1996 VALUATION ACTUARY SYMPOSIUM PROCEEDINGS

SESSION 10

Liability Modeling I -- Annuity Products

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LIABILITY MODELING I -- ANNUITY PRODUCTS

MS. MEREDITH A. RATAJCZAK: This teaching session will look at annuity model building and both consultants and company actuaries will discuss their experiences. Mike Murphy will discuss the key aspects of identifying and gathering the data required to construct models and develop assumptions. Mike is a managing director in the SS&C Consulting Group. He is responsible for the direction and management of complex financial consulting engagements, and helps clients understand the conditional value of their firms. He is also responsible for the recruiting, development and support of the professional staff.

Greg Mateja will discuss the actual modeling process, focusing on objectives, constraints, considerations and validation. Greg is assistant vice president and director of individual life and annuity actuarial at ITT Hartford Life. His current responsibilities include testing, review of investment strategies, strategic planning, acquisition analysis, expense management, product review and valuation. Illustration actuary responsibilities have also recently been added to that list.

I will briefly talk about policyholder and company behavior and their significance from a model-building and assumption-development standpoint. I will spend the majority of my time talking about a case study that I put together involving a real block of deferred annuity business. This case study was developed to show the potential impact on cash-flow testing results when you modify your model slightly. I am a consulting actuary with Milliman & Robertson, and these days I'm somewhere between Philadelphia and Hartford, Connecticut. I will be relocating to Hartford, and at that time I will continue to work with clients on cash-flow-testing, appraisals, GAAP valuation, product development, and illustration actuary assignments.

Our session is titled Liability Modeling I -- Annuity Products. We will talk about model building in general terms, but where we can, we will also talk about specific products, characteristics and

considerations for specific annuity product types, such as immediate annuities and market-value adjusted (MVA) products.

MR. MICHAEL J. MURPHY: I am going to focus on more generalities, on model structure, and on the process of building models. There are four major points I want to cover: model purpose, model structure, data collection and behavioral models. Most of you already have a model purpose and have models in house, primarily for valuation actuary and cash-flow testing. That is all well and good. However, those models need to be expanded and used throughout the company for other purposes, whether it is strategic analysis for investment strategies, duration and interest rate risk analysis or value-added analysis. Greg plans to talk more about uses of models and the model purpose, so for the moment, I am going to assume that we have a model in place and have already defined the purpose.

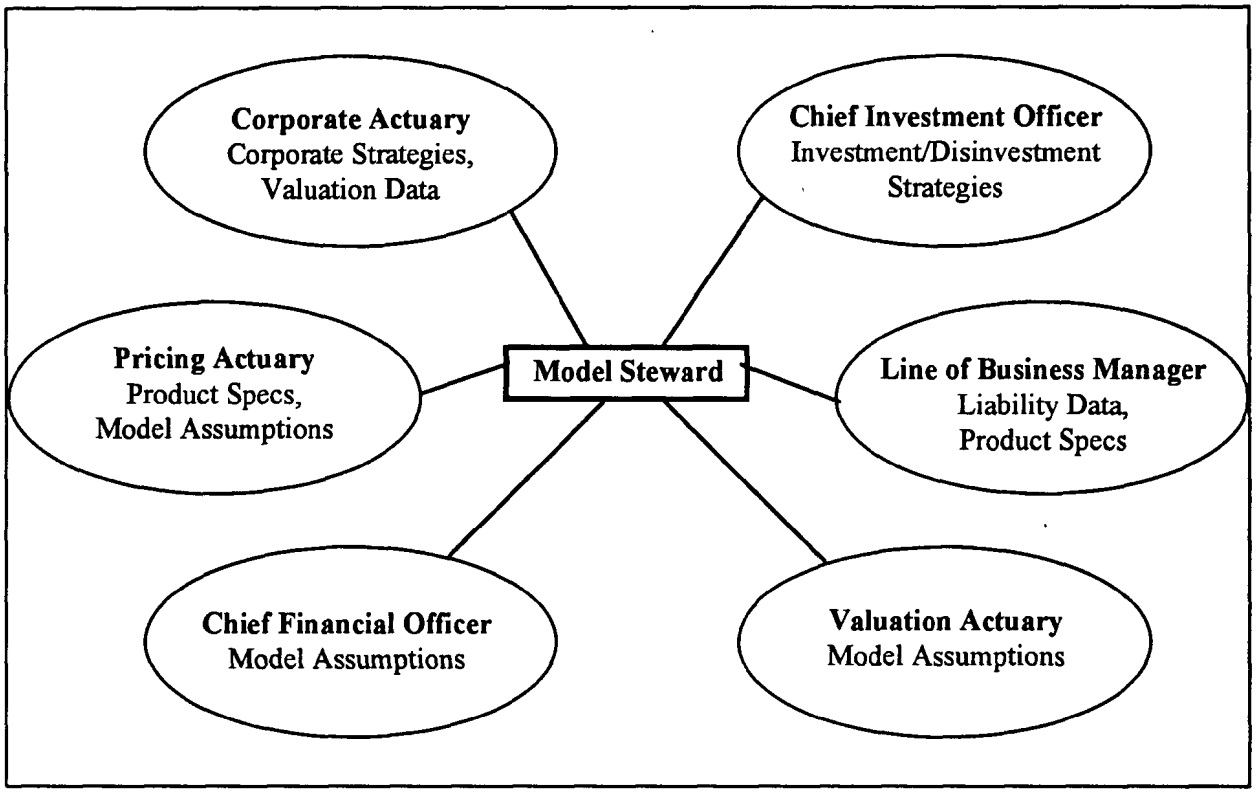
Moving on to the model structure, the first thing I want to do when I am setting up a model is to designate a model steward, someone that is going to be accountable for getting this model in place and communicating with the various departments that need to be communicated with, to pull in assumptions and have those departments build models for their individual lines (Chart 1). In addition, this model steward is going to be accountable for getting the projection system in one spot. I recommend putting the models on a company network and allowing access to everybody, including senior managers. There might be some security issues that can be dealt with through read-only access.

As far as where the system should be, I again recommend putting this on a network. I find it is important to have one uniform system and that system would be continuously updated as new systems came out, as modifications are made for the particular company, as certain system fixes are made by the supplier of the system. In addition, all the data files will be in central locations, so any models that are being run will be using consistent information throughout the firm. In addition, I like having this system and the one model available to senior managers, because we are all computer literate now and systems are becoming more user friendly. Systems are generally in Windows now and it is very easy to get access to them. As senior managers, I think it is

important to be able to load up the model, look at the model, and understand what is going on. This model is being used to drive your business and you should have an understanding of it.

CHART 1

Modeling Process



In addition, as far as model hierarchy goes, I think we need to take a more intuitive approach (Table 1). As managers we think from the top down rather than bottom up. I think the more traditional approach of building models from the bottom up is a thing of the past. It is not bricks and mortar anymore. I think it is a better approach to think top down. What does our company look like; what is the structure of our company; where can we add value; where can we add lines or subtract lines; and where can we focus the capital?

With a top-down approach then, we would start with the corporate segment. The corporate segment acts as a banker, managing the transfer of funds between the other business lines, managing the surplus accounts, managing the major accounting issues such as the asset valuation reserve (AVR),

interest maintenance reserve (IMR), risk-based capital (RBC), and the tax implications. Then, as surplus is available, this money is sent to corporate shareholders or for other capital needs.

