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**VALUATION ACTUARY OVERVIEW --
THE NEW STATUTORY VALUATION OPINION**

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MR. ABRAHAM S. GOOTZEIT: Our panel includes Doug Doll, a consulting actuary from the Atlanta office of Tillinghast; Debi Gero, vice president in charge of asset and liability modeling at Conseqo; and Marc Pitoniak, founder and president of ValAct, an organization providing software and consulting services for asset and liability modeling.

Doug will discuss regulatory issues and the amendments to the standard valuation law. Debi will then discuss practical considerations, such as accumulating data, setting assumptions and creating models. Marc will discuss an example that illustrates a number of the issues and considerations involved in cash-flow testing.

MR. DOUGLAS C. DOLL: I'm going to cover some of the regulatory items with regard to the Standard Valuation Law and then talk a little about actuarial liability. There are 10 states that have adopted the new Standard Valuation Law effective for 1992 statements and five states for 1993. The 10 states for 1992 include some of the big ones like California, Illinois and Texas. There will be an impact on 1992 statements on any company that's operating in several states.

Only one state has actually adopted the accompanying regulation, and that's Oregon, but it's proposed in quite a few other states. Most of the regulations that are proposed are basically the same as the standard adopted by the NAIC. California's

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regulation is somewhat interesting. The standard model regulation would allow a three-year period in which to grade up extra reserves. In other words, in the first year, if cash-flow testing says extra reserves are needed, you only have to put up one-third. Next year you have to put up two-thirds of the extra, and so forth. California deleted that provision. You have to put up the extra amount immediately.

There were a couple of changes made to the model regulation by the NAIC at its last meeting in September. These aren't significant. They replaced the references to the mandatory securities valuation reserve (MSVR) with the asset valuation reserve (AVR) and interest maintenance reserve (IMR). You must use the proper allocation of assets backing the IMR. You may include assets backing the AVR to the extent applied to asset default, which was the same methodology that was intended to be used for the MSVR.

They also changed the seven prescribed scenarios. The minimum interest rate is no longer 4%. Now the minimum interest rate for a five-year Treasury note is $\frac{1}{2}$ of the starting rate. They also took out the maximum rate. The previous maximum rate was 25%, so it's a nonevent to take out the maximum.

They changed the headings for the reserve table in the actuarial opinion. That's no big deal, but now the headings are intelligible.

Let's turn next to the Actuarial Standard of Practice (ASP) for the appointed actuary opinion. I'm not associated with the Actuarial Standards Board (ASB). I've talked to some people and have gotten some comments about what the next exposure draft is going to have, but I'm not absolutely sure that I'm correct. It could change.

The ASP is going to be broken into two pieces. Section 7 opinions are for small companies that do not need to do cash-flow testing. The Section 7 piece is not going to be a standard of practice. It's going to be a compliance guideline. The essence of that will be that the appointed actuary does not have to do cash-flow testing if regulations specifically say you don't have to do cash-flow testing.

The Section 8 (asset-adequacy opinion) piece has had some changes made to it. The changes were deemed significant enough that it's going to be reexposed rather than be adopted as final this year. Both the Section 7 compliance guideline and the revised Section 8 actuarial standard of practice are going to be reexposed and will probably come out in early December 1992. Some of the interesting changes to the Section 8 ASP are as follows. In the original draft, reserves have to satisfy substantially-better-than-even scenarios. There's been a lot of question about what "substantially-better-than-even" means. The new wording is going to be "moderately adverse conditions." The ASB was actually considering using "best estimate." Because at least you know what best estimate means. The next exposure draft is going to invite comments. Should it be best estimate? Moderately adverse? Or what?

The original exposure draft said that with regard to actuarial guidelines and general distributed interpretations of laws and regulations, the valuation actuary had to be satisfied that those requirements were met in reserves. The new version takes away that requirement and says that you need to be aware of actuarial guidelines and generally published interpretations. You should disclose deviations in your actuarial

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memorandum, but there's no longer a requirement that you have to satisfy those in your reserves.

There are some minor proposed changes in New York Regulation 126. They changed the section on defaults. In the absence of credible experience, they've suggested some default rates that you can use. They said it should not be less than 20% of the AVR maximums. For example, for AAA bonds, that would be a default cost assumption of 0.1%. They also changed the minimum interest rate on the prescribed seven scenarios to 0.5% of the starting treasury rate.

