specific bond and calculated its option-adjusted spread. But the approach that's used and the basics of how you would calculate the option values are helpful as a building block.

When you get into option-adjusted analysis of a portfolio, either on the liability side or the asset side, you're probably not going to use this specific treatment for one specific bond. But in terms of calculating the values over a group of scenarios and doing some discounting and saying, for example, on our SPDA we are paying something to let the policyholder have the option of surrendering at book value, this is a real foundation for the type of analysis that you get into in asset/liability projects.

MR. LUCKNER: That's a good point. There was a research project that studied the SPDA experience on lapse. It may be helpful to have that kind of measure of the impact of people withdrawing and compare that to what you need to have with offset the lapse experience.

Continuing with our analysis, consider the topic, "Determination of Portfolio Policies: Institutional Investors," are we talking about identifying, quantifying, or managing risk? When you're talking about portfolio policy, what you're really doing is identifying the risk. You're saying: "This is what I want to do with my investments, based on the return I want and the risk I'm willing to take."

What about equity portfolio management? Simplistic point of view: management in title means managing risk. Is that what is happening? In a sense, yes, because the institution constructs a portfolio that is intended to meet the objectives, based on the risk and return profile. And that's managing the risk.

What do you think about defaults and returns on high-yield bonds?" Considering the analysis presented, what is being done in that kind of study? It's quantifying the risk of investing in high-yield bonds. Two measures that are used are the incidence, the default rates, and a basis-point loss measure, which incorporates incidence and a measure of the economic loss.

I'll do one more. Study Note 230-22-91 "Finding the Immunizing Investment for Insurance Liabilities: The Case of the SPDA." The case study is essential to what the SOA is trying to do with Course 230 as a starting point: asset and liability management. This is a case study of the immunizing investment for insurance liabilities. Is that identifying a risk? Is it quantifying a risk? Is it managing a risk? In some sense it may be doing all three. Ultimately, the important thing is managing the risk through setting up a way for the assets to track the liabilities, so the risk of a mismatch is eliminated or minimized.

FROM THE FLOOR: Could you say more about the new investment track?

MR. LUCKNER: Efforts to enhance the investment education of actuaries began in 1989 with Greg Carney as chairperson of a task force. It ultimately resulted in a finance track in 1993. The finance track was described in *The Actuary* this past February (1995). The finance track emphasizes financial management and reporting. The recently approved investment track, which overlaps the finance track, requires only one new course; the other courses already exist as electives in the current structure. The new course is an applied asset/liability management course. That will be offered in the fall.

As with any other track, the investment track includes 90 credits of required courses and 60 credits of electives.

In closing, I believe both the investment track and the enhancement of investment education reflect the commitment of the Society of Actuaries as a professional association in support of its members, to continue to develop opportunities for new areas of application of actuarial techniques as well as educate individuals in the areas in which an actuarial background can perhaps add value.