TABLE 1

Model Hierarchy

Company	Model
Corporate	Corporate Segment
UL	Segment
SPDA	Segment
SPDA - Agency	Population
SPDA -- Bank	Population
SPDA -- 1	Plan
M45N	Cell
M65N	Cell

Below the corporate segment we will define the various business units. These units are generally defined by current internal reporting mechanisms. What sort of reporting systems do we have now? If we build a model that follows those, do we have some independent reports we can compare to, whether it is the ledger system or whatever it might be. If these various segments operate as profit-and-loss units, we would want to build our model to reflect this, having the right amount of surplus maintained in these business units, and the right accounting for assets and liabilities.

Again following the top-down approach, below the segment level, we would have populations and plans just as we normally do. With the top-down approach, it is much more intuitive and it is faster to build a model. We can have pieces of the model built when we think top down as opposed to bottom up. In the bottom-up approach, everything does not come together until everything is done. As a manager, I was always frustrated by never knowing when I was going to get results. With the top-down approach, I can start getting bits and pieces right away, and then make the model bigger and better over time.

As far as model granularity goes, as we get down into the plan and cell level, I encourage you to focus, to think smaller with fewer plans and more aggregation. As Meredith will point out later, there does not seem to be as much effect in having more detail as it does to fine tune the macro assumptions.

I use the term model granularity in terms of how much detail we want in the model. As I said, I want fewer plans, but I want those to be good representative plans. Cells will probably be a thing of the past. We always need a male 45 nonsmoker, but that's about all that needs to be stored in a cell. Again, with the top-down approach, we are going to be more table driven. So when we talk about a 45-year-old nonsmoking male, we are really talking about mortality rates, lapse rates, and maybe expenses. With the top-down approach and by using tables, it is easy to modify these tables, easy to replace the tables, and easy to understand what is in your model.

From a peer-review approach, if I open up a model and I look at a male 35 nonsmoker and I see 0.001 for mortality, I do not know what the source of this data is. What I want to do is open up the plan and see the mortality that we are using is the 1965-70 Mortality Table times a scaling factor. This structure can be easily modified and easily adjusted. In addition, I have self-contained documentation and it is all right there embedded in my model. Looking ahead a little bit, I also think we are getting away from file structures and moving more towards databases. A model will be one file essentially, not 100 cells all with unique file extensions, and not 100 plans and not three populations. We're moving to a database approach both for input and output.

The next major item is data collection and the items are listed below:

- Liability extract files
- Rates and factors
- Product characteristics
- Experience assumptions
- Corporate level assumptions.

The first important item to collect is the liability extract files, putting information on your current block of in-force business. This usually comes from an administrative system, and it contains individual information by record, such as account values, current credited interest rates, the sex, the underwriting category, and the issue year. All this is fairly straightforward. The difficulty comes in mapping this down to something representative, and again, the focus should be to a few unique plans. See if you can find some representative plans and consolidate as much as possible.

Once we take these liability extract files, we go through the mapping process that generally turns into populations. A population is a plan type, an issue year and then within a line of the population, there's the underwriting and sex category. Once these populations are built, and they are built fairly quickly, we have all the plan types that we need to build out. Again, this information is generally factual and easy to obtain. It is part of an implementation memorandum, actuarial memorandum, policy forms, and product specs. We have been through the gamut, and that information is tedious to collect, but we can collect it and code it in. The point that I want to focus on is, when we collect that information, we must thoroughly document the model. Models become very unwieldy, and it is usually because we have made modifications after a year or two. As I said, we have assumptions in the model and they are in investor form and numerical form as opposed to table name form. We just do not know where it came from.

Maintain model documentation. Build some capital when you are building the model. It is helpful for managers to be able to pick it up and understand where information came from. It will help regulators if they get involved in model reviews. It certainly helps the model steward and the people coming up behind the model steward to understand what is in the model and to train the next level of actuaries to understand models. I cannot stress that enough. My practice is to build models, and I do it all the time for a lot of companies. I might have five going on at a time and it is very important to have documentation as to what the model is and to have a top-down structure where I can understand at any time what is in my model and how it is operating.

Behavioral models is where I want to spend most of my time and that is primarily because the data that I have talked about so far are factual. It is just a matter of collecting them. Then we get to the

more difficult assumptions like behavioral models. There are really two behavioral models, one for policyholder behavior and one for the corporate behavior.

Let's focus on the policyholder behavior first, which includes dynamic lapse rates, dynamic premium withdrawals and policy loans. It is difficult to understand how our policyholder is going to behave, but it is important that we try to design a model to reflect this behavior. It is important because it is the key driver to the cash flows, and it is the key driver to the type of analysis that we want to do, whether it is duration analysis, a five-year business plan, or whatever. It is easy to come up with base lapse rates, generally through experience studies. But given the economic environment over the last years, these are somewhat unpredictable of the future. We have not had a lot of volatility in interest rates, and we have not seen a lot of spikes in lapse rates because of that. The environment has been relatively level. With the equity market being up so high, we have seen a lot of movement from single premium deferred annuity (SPDA) money to variable accounts or to the equity-indexed products; that's because interest rates are no longer the key driver of lapse models. Now we need to worry about equity earnings as well.

My point is that we need to build a behavior model, and that is a difficult thing to do. It is important enough that the key people in the firm need to get involved. Whether it is the CFO, the CEO, or the chief actuary, the top people should provide some insight into these behavioral models. I am not going to go to the CFO and say, "If interest rates go up 200 basis points, what kind of lapse do you expect in our market?" He is not going to sit down and design me the Regulation 126 lapse formula or anything else.

What I want to do is try to find some boundaries in the lapse rates and present a table like Table 2 to these key people. Given that I have an economic scenario, a competitive rate or a treasury rate of 7%, if I credit 4%, 6%, 8%, or 10% and our block of in-force business is in a surrender charge period, what are the lowest and highest lapse rates you might expect? By going through this process, I can then take this information that I have from the senior people in the company and determine parameters for whatever lapse model I want to use. If I have the lower boundaries and the upper boundaries, I am not going to run just the one policyholder behavior model, I am going to run

sensitivity tests with the low and the high boundaries to find out how sensitive my business is to this lapse assumption. I would do this for premium flow, withdrawal loans, and some of the other dynamic assumptions.

TABLE 2

Lapse Model Development
For Competitor Rate = 7%

Surrender Charge	Credited Rate							
	4%		6%		8%		10%	
	L	H	L	H	L	H	L	H
6%+								
3-5%								
1-2%								
0								

A key measure of the business is behavioral models. Just like on the asset side, we spend hours and research money chasing after interest rate generators, but they are not valuable unless we know how that drives behavior. If I told you interest rates went up 300%, it does not matter if you do not know how your policyholders are going to behave. It's the same with assets; we want to model how people prepay or call.

I would say the same thing about interest crediting which falls to the corporate behavior. Again let's design model templates and understand what our crediting strategy is. Many company managers meet periodically to set strategy, and they may have click points that mean if interest rates move 50 basis points, they will need to revisit the crediting strategy. It is important to have a dynamic behavioral model in place because we are doing 5-, 10-, and 30-year projections over various scenarios and sensitivity tests, and we need to have a system and a model to project our crediting strategies and expected behavior over time. It is not enough to say that if interest rates go up 100 basis points next month, here is how we will credit the business. We need to try to formalize this.