The next topic is practice notes. It was announced at the Valuation Actuary Symposium, that there was a task force set up to develop practice notes. These practice notes take various topics or issues that the valuation actuary has to deal with, such as how to handle default rates, or how many scenarios should be tested, and develop something to give guidance to the practicing actuary as to what would be a reasonable thing to do. This is a task force through the Academy Committee on Life Insurance. The task force chairperson is Donna Claire. There are about 10 topics. These drafts are currently being edited by the Academy, with a view toward making sure that these practice notes don't have rigid requirements in them, so that the actuary who does something different than is in one of these practice notes is not subject to criticism.

Many people are asking for guidance in certain areas. We have to draw that fine line between doing something that will be of help to actuaries versus doing something that the actuary will be criticized for if he or she doesn't follow. If problems develop later, we don't want it contributing to possible actuarial liability.

I already mentioned what the new Actuarial Standard of Practice will say with regard to state variations. Milliman & Robertson and Tillinghast have proposed to the AAA that they work on a research project to tabulate all the state variations on laws and regulations and generally published interpretations of those laws and regulations. We're working on compiling the state variations and actual laws and regulations, the summary of actuarial guidelines, and a survey of state insurance departments' interpretations of laws, regulations and guidelines. I hope that we'll have something on that by year-end.

The next topic is reliance on investment professionals. I think many of us will at least make certain asset assumptions and maybe projections of certain kinds of assets, such as collateralized mortgage obligations (CMOs). The model regulation provides wording for when reliance is used on asset projections and requires a statement from the person relied upon. In the actuarial memorandum, the ASP would require a statement of qualifications. This, by the way, is a little bit different than the original exposure draft, which I think says something to the effect that the actuary had to provide evidence that the person or firm relied on was qualified. Now it's a statement of the qualifications.

My next topic is regulatory oversight. At the last meeting of the NAIC Actuarial Task Force a couple of weeks ago, it was proposed that a group of insurance department actuaries and other state financial examiners meet sometime next spring, after all the statements are in, to review actuarial memorandums. The intent is that every state

insurance department will submit actuarial memorandums that they want for review. The purpose of this is to get some uniformity among states. Also, if individual regulators have concerns or think that a memorandum is not up to snuff, it will give them some comfort, before they challenge it, to get some other folks to agree with them.

Finally, what is actuarial liability? It's like an illness. Who gets it? By definition, actuaries get actuarial liability. How? It is usually contracted by an insolvent insurance company for whom you've signed a recent opinion. How serious is it? Very, very, very. It can consume all your time and energy. It can drain your assets and it can ruin your career. Can it be cured? Once contracted, there's very little you can do to cure it. It's a condition that responds well only to preventive measures. What are those preventive measures? Do only work for which you're qualified. Know and follow actuarial standards. Make sure your report is complete and clear; don't sugarcoat the problem.

What do we have to do with regard to actuarial standards? Think of actuarial standards as a coloring exercise. When you were a kid, you colored in coloring books. You need to do two things. Don't make any mistakes; that is, color between the lines and color all areas that should be colored. So in actuarial standards, do what they say to do, and be very careful of going outside of what they say to do.

Be careful about three other things. Word your opinion carefully. Assume any ambiguity in the standards or requirements will result against you. Last, make sure your errors and omissions or directors and officers (D&O) liability coverage is current. Performance is going to be measured against the skill and knowledge normally possessed and used by members of the profession in good standing. Dangers that we have to protect ourselves against include changes in actuarial standards over time. Another possible danger is actuarial standards strictly applied. There we have to be careful that when going outside the actuarial standards, there is a reasonable basis for doing so.

MS. DEBORAH A. GERO: I'm going to be covering some basics of asset and liability modeling. Many of you might find that this is more of the same old stuff, but I hope, through our experiences of having modeled seven different companies, where we acquired assets from various sources, together with the practices of our current investment department, we can shed some light.