Table 3 is an example. It shows a real in-force block of SPDAs. I have just run a couple of sensitivities. Starting out keeping my crediting rates fixed and my lapse rates fixed, in running a projection, I calculated a liability duration of 13. I then made my lapse rate dynamic by assuming the Regulation 126 lapse formula and putting in some relatively standard perimeters for A, B and C. This knocked my liability duration down to 6.

TABLE 3

Behavioral Model Affect on Duration

	Duration	
Fixed Credited, Fixed Lapse	13	
Fixed Credited, Dynamic Lapse	6	
Portfolio Credited, Fixed Lapse	3	(= Assets)
Portfolio Credited, Dynamic Lapse	0.3	

If I go to a dynamic portfolio rate based crediting strategy and held my lapse rates fixed, the duration was three, which was similar to the duration of my assets, which is what I expected. If I am crediting a portfolio rate and the cash flows are relatively insensitive with no dynamics going on, then I expect similar durations. If I made both the crediting rate and lapse rate dynamic, the duration fell to 0.3. As you can see, the behavior model is the key driver in duration analysis.

To summarize my main points, modeling is a process; it is not a one-time deal. I know a lot of firms throw a lot of money and effort into a model the first time and try to make it perfect and try to make it big and realistic. I would go the other way. Focus on the top-down build approach. Build it relatively small but get some results. Calibrate this model to your actual in-force business. If that means putting in overhead expenses, some miscellaneous assets and liabilities, then do so, but get a model in place in six months and then refine it over time to make it bigger and better. It is not hard to later make the model a little more detailed in remapping the extract files, adding plans later on. Assign a model steward. It is important to have somebody in charge of the modeling process and accountable for it. A big part of that role is going to be documenting the process, building capital,

teaching those below to run the model and teaching those above what is in the model. The senior people have to get on the network and look at the model. It is not hard to do, these are fairly intuitive systems now, and they are easy to use.

The key is to focus on behavioral models. You can see this is a key driver of the business, and you need to understand this. For interest rate and behavioral models on the asset side, Merrill Lynch spends millions of dollars a year refining their collateralized mortgage obligation (CMO) prepayment model. We also need to spend time on the lapse models and on the corporate behavioral models.

MR. GREGORY M. MATEJA: Throughout my career, I have done a lot of work with models both at companies and as a consultant. In the past several years, I have spent most of my time reviewing models and managing the model-building process. Most recently I'm dong a lot of due diligence of potential acquisitions, and reviewing modeling work that has been done usually by a consulting firm.

I would like to share some of the insights that I have gained from my experience in terms of identifying key aspects of the modeling process, things to think about in the modeling process, and how to make it run smoothly.

I think of the modeling process as containing eight steps. The first step is to determine the goal. What is it that you want to do? The next thing you need to do is ask, what kinds of constraints do I have? You then have to gather the data that you need, do a product review and decide what cells you are going to model prior to building the model. You select some model plans, you get the rest of the detailed data that you need. You build the model, and you validate it, and then you have the answer to the question. What I am going to talk about is primarily the first four steps, which set the foundation for the rest. Building the model is the easy part. There is a great deal of work that goes into building it, but I will discuss tips and techniques to save some time.

The most important step is to figure out what the goal is that you want. What is the objective? I find it easiest to think of this in terms of a question. What is the value of the in-force business? How

much am I willing to pay for this block of business? How much is this block of business that I want to sell worth? Another question we ask ourselves falls under "what if" analysis. If I do this, what happens to the bottom line? What happens to financial reporting? What are my results going to be next year? We also ask, what can I do to improve the profitability, and what can I do with my crediting strategy, my investment strategy, or other aspects that are under my control? We also have some regulatory requirements that need to be met.

The key to a successful model, in my opinion, is optimizing the trade-off between the goals, the constraints and the characteristics of the liabilities being modeled. It is understanding all of those things and successfully managing them that makes a successful model-building process. One of the constraints that you commonly run across is time. You do different things if you need results next week rather than if you have three or four months. Are the data that are available in hard-copy form, or available electronically? How long will it take to get the data and how clean are they? You can use consultants to get the work done, and sometimes that is a very effective way to go.

In terms of the structure of the model, how do you have to segment results? At my company, we look at our annuity line in three or four groups. So while I am really doing one model, underneath it are five separate models. What kind of things are the people at your company used to? If you want to make changes, you have to educate people ahead of time. You cannot just go in and say, "Here are some new results, a whole new format, and whole new approach." People will not know what you are talking about. You have to do that carefully. You want to identify your constraints as early as possible in the process. If you cannot get your job done within the constraints to meet your goal, you have to change your goal or change your constraints, and the earlier you can do that, the better off you will be.

One of the questions everyone asks is, how big should a model be? I think the answer to that question is very simple. It should be as large as your constraints permit and as small as the objective allows. You also have to play the constraints, the objectives, and the characteristics off against each other. How many distribution systems do you have? How many different types of products do you have? What kind of policyholder and company demographics and behaviors do you have to worry

about? You want to consider all of this and ask how many do you need. You can think of this as a tree where each one of these policy characteristics gives you a potential branch. What you want to do is select the branches that give you the best model. You want to prune it down as small as you can as Mike indicated, but you also want to capture all the nuances. Sometimes just using an average assumption can produce very different results.

Let's discuss doing the modeling yourself versus hiring consultants. I am a big fan of doing all the modeling work internally, but I am also one of the first ones to suggest that we go outside, under the right circumstances. When you do it yourself, you have a lot more control over the results. You get a lot of satisfaction from doing a good job and getting recognition from senior management. On the flip side, there tends to be an emphasis on details. Oftentimes we get bogged down, as Mike indicated, in a bottom-up approach, and we spend a lot of time on the details without getting much in the way of results. Then we get interrupted. When you hire a consultant, you tend to get faster, broader knowledge, although you may not get as much in-depth knowledge about your company or your product. You are often getting a coarser model with less cells, which, in many instances, is a good thing. The one thing people tend to underestimate though is that when you go outside with a consultant, you do have to provide a significant amount of support. You still have to research all the data, and you still have to find out all the information. You also still have to determine the policyholder behavior that is appropriate for your company. I have had some success working in a couple different consulting situations where we have done a hybrid approach and have given pieces of modeling work to people internally and other pieces to people outside. That has proved effective sometimes, and other times it has not.

When you build your models, you can build models of two types. One is a single-use model that you use for a specific purpose and then discard. Or you can use it the next time you need to answer a similar question. You can also build a multiuse model that has many uses. The single-use model can be tailored to fit exactly what you need. You can often build one very quickly if your needs allow that. You do have increased maintenance, because you can end up maintaining three or four models if you have different ongoing needs. You'll have a problem with consistency because you will often get different results from different models. If you build one model, and you use it for many purposes,

you usually end up with a model that gravitates to the most detailed needs. That often leads to a longer run for certain types of modeling, such as your cash-flow-testing type results. However, the advantage of that approach is you have less maintenance, and you do not have any consistency concerns. At my company we have one multiuse model that we use for virtually all of our modeling. When the need arises to do strategic analysis, that involves much intense modeling, and we build models specifically for that.

When you are looking at annuities, there are a couple of things you always need to consider when reviewing products. This is also the process that I go through for due diligence or a model review or when just looking to establish a new model. What kind of marketing and distribution characteristics are there, and where is it distributed? This drives your policyholder behavior, it drives expenses, and it drives your experience assumptions. What kind of liquidity options are available in the contract? There are withdrawals and loan provisions in some annuities. How much can the policyholder get out? What are the surrender charges? What are the crediting practices? As Mike said, it is often difficult to define a company's crediting practice. We do not spend a lot of time defining that and a lot of the models that we use for cash-flow testing or other work are not always as accurate and as reflective of reality as we would like them to be. So this is an area in which we also want to be very careful. What are the product features? What other kinds of bells and whistles are there? You do not want to forget about your traditional actuarial experience assumptions. Persistence is one of the primary determinants of annuity profitability.

Let's look at some specific product types. If you look at a traditional general account, an SPDA or a flexible premium deferred annuity (FPDA), you want to look at a few specific things, including additional premium. Additional premium is a valuable source of profits for FPDAs and for certain other kinds of annuities. If there are bells and whistles such as bailouts, you want to consider those. You want to know if any of the products have these kinds of features, because missing them might have a material impact on the value of the block. For general account deferred annuities, the most important things are interest crediting strategy, investment strategy and policyholder behavior. In an SPDA, you are able to manage both sides of the balance sheet, both the assets and the liabilities. You need to focus on both the investment side and on the policyholder behavior side.

The next product is market-value adjusted (MVA) annuities. Whenever you look at a block of market-value-adjusted annuities, what you want to be aware of is the MVA formula. There are a few different ones in use, and they have different values to the company and to the policyholder. You want to make sure you understand what is going on with the MVA formula. How does the company set the rate that is used for market-value-adjustment purposes? Then what is the impact of market-value adjustments on surrenders? If you have a product that has market-value adjustments that go both ways, (that is, it can be a positive as well as a negative), the fact that your interest rates have declined and MVAs are positive can induce lapses. You want to be aware of that and consider it when you set your policyholder behavior assumptions.

One of the most important characteristics when modeling market-value adjusted annuities is how many cells do I need and which ones should I use? At my company for example, we set rates every two weeks. We have seven different guarantee periods that we offer, and we end up with a lot of zero-coupon liabilities out there. We need to bring them together in a way that captures all the cash flows that we expect off of the liabilities. Because the market-value adjusted product is locked in at issue or at a set guarantee period, you want to be very aware of what the investment strategy is, because you no longer have any control over the liability side of the balance sheet after you issue the policy or after you reset the rate. The only thing you can control is the investment side of the equation.

Immediate annuities are pretty straightforward. For the product characteristics, there are not too many bells and whistles that are common. You want to be aware of mortality, and what kind of markets the product has been sold in and the impact that will have. Are there any special death benefit features that you need to model? Valuation basis can often play a significant role in immediate annuity modeling depending on the kind of modeling that you are doing.

When you start thinking about building the model, the most important things to think about are how do I get the cash flows right. It is similar to the MVA issue. You have a lot of liabilities. Grouping them together at the cell level may or may not produce an accurate reproduction of cash flows. What I have tended to do is to project all of the cash flows. I add those all together and end up with

essentially a one-cell approach. There are some advantages and disadvantages to that approach, but it does lead to accurate cash flows.

For variable annuities, you do not have a lot of control over either the liability side or the asset side. It is basically a spread business. One of the most important things to look at are the fund characteristics. Also, determine what kind of bells and whistles are especially related to transfer restrictions and the presence of a fixed account. How is that fixed account run? How is the credited rate determined? What has experience been for a movement into and out of the fixed account? You want to be aware of any surplus that is in a separate account and how that is modeled.

When you are modeling variable annuities, the most important thing to do is to read the prospectus. That may seem obvious, but every time I have read a prospectus, even after I thought I understood a product, I have learned something. There is a lot of disclosure that is required by the SEC. There may be a lot of questions raised in your mind that you can then get answers to. Sometimes it will be material. You might also find some sample illustrations in there.

You also want to know what your experience assumptions are for a variable annuity. Since you do not have much control over either side of the balance sheet, you want to know what your lapses are, what kind of mortality you expect, and how your demographics affect the results. You want to be especially aware of what kind of fund growth rate assumptions you use. It is very different to assume an 8% or a 9% level growth rate assumption as opposed to a 20% one-year-minus 10%, no-growth rate. You may end up at the same place, but the values that you arrive at, like the economic value, as well as interim results, will be very different.

Another annuity product that you sometimes run into is equity-linked products which have become hot over the past year or so. One of the most important factors to consider is, what is the index? Others are: What kind of participation formula is there? How long are the people tied into the participation? What kind of liquidity options are there for the policyholder? Then you want to be very aware of what is being done on the asset side. It is important that the strategy that is used to manage the assets is being matched to your liabilities, otherwise you have a potential for significant

problems. You want to be aware of how people are managing the in-flows and the out-flows, and when do people get the participation. When you sell these products, oftentimes the premium will be accumulated, and it will not move into the market for a period of time. You want to understand how that process works.

If you run across variable immediate annuities, you want to understand what the assumed interest rate is, how your payments are calculated, and how they might change in the future. There are a few different reserve valuation methods that I have run across for immediate variable annuities, so you want to understand what is being used so that you can get your capital flows modeled accurately, and you want to know if there are any special liquidity bells and whistles for the policyholder.

To summarize, I would like to leave you with four tips here for success. When you are looking at your liability data, you want to identify unusual contract features and/or experience factors and you want to do that as early as possible in the process. You want to set the goal, keeping the constraints in mind and you want to continually optimize by managing the interplay between the objectives, your constraints and the characteristics of the block that you are modeling. Remember that this involves a lot of art as well as science.

MS. RATAJCZAK: After listening to Mike and Greg, I think you realize that at almost every step in the model building process -- determining your goals or your purpose, defining constraints, gathering preliminary data, reviewing the products, selecting your model plans, gathering more detailed data, building the model and validating the model -- you as the model builder will constantly be reviewing and re-reviewing your products so you can make sure that your models will allow you to appropriately reflect these behavioral aspects of your products whether they be your company's behavior or the policyholder's behavior. You have to look at model building and assumption development as processes that do not happen separately. The case study that we will talk about will show you what happens when you make certain simplifying assumptions about your models to show you what the impacts might be on cash-flow-testing results.

Greg spent some time talking about more of the behavioral or company aspects to take into consideration when you are going through the modeling process. I am going to talk very briefly about some of these key areas and give you some thoughts, based on the work that I have done, on the type of things that we have seen from a model-building standpoint when we model the underlying policyholder and company behavior.

Most people probably think immediate annuities are fairly boring things to model. They are noninterest sensitive on the liability side. Certainly there is sensitivity to assets that are backing them, but I think the significant assumption that you are going to be working on, as far as developing your models and linking that up with the cash-flow projections, is the underlying mortality that you are using to project your future benefit flows. If you think about it, when you are doing projections with immediate annuities, you don't see premiums on your projections; you see cash flows on the benefits. You see expenses and you see a change in reserves.

I have actually done seriatim cash-flow projections. I have been able to get from the company a listing of every single policy giving me the person's age, the benefit options that they have chosen, and when the policy was issued. With those data in hand, I actually project detailed cash flows for every single record in the in-force file. For some companies that is not always the most efficient way to do things. In the other extreme, we have also taken in-force blocks of business and determined the model where we have come up with average assumptions for a block of certain noncontingent annuities. You might make an assumption that, on average, this particular block of business has seven years remaining in the certain period, and its average issue age is 65 years old. That significantly collapses down the models. For some companies that are primarily annuity companies, doing something like that is the most cost-efficient method for projecting cash flow. If you do a decent job coming up with your average assumptions, you are really not losing anything as far as materially changing your cash flows that you are projecting.