The first notion I would like to challenge is this perhaps misnomer called "valuation actuary." The actuary is the one who gets to have all the fun and pull all the data together and do the work, but really, the actuary is not acting alone. Doug talked about reliance, and I think even the best actuaries would find it impossible to have all the experience necessary to come up with the correct assumptions and input required. We really have, at least in our case, to rely on the investment professionals to come up with reasonable assumptions and methodologies on the asset side. We also have to rely on our marketing people to give us feedback. I think it is a bit of the old adage that the actuary can come up with a product that will never sell, but meets all the profit criteria of the company. I think you can fall into the same trap when you are trying to do cash-flow testing. You can come up with some wonderful results, but your company would, for all intents and purposes, be out of business for new

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business because you would have a bad track record. You really need to be aware of the various audiences that will be eagerly looking at your results and the types of assumptions you make. You cut them off at the pass by going to them first.

The first subject I would like to cover is asset modeling, and the second subject will be liability modeling.

ASSETS

Asset Modeling

I think that even in those companies that have the best asset/liability management systems put in place, the actuaries really have very little knowledge of the specific asset details, the nuances and characteristics, of those that are purchased until after they are purchased, and the actuary has to deal with them. The actuary needs to investigate, when putting together cash-flow tests, those features that will have a material impact on the results and various scenarios.

I would like to cover some of the aspects of existing assets, because as we all know, there are Schedule B's and D's that contain long lists of assets, but unfortunately, they are really a poor place for actuaries to get the kind of information they need. Much of the information is also not found on administrative systems. This, I think, is especially true, we found, when it comes to dealing with mortgages or collateralized mortgage obligations (CMOs). You may have the basic par and book value, but much of the other required information is missing.

I am briefly going to talk about mortgages, mortgage-backed securities, other CMOs, bonds, floating rate securities, and interest rate swaps. I have not yet figured out how to project common stock with sufficient credibility, so I am going to skip that one.

There are many different features of mortgages and they typically have various prepayment provisions. You may have a period of time for which no prepayment is possible. Floating-rate securities have reset dates, indexes, floors and ceilings, and balloon provisions. You may also have some equity participation, which you might want to consider in determining how good the collateral is. One of the ways we have found to deal with all this (because our administrative systems don't have many of these provisions on them and we have bought companies where their old administrative systems did not have this information on them) is to use the underwriting guidelines that may have been applicable for given eras in the past. Mortgages issued during a certain time period may typically, for a certain term of mortgage, have an average time for which no prepayment is possible, and some standard indexes are used. With the balloon provisions, you may also now want to look at how realistic it is that those balloon payments will actually be made.

Mortgage-backed securities are assets that are extremely good for grouping together. A government national mortgage association (Ginnie Mae 8) is a Ginnie Mae 8. There may be some specific geographic concentrations you may want to take into consideration. You also would want to be careful about the original length of the underlying collateral and the issue dates.

We commonly talk about call schedules with corporate bonds, but many bonds, especially utility bonds have, in essence, two types of calls. There are calls that can be made at any point and at anytime for a given prepayment price. There are also calls that are called "refunds," which cannot be made if the issue is just refinancing at a lower interest rate. The refunds are the most important for us to review when we are dealing with callability of bonds in various interest rate scenarios.

The amount of callable bonds that are being issued has been drastically reduced. In the 1970s and 1980s, 95% of bonds were callable. From 1989-90, about 30% were callable. As interest rates have continued to decline, less bonds are being issued callable. This is also attributable to the fact that the market is more sophisticated in pricing the call option. I think the importance of this is that many of us, when we put together our reinvestment assets, historically look at what spreads have been available and go from there. Given that spread premium for calls may no longer be available, you may want to look at some more recent data on recent purchases that your company has made, instead of taking long-term historic averages. When a bond is callable varies significantly by the bond and the term of the bond, and you hope that information will be available to you.

Sinking-fund schedules are, again, not typical on new issues, but to the extent you have any old issues hanging around, they may have sinking schedules. The schedules are really only a starting point for your work. There are provisions that may, in effect, render the sinking-fund schedules useless at this point. For example, some companies have repurchased bonds and their sinking-fund schedule was only applicable if a certain par amount of bond was outstanding, and they are below that level now. Thus, it may affect how likely they are to sink the bond.

Some bonds, too, have put schedules. We are currently not dealing with puttable bonds. If you do not take advantage of them when you can, it will reduce the yield in your projections. You may at least want to try and figure out how many of your assets have puts. If you are severely penalizing yourself, it would be worth noting.