The other modeling considerations that impact your assumption development for immediate annuities is mortality. Is your business immediate annuities or is it structured settlement business where you might have a very young block of business and have substandard mortality to take into consideration.

When you are doing modeling for immediate annuities, ask if this structured settlement type business is very important from a model-building standpoint. If you are doing seriatim projections, you should not really care about what the benefit option mix is. Because of the purpose of your models or the time that you have to complete your projections, it may be necessary for you to understand that this block of business provides for life and joint survivor, and you need to come up with an average assumption for benefit options.

If you open up a *National Underwriter*, or any product development newsletter, you know that many companies with SPDAs and FPDAs are adding many bells and whistles to their products. Those bells and whistles have implications as far as company behavior and policyholder behavior. I think you will see that when we look at the sensitivities in the case study that we will talk about. Some of the bells and whistles that are very important to get your hands on, as far as utilization goes, include systematic withdrawal options. This allows the policyholders to automatically get credited interest out of their policy each month. Another of the bells and whistles you see companies offering is nursing home type benefits. This benefit might credit an extra percentage on annuitization value if the person is confined to a nursing home or the surrender charge will be waived.

If you think about modeling something like a nursing home benefit, if in fact your underlying model is a very old deferred annuity model, and if you look at incidence rates that you might use on something like a nursing home benefit, it becomes a very costly option. It is important to have an understanding of how the mechanics of that benefit work so you can reflect policyholder behavior and the resulting cash-flow impact for those bells and whistles.

Policy loan type and utilization. Policy loans come in many different forms. You might have your standard policy loan provision where the company credits 200 basis points less on loaned account value as unloaned account value. Some policies also provide for wash type loans if they just take out the interest on the underlying policy. In today's interest environment, (over the past year-and-a-half interest rates have been lower), I can imagine that if you have a wash loan provision in your annuity policies, you are going to see much different account value development if you reflect that than if you do not reflect that. You need to get a handle on the type of loan as well as the utilization.

MVA and indexed products. In the case of the MVA product, you might have ten different guarantee periods that you provide, and if you do collapsing across the models, coming up with some sort of average assumption, you probably will not be capturing the appropriate amount of excess lapses that might occur at the end of the guarantee period, depending upon the interplay between your MVA mechanics, your surrender charges, and what your lapse experience has been. Recognizing the interaction of those is something that you must take into consideration. Because things like indexed annuities are becoming the hot item, and you need to read about the provisions and how they impact the guarantee rates.

I have provided about an inch of computer output for a case study, and for each of the sensitivities that I ran. I ran a summary sheet of output which shows the present value of profits across three different discount rates and at the after-tax net investment earnings rate.

The block of business that I chose is real. We do a lot for work for the company on the valuation side, and we also do cash-flow testing and pricing work. This block of deferred annuity business has reserves in the $250-270 million range. The model that we used for the base case is what we used for cash-flow-testing purposes. The runs were based on the September 30, 1995 interest environment.

For this particular block of business, there are 13 major plans and the majority of them are SPDA plans. There is some FPDA business, but there really is not a lot of renewal premiums on it. The business was modeled with just one average issue age of 62, and there was not collapsing at all across durations. We also assumed, for mortality purposes, a certain split between males and females for this business, but we did not specifically set up a male cell and a female cell.

The products in this portfolio are primarily back-end-loaded products. The SPDA contracts have surrender charges anywhere from five to ten years. The surrender charges for the FPDAs are on the longer side, 14 years. These policies allow the policyholder to take 10% of account value free withdrawal once a year after the first policy hear. They also give the policyholders the option of taking a monthly interest option. So the policyholder can, automatically, have a check sent every

month for the interest that has been credited to his account. This block of business also has a 4% guarantee. This guarantee becomes significant when you look at results for this block of business in the down interest scenarios.

The other feature about the way in which the company manages this business is it looks at crediting strategy in terms of size bands. They are very interested in policies with account values less than $20,000 and those that are $20,000 or greater.

When I came up with the case study, I decided that, instead of going out and changing things like crediting strategy or lapse strategy or interest-sensitive lapse formulas, I would take my base model and make modifications to it. For all of the sensitivities that we are going to look at results for, the assumptions that were used to do the projections include no renewal premiums. Maintenance expenses equal $55 per policy. They are inflated 3% per year and base lapses for this block are assumed to be 1.5% in the first year and that will grade to 10% through the year the surrender charge is still non-zero.

The base lapse is increased to 30% the year the surrender charge disappears, and then it is 15% thereafter. Those assumptions were developed looking at the small amount of actual experience that was available for the company. As I said, it is a rather immature block of business. I mentioned the 10% of account value partial withdrawal provision. We have assumed that the utilization of that provision will be 20% per year, and the business has a trailer commission equal to eight basis points of account value annually.

The company's crediting strategy in very general terms is to lag the market up and follow it down. I mentioned that the company looks at this business in terms of size band. For an account value less than $20,000, they credit a lower interest rate when they determine renewal credited rates. The other credited rate impact that they also take into consideration is for policyholders that elect to have the monthly interest option (MIO). They credit 50 basis points less on those policies. It is important to keep this in mind, because our sensitivities are going to deal with changing our model in different ways to reflect or not reflect these policy characteristics. For this particular portfolio of business, in

up scenarios, the crediting strategy is to move from the credited rate to the market rate over five years. In down scenarios and for the level scenario, the credited rate is defined as the lesser of the market rate and the portfolio rate less a spread.

For this particular block of business, the market rate is defined as the five-year treasury rate. The spread that is mentioned here ranges from 150 to 210 basis points. The company in question decided that they were going to make a conscious effort on policies that had been sold in the last year or year-and-a-half to see what they could do to maintain a larger spread for the business. The older business would be in the 150-basis-point range, and the newer business would be at the 210-basis-point range. Those two adjustments that I mentioned are made once the renewal rates are calculated.

The interest-sensitive lapses are a calculated standard formula that we always use and that formula has a multiplier term. I think, in this case, it might be two. Then you have a piece that is the difference between the market rate and the credited rate, and you also take into consideration the fact that certain of these policies have surrender charges and since surrender charges keep people from lapsing their policy, it is a deduction to the interest-sensitive lapse formula. When you take the base lapse rate plus the interest-sensitive piece, lapses are never allowed to be less than 3%.

In the base model that I have worked from, we do have control over the in-force data that we get, so we actually make a distinction in the model for size -- under $20,000 and over $20,000. We also know which policies have elected to take the MIO and which do not. We also take into consideration the plan of annuity, and we do not collapse any on duration. The model is fairly detailed. When all is said and done, I think we end up with 212 model cells that we are actually projecting for this particular block of business.

What I did to that base model is make a couple of simplifying assumptions. First, I collapsed my model back down again so I do not have separate cells for IO. Instead, based on the mix of people that have elected the MIO and those that do not have it, I came up with an average assumption as far as what the reduction to the credited rate would be. In the next scenario, I

collapsed my model for size band. I once again came up with an average deduction to my credited rates based on what the business looked like as of the valuation date. In the last test that I did, I took the base model, split it, copied the whole model, and I took the in-force information that was in the model, split it into pieces and came up with a model that had two issue-age cells. For this block, I ended up with a 60 and a 67. Those are the results that we are going to look at in the case study.