There was a workshop in 1991 in New Orleans and five or six of us in attendance were greatly concerned about how to deal with modeling CMOs. Various answers came from around the room as to how they were being modeled. One response was to allocate them into capital and surplus, if you have that few. One company had bought some and did not know what to do with them when it came time to model them, so it sold them. Those of us who are forced to deal with them, because we do have enough, have ended up spending quite a bit of time trying to model them accurately.

There have been several methods that have emerged in our studies and in working with some consultants. One way is to take a seriatim approach, where you look at CMO-by-CMO. In doing this, you have to (using the fancy term on Wall Street) "reverse engineer" a CMO deal. Now as actuaries, we just call it modeling. You basically have to structure the deal and assign cash flows from the underlying collateral to the specific tranches. You cannot just model the tranche you own (unless you have A tranches), because your payments will be affected by the tranches in the entire deal. You can get the tranche structure from the prospectus that your investment department should have received before it bought the

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instrument. You also need the remaining collateral underlying the CMO to do your work. That's available from Wall Street systems, either in software analytic packages or on Bloomberg on-line.

The group method has also been used. You look at all your CMOs, and you put them into groups like Zs and planned amortization classes (PACs) and sequentials. Look at the underlying collateral, the type of protection that each tranche would have, and fit them into reasonably homogeneous groups. That takes the time, in my opinion, of an investment professional. But again, it would require going through the prospectus and really knowing what your CMOs are.

We have opted for a third option. We have gone to a software vendor who has already done all this modeling for the CMOs for us. The software vendors model most of the deals that are fairly straightforward. If you are buying quirky deals, they may not be there. The purchases you made in the last few days of the month may also not be included in the data base.

The software can greatly assist in the analytics, which from our experience, I think regulators like to see. They keep talking about assigning ratings for CMOs, based on volatility, ability to hedge them, and type. As they haven't done that yet, I think that it gives great comfort, or at least insight, to a regulator if you can tell them how the CMOs are broken out by tranche type.

You can use these methods in combination. To the extent that an outside software vendor does not have all your CMOs modeled, you could group unmodeled ones with modeled ones with similar attributes.

Another type of instrument you might have on your books might be an interest rate swap. When I was naively looking at this, I thought we bought a floating rate security; we gave someone that payment, and they gave us a fixed payment back. As I have come to find out, they are a little more complicated than that. I want to kind of go through the mistakes that I naively made when I was first trying to model it.

We thought we had to get the floating-rate provisions. You need to review counterparty risk. If you have a swap, what's the likelihood that your counterparty will default? So you have a floating-rate instrument, and you have promised that coupon to someone else and they're promising you a payment back. Well on your Schedule D is the floating-rate instrument. You don't have that promise back, so you need to get information to do, in essence, a quality check on your counterparty. Another thing you need to check on is if there is any mismatch in the amount and term of the underlying collateral.

Here's a brief example. We have a floating-rate security that we bought, that pays London Interbank Offered Rate (LIBOR) plus 0.25%, with a minimum 5% coupon. The swap is that we pay out LIBOR and we receive back 6%. (Another item you may have to contend with is that LIBOR is not really a commonly modeled index on many projection systems.) In the interest rate environment we are projecting here, we are just going to assume it goes up 1% a year.

Our first inclination, if we had not known about these swaps (which are really just a footnote on the annual statement), would have been to assume the income from the Schedule D floating-rate asset, i.e., the LIBOR payment to be received), subject to the 5% floor (not a schedule D item). Knowing about the swaps, the first inclination was to use 6% as the interest income. But when we combined the swap with the security, we found out that in low-interest-rate markets, we were able to keep the difference between our floor and LIBOR. The net result actually has a bit of an inverse floating property, which can be important if there is any type of fixed-rate interest credits on the liability side.

ASSET ASSUMPTIONS

Defaults

Some of the basics that have been acceptable or standard for bond defaults from our dealings in the industry have been in the Altman Study that came out in 1989. It talked about default risk mortality rates and performance of corporate bonds. This study essentially followed issues from their original bond rating. That study has since been updated with further information on below-investment-grade bonds. New York came out and said you can assume a default rate of specified percentages of the AVR maximum.