We have been talking more about the liability side of things. As background, this company's portfolio is primarily callable and noncallable bonds, but probably more noncallable. They do have your standard mortgage-backed securities, and they also have some collateralized mortgage obligations. When we go through the projections, if sales are indicated, the assets are liquidated to maximize capital gains, (minimize capital losses), and if there is excess cash, the investment strategy assumes that any excess cash is invested 50/50 in bonds and mortgage-backed securities earning 50 and 85 basis points over the treasury rate. For this company, investment expenses were in the 15-basis-point range and average asset quality is BBB.

Let's start with the base case for this product and take a look at the summary of profits page and concentrate on the column that is labeled Net Investment Earning Rate (NIER) (Table 4). If you look at the last two scenarios, you have a pop-down 3% and a down 5% and up 5%. Those two scenarios are not good for this particular product; you are bumping up against that guarantee. Keep in mind that these are raw numbers; they do not include any sort of adjustments or impacts of AVR and IMR. This is just to show you what happens when we go in and make modifications to the underlying model. That is what we are starting from. In this particular case, when you layered in AVR and IMR, one of the two negative scenarios turned positive.

In the second scenario that was tested, I took the base case model and collapsed on the size band characteristic (Table 5). It is labeled No Model Distinction for Size Band. If you look at the output again, you will see that, once again, scenario six and seven are negative. In this particular instance, we came up with another marginally negative scenario -- the gradually up scenario. Depending on what kind of additional margins we added with AVR and IMR, it is possible that you could go from a situation where you have two to three negative scenarios. For this particular block of business, it

made sense to actually construct our model, taking into consideration that we had business that was above and below $20,000. Depending on what your purpose is, you might not have the available data or the time to construct the model that would reflect this difference in your model. You might have to use an average assumption. This is what happens as a result of this simplification.

In the next sensitivity that we looked at, I took the base case model and doubled it from 212 cells to 424, and made one of the blocks of cells age 60 and the other age 67 (Table 6). It was not a 50/50 split, whatever I had to do to get to an average age of 62. When I looked at this, it was surprising to me. I had expected that would make more of a difference. If you line it up against the base case, you will see that scenario six and seven are still negative, but if you look at all the results, they have changed a little bit, but not too much. What this indicates to me is the mortality element that we are looking at, and the nursing home benefit that we have included in here really do not impact the results that much. If you have a block of deferred annuity business that is really old, the nursing home benefit can get really expensive and it is possible that splitting up your model into more cells may make a much bigger difference. For this case it really did not.

The last sensitivity took the base case scenario, collapsed it on the MIO indicator option (Table 7). I came up with an average impact on the credited rate. Scenarios six and seven are still negative, but you will see that every scenario looks better.

You might ask, what is right? All I can say to that question is, it depends and use your judgment. The purpose of what you are doing for the model, the availability of data, the time you have available to actually build the model, the resources available, and even who your ultimate audience is will impact what is right for your situation. In this case, we had a lot of control over the detail of the data that we could get, so it made sense to me, from a projection standpoint, to reflect features like MIO and size band. I do a lot of work on the appraisal side. Sometimes companies come to us and say, "you have two hours." What I need you to do is determine a value for this $2 billion block of annuities. I have had $2 billion blocks of annuities that I heeded to value in that period of time. The problem with that is I have no time, and because it is a windshield appraisal, I have no data. What

TABLE 4

Base Case
Summary of Profits

Scenario Summary for Module Projection
Description: Scenario Report
Projection Mode: Annual
Projection Date: 09/1995
Projection Cycles: 20 (Annual)

Present Value of Profits at	10%	12%	15%	NIER
Scenario Level	768,926.25	753,751.03	738,063.48	864,854.72
Scenario Gradually Up	275,375.26	312,068.28	354,015.34	142,966.20
Scenario Up 5% Over 5 Years, Down 5% Over 5 Years	847,222.88	729,055.82	609,787.79	1,361,347.12
Scenario Pop Up 3%	1,409,745.28	1,244,008.52	1,055,516.83	1,985,856.60
Scenario Gradually Down	1,123,153.83	1,236,619.36	1,348,717.49	479,570.25
Scenario Pop Down 3%	-1,685,411.25	-1,293,743.66	-828,434.61	-3,484,856.59
Scenario Down 5% Over 5 Years, Up 5% Over Five Years	187,407.60	392,803.65	628,444.30	-744,639.99

	9/96	9/97	9/98	9/99	9/00	9/01	9/02	9/03	9/04	9/05
PROFITS RELEASED										
Level	341,795	688,376	294,357	76,071	-30,921	-157,390	-228,097	-280,138	-442,456	-392,925
Gradually Up	257,170	517,601	135,575	-29,272	-53,039	-72,370	-178,876	-389,532	-35,663	-186,117
Up 5% Over 5 Years, Down 5% Over 5 Years	274,520	553,034	192,708	50,981	-208,293	-497,554	-551,955	-383,185	-327,472	-11,832
Pop Up 3%	250,028	501,576	159,125	10,309	-1,526	-19,462	-130,453	-234,992	235,859	258,594
Gradually Down	498,014	1,106,245	859,502	609,716	339,462	25,632	-330,369	-589,660	-1,017,520	-1,040,511
Pop Down 3%	692,815	938,019	433,445	-470,768	-585,340	-758,113	-835,084	-925,053	-1,323,350	-1,296,040
Down 5% Over 5 Years, Up 5% Over Five Years	697,977	1,281,804	658,628	323,850	-425,234	-586,097	-672,242	-731,684	-958,472	-868,599
High Value	697,977	1,281,804	859,502	609,716	339,462	25,632	-130,453	-234,992	235,859	258,594
Low Value	250,028	501,576	135,575	-470,768	-585,340	-758,113	-835,084	-925,053	-1,323,350	-1,296,040
Mean	430,331	798,094	390,477	81,555	-137,842	-295,050	-418,154	-504,892	-552,725	-505,347
Standard Deviation	185,057	289,631	256,511	307,303	281,028	289,696	250,755	235,019	524,628	532,549

	9/06	9/07	9/08	9/09	9/10	9/11	9/12	9/13	9/14	9/15
PROFITS RELEASED										
Level	-130,890	287,744	398,136	272,472	144,744	80,520	55,610	37,309	27,029	26,291
Gradually Up	-180,860	-12,097	31,126	4,655	2,538	11,934	24,856	32,873	37,826	19,567
Up 5% Over 5 Years, Down 5% Over 5 Years	376,456	785,495	933,791	566,573	323,926	180,458	115,064	75,046	55,499	84,537
Pop Up 3%	350,718	489,067	485,436	327,589	207,509	137,273	96,904	69,759	51,074	32,616
Gradually Down	-779,694	-251,169	427,580	296,510	-23,057	-157,599	-126,663	-101,015	-75,080	-49,043
Pop Down 3%	-963,684	-350,123	436,990	336,389	-123,732	-205,666	-155,725	-116,407	-84,214	-54,843
Down 5% Over 5 Years, Up 5% Over Five Years	-540,207	-52,798	92,002	6,376	-74,915	-55,129	-17,792	9,717	27,618	34,151
High Value	376,456	785,495	933,791	566,573	323,926	180,458	115,064	75,046	55,499	84,537
Low Value	-963,684	-350,123	31,126	4,655	-123,732	-205,666	-155,725	-116,407	-84,214	-54,843
Mean	-266,880	128,017	400,723	258,652	65,288	-1,173	-1,107	1,040	5,679	13,325
Standard Deviation	484,683	380,390	273,937	183,378	151,451	135,331	97,792	72,518	54,923	45,702

TABLE 5

No Model Distinction for Size Band
Summary of Profits

Scenario Summary for Module Projection
Description: Scenario Report
Projection Mode: Annual
Projection Date: 09/1995
Projection Cycles: 20 (Annual)

Present Value of Profits at	10%	12%	15%	NIER
Scenario Level	570,300.06	572,719.72	578,935.39	604,232.16
Scenario Gradually Up	104,733.60	154,010.57	212,235.42	-66,791.52
Scenario Up 5% Over 5 Years, Down 5% Over 5 Years	690,266.47	583,686.81	479,216.85	1,166,830.63
Scenario Pop Up 3%	1,248,967.74	1,094,545.95	920,837.19	1,791,129.41
Scenario Gradually Down	1,056,749.80	1,172,816.77	1,288,408.49	404,703.18
Scenario Pop Down 3%	-1,702,620.02	-1,310,456.35	-844,478.14	-3,503,832.61
Scenario Down 5% Over 5 Years, Up 5% Over Five Years	137,365.30	344,727.92	582,990.71	-801,477.54

	9/96	9/97	9/98	9/99	9/00	9/01	9/02	9/03	9/04	9/05
PROFITS RELEASED										
Level	309,746	657,056	263,430	45,656	-60,631	-186,275	-255,843	-306,681	-467,628	-415,477
Gradually Up	225,203	486,460	105,076	-58,695	-81,083	-99,226	-203,611	-410,937	-54,979	-202,785
Up 5% Over 5 Years, Down 5% Over 5 Years	242,565	522,151	162,964	23,072	-231,896	-516,693	-569,421	-400,664	-345,773	-26,740
Pop Up 3%	218,120	471,327	130,037	-17,433	-27,950	-44,451	-153,564	-256,102	216,907	242,970
Gradually Down	465,702	1,079,680	848,238	608,589	338,150	24,072	-332,022	-591,336	-1,019,234	-1,042,119
Pop Down 3%	676,385	937,691	433,028	-471,187	-585,744	-758,529	-835,495	-925,454	-1,323,743	-1,296,392
Down 5% Over 5 Years, Up 5% Over Five Years	667,311	1,266,475	656,901	321,915	-427,322	-588,360	-674,495	-733,866	-960,608	-870,434
High Value	676,385	1,266,475	848,238	608,589	338,150	24,072	-153,564	-256,102	216,907	242,970
Low Value	218,120	471,327	105,076	-471,187	-585,744	-758,529	-835,495	-925,454	-1,323,743	-1,296,392
Mean	400,719	774,406	371,382	64,559	-153,782	-309,923	-432,064	-517,863	-565,008	-515,854
Standard Deviation	188,499	296,205	266,450	310,119	277,569	283,659	242,373	225,665	516,522	525,772

	9/06	9/07	9/08	9/09	9/10	9/11	9/12	9/13	9/14	9/15
PROFITS RELEASED										
Level	-149,559	272,782	388,738	265,638	140,531	77,168	52,952	35,225	25,489	25,413
Gradually Up	-192,635	-16,384	32,374	6,521	3,794	12,343	26,762	34,676	39,592	21,553
Up 5% Over 5 Years, Down 5% Over 5 Years	369,269	783,193	935,432	566,759	320,995	177,183	112,669	73,410	54,491	85,795
Pop Up 3%	339,656	487,485	488,104	331,729	211,645	140,411	99,081	71,425	52,288	34,152
Gradually Down	-780,924	-253,205	427,200	296,504	-22,703	-197,693	-126,739	-101,076	-75,139	-49,097
Pop Down 3%	-963,946	-350,626	437,050	336,448	-123,632	-205,699	-155,751	-116,426	-84,229	-54,852
Down 5% Over 5 Years, Up 5% Over Five Years	-541,353	-53,300	92,061	6,377	-74,908	-55,119	-17,764	9,757	27,654	34,193
High Value	369,269	783,193	935,432	566,759	320,995	177,183	112,669	73,410	54,491	85,795
Low Value	-963,946	-350,626	32,374	6,377	-123,632	-205,699	-155,751	-116,426	-84,229	-54,852
Mean	-274,213	124,278	400,137	258,568	65,103	-1,629	-1,255	998	5,735	13,880
Standard Deviation	480,617	379,377	274,295	183,232	150,872	134,915	97,582	72,500	55,026	46,102

TABLE 6

Model Split into 2 Issue Ages
Summary of Profits

Scenario Summary for Module Projection
Description: Scenario Report
Projection Mode: Annual
Projection Date: 09/1995
Projection Cycles: 20 (Annual)

Present Value of Profits at	10%	12%	15%	NIER
Scenario Level	758,890.96	743,941.50	728,620.06	854,451.28
Scenario Gradually Up	261,066.99	298,347.09	341,166.57	127,165.38
Scenario Up 5% Over 5 Years, Down 5% Over 5 Years	823,276.36	707,410.39	590,960.07	1,329,983.55
Scenario Pop Up 3%	1,381,290.97	1,218,004.27	1,032,591.23	1,949,950.87
Scenario Gradually Down	1,122,422.31	1,234,334.36	1,344,746.35	487,269.99
Scenario Pop Down 3%	-1,670,575.27	-1,281,946.67	-820,218.78	-3,454,706.10
Scenario Down 5% Over 5 Years, Up 5% Over Five Years	193,287.90	396,423.15	629,497.39	-727,260.84

	9/96	9/97	9/98	9/99	9/00	9/01	9/02	9/03	9/04	9/05
PROFITS RELEASED										
Level	340,040	682,369	289,665	73,670	-32,239	-157,525	-226,962	-278,537	-440,247	-391,036
Gradually Up	255,537	511,783	130,767	-32,371	-55,863	-74,598	-180,024	-389,902	-35,885	-185,125
Up 5% Over 5 Years, Down 5% Over 5 Years	273,001	547,300	187,511	46,885	-211,874	-499,842	-553,089	-384,272	-328,262	-13,834
Pop Up 3%	247,998	494,724	152,745	5,397	-6,179	-23,338	-132,933	-237,079	232,954	255,884
Gradually Down	495,943	1,099,360	853,750	606,631	338,246	26,759	-326,685	-584,796	-1,011,190	-1,033,727
Pop Down 3%	690,815	932,707	430,173	-469,795	-582,773	-753,538	-828,559	-917,755	-1,314,785	-1,287,336
Down 5% Over 5 Years, Up 5% Over Five Years	695,506	1,274,886	654,081	322,405	-423,699	-582,560	-666,747	-725,652	-951,859	-862,386
High Value	695,506	1,274,886	853,750	606,631	338,246	26,759	-132,933	-237,079	232,954	255,884
Low Value	247,998	494,724	130,767	-469,795	-582,773	-753,538	-828,559	-917,755	-1,314,785	-1,287,336
Mean	428,406	791,876	385,527	78,975	-139,197	-294,949	-416,428	-502,570	-549,896	-502,509
Standard Deviation	184,836	289,393	256,581	306,524	279,544	287,778	248,250	231,847	520,663	528,445