The final check you should always use, instead of just deferring to an industry standard, should be to review your own company's experience. Clearly, if your own company's experience is worse in defaults, that would need to be reflected. Unfortunately, in putting together company-default studies, there are several problems that are faced. The law of large numbers may not apply. It is difficult to actually capture much of the data on losses too. First, there are defaults that are taken in the form of write-downs. Given the decrease in the interest rate environment, you could have bought a bond at par, sold it at par, and you think you did not have a default. If interest rates have changed substantially, there may, in fact, be an embedded credit deterioration in the transaction that is not properly being captured. Nonetheless, to the extent you have such information available, it would support using higher default rates.

For mortgages, the defaults using the AVR formula will vary, based on company experience. You can, de facto, get some of your company experience into the mortgage default rate by using the AVR formula.

Some of the interesting things on defaults are really on the mortgage side, and I am not saying that because so many defaults have happened. Unfortunately, when it comes to mortgages, we are not blessed with credit ratings. A company's mortgage holdings largely reflect the foresight and practices of a few individuals in the mortgage department. I do not think that those are standard across the industry. In coming up with a mortgage assumption, too, there may be standard default rates out there in the industry, but you may have an aged portfolio. You may have a portfolio where you made the loan on the property, perhaps in the early 1980s before the inflation hit, so the fact that market values are depressed may still mean that you are in good shape. The aging of a portfolio and the loan-to-value ratios are important to take into account.

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There are published data taken in survey form by the ACLI that talk about differences in delinquencies and foreclosures by the type of mortgage and geographic location. There is something in the guidance notes that refers to some of the ACLI studies.

If you are fortunate enough to have your company participate in the ACLI survey, this data may be readily available. If your company does not participate, you may have problems, because it may not participate because it does not keep statistics that look this way. But I'll mention an example here that I think was somewhat extreme, and why averages may be inappropriate. In looking at the June 1992 survey results at hotel/motel, the total in default and foreclosure was 15.89%. The Pacific area had a 23% default and foreclosure rate. The East/South Central U.S. was 2.81%. I think it would be *unduly harsh to assume an average, if you are blessed with very good historic experience and have the loan-to-value ratios to back up a low-default assumption.*

Calls/Prepayment

Most projection systems handle calls by looking at when it is economically feasible for the issuer to call the bond. That will vary by call premium, current refinancing options and the cost of refinancing. Now, as I mentioned, we would again want to make a difference between a refund provision, where you cannot prepay just to refinance to take advantage of lower interest rates and a call that could be made at anytime.

Some companies actually buy callable instruments with an incredible, detailed knowledge of the issuer's capital structure. If you own a bond that has a relatively low interest rate in the issuer's financial structure, it would put you in a lower priority to refinance. Prepayments might be less than the pure economics of the issue, viewed independently, would indicate.

Much of the same types of assumptions are made on mortgages. If you are dealing with CMOs or pass-throughs, and you use an asset-side vendor, they will many times have prepayment models already built. They will consider factors like burnout and seasonality.

LIABILITIES

Liability Modeling

When we are putting together our models, despite the urge of the most detail-oriented among us, it is usually not possible to do a seriatim projection. If we are doing the New York 7 or an inverted yield curve and have a finite number of projections, it is very difficult to do, and as we look toward doing the greater stochastic modeling, it becomes an impossibility. The liabilities can usually be grouped by some finite characteristics. But typically, we will look at plans based on their financial significance and we will assign lower, less important plans to those, if we feel that the profit margins are reasonably similar.

Another approach that can be taken is to model, say, 95% of your business; the remaining 5% could be grossed up into the 95% modeled – this assumes that unmodeled business has the same characteristics of everything you model.

If we are looking at lines of business in priority, interest-sensitive has caught everyone's attention. We want to look toward broadening that to traditional lines, but even

with traditional lines, we would probably want to differentiate between whole-life-type plans and term insurance. Finally, there is health insurance. Within health, disability income, long-term care, and other longer liabilities would have a higher priority than short-term medical coverages.

In looking at liability characteristics, we look at many of the same issues we look at when we are trying to price a product. You would want to look at the issue age, sex and the underwriting categories. You want to make sure that the model is not biased or is properly biased by any pricing to a certain age you may have done. You may also want to reflect benefit triggers at given ages. Many people