	9/06	9/07	9/08	9/09	9/10	9/11	9/12	9/13	9/14	9/15
PROFITS RELEASED										
Level	-130,071	286,974	397,019	270,867	144,611	80,751	55,842	37,603	27,453	27,018
Gradually Up	-179,578	-11,461	31,330	4,491	2,689	12,125	25,309	33,487	38,469	20,548
Up 5% Over 5 Years, Down 5% Over 5 Years	372,969	780,712	928,661	562,604	321,939	180,220	115,230	75,447	55,661	86,280
Pop Up 3%	348,142	486,218	482,785	325,257	206,281	136,951	97,087	70,267	51,754	33,424
Gradually Down	-773,624	-248,036	427,466	294,374	-21,844	-154,992	-124,893	-100,039	-74,826	-49,213
Pop Down 3%	-956,155	-346,174	437,147	334,142	-116,774	-205,033	-155,604	-116,734	-84,881	-55,442
Down 5% Over 5 Years, Up 5% Over Five Years	-535,363	-50,156	93,570	7,752	-73,797	-54,161	-16,896	10,641	28,505	35,099
High Value	372,969	780,712	928,661	562,604	321,939	180,220	115,230	75,447	55,661	86,280
Low Value	-956,155	-346,174	31,330	4,491	-116,774	-205,033	-155,604	-116,734	-84,881	-55,442
Mean	-264,811	128,297	399,711	257,070	66,158	-591	-561	1,525	6,019	13,959
Standard Deviation	480,764	377,408	272,107	181,847	149,302	134,639	97,509	72,601	55,256	46,410

do I do? I get out the Best book or I get into One Source and get all the data that I can get to build a model. For that $2 billion block of business that I looked at, I had one cell, and under the situation and the purpose for which I was building the model, that was right. I cannot say what is right, because you have to answer that question for yourself once you have considered who your audience is, what resources you have available, and the type of data that you have and what the ultimate purpose is. I can only leave you with these words of wisdom. Use your judgment.

You need to use your judgement as far as understanding your products to know where your sensitive areas are. If you think about it, once you build the model, you do not do a lot of sensitivity testing by modifying that model. It was very eye-opening for me for that block of business to determine what happened or did not happen when I split it into two issue age cells. I always say you spend a lot of time building these models. Use them as tools, and I think that will give you a better sense, when you are looking at modeling considerations and assumption developments, for what the key considerations are and the items you need to consider when building these models.

That concludes our prepared remarks. I am going to ask Greg a question. He does a lot of cash-flow testing with a large amount of business. I talk a lot about using your models as management tools. I would be interested in getting the company perspective. Have you seen a shift towards having senior management more involved in model building and assumption development, and do you think you find yourself using the models more as management tools these days?

MR. MATEJA: I think we have used modeling of our liabilities and our assets as management tools for a long time. I do not think that is new, and it is entrenched at our management level. I would say we have had some changes in our structure over the past year or two, and as a result of that, there is some more interest in modeling results at a higher level.

As to the first question, you have to understand our block of business. We have $35 billion of annuities. Virtually all of it is either separate account variable business or market-value adjusted. The impact for modeling that is very different. Our interest-sensitive products are actually modeled on a monthly basis at a very detailed level so that we can manage them well.

TABLE 7

Average Assumption for Interest Option Impact
Summary of Profits

Scenario Summary for Module Projection
Description: Scenario Report
Projection Mode: Annual
Projection Date: 09/1995
Projection Cycles: 20 (Annual)

ABC Life Insurance Company
08/09/96 10:38:52
ALFA 4.43 / DBP15B.A12 / VALACT2

Present Value of Profits at	10%	12%	15%	MIER
Scenario Level	1,128,736.54	1,079,852.33	1,022,422.65	1,344,660.32
Scenario Gradually Up	475,601.54	500,521.64	526,612.22	377,884.46
Scenario Up 5% Over 5 Years, Down 5% Over 5 Years	1,041,300.46	907,318.79	768,559.93	1,609,414.55
Scenario Pop Up 3%	1,600,974.99	1,421,211.58	1,214,488.02	2,219,346.97
Scenario Gradually Down	1,282,697.48	1,389,256.64	1,492,061.52	661,268.86
Scenario Pop Down 3%	-1,669,484.47	-1,278,261.24	-813,555.16	-3,467,368.71
Scenario Down 5% Over 5 Years, Up 5% Over Five Years	290,719.46	491,971.09	722,059.52	-627,178.16

	9/96	9/97	9/98	9/99	9/00	9/01	9/02	9/03	9/04	9/05
PROFITS RELEASED										
Level	384,768	745,267	351,625	132,438	24,253	-103,394	-175,691	-229,769	-394,687	-348,699
Gradually Up	294,774	562,841	179,911	13,379	-12,311	-33,536	-142,195	-364,000	-28,368	-193,715
Up 5% Over 5 Years, Down 5% Over 5 Years	311,819	597,260	234,968	90,510	-186,758	-492,772	-546,414	-376,658	-315,407	12,417
Pop Up 3%	283,275	537,208	193,550	43,348	30,491	11,359	-100,811	-206,652	260,944	277,825
Gradually Down	548,270	1,183,919	904,064	612,508	342,708	29,471	-326,219	-585,412	-1,013,269	-1,036,581
Pop Down 3%	708,053	938,375	433,896	-470,384	-584,973	-757,731	-834,728	-924,699	-1,323,013	-1,295,758
Down 5% Over 5 Years, Up 5% Over Five Years	752,322	1,323,713	662,059	327,849	-420,910	-581,420	-667,511	-727,081	-954,041	-864,797
High Value	752,322	1,323,713	904,064	612,508	342,708	29,471	-100,811	-206,652	260,944	277,825
Low Value	283,275	537,208	179,911	-470,384	-584,973	-757,731	-834,728	-924,699	-1,323,013	-1,295,758
Mean	469,040	841,226	422,868	107,093	-115,357	-275,432	-399,081	-487,753	-538,263	-492,758
Standard Deviation	185,299	292,361	250,964	305,057	287,900	301,615	265,577	248,127	532,291	539,596

	9/06	9/07	9/08	9/09	9/10	9/11	9/12	9/13	9/14	9/15
PROFITS RELEASED										
Level	-92,851	318,800	418,744	287,310	154,398	87,967	61,366	41,703	30,222	28,132
Gradually Up	-197,374	-27,361	25,433	2,937	1,830	11,087	26,596	34,382	38,609	22,695
Up 5% Over 5 Years, Down 5% Over 5 Years	402,621	808,546	945,883	574,464	333,164	188,526	120,948	79,211	58,469	84,421
Pop Up 3%	361,066	488,654	482,719	324,470	204,066	134,593	94,863	68,121	49,779	31,246
Gradually Down	-776,818	-246,035	429,157	296,509	-24,668	-157,702	-126,762	-101,083	-75,093	-49,004
Pop Down 3%	-963,500	-349,819	436,908	336,371	-123,782	-205,641	-155,706	-116,392	-84,203	-54,836
Down 5% Over 5 Years, Up 5% Over Five Years	-537,967	-51,765	91,641	6,021	-75,121	-55,294	-17,969	9,534	27,469	34,005
High Value	402,621	808,546	945,883	574,464	333,164	188,526	120,948	79,211	58,469	84,421
Low Value	-963,500	-349,819	25,433	2,937	-123,782	-205,641	-155,706	-116,392	-84,203	-54,836
Mean	-257,832	134,431	404,355	261,155	67,127	505	476	2,211	6,465	13,809
Standard Deviation	492,210	388,034	278,426	185,754	154,233	137,182	99,092	73,346	55,410	45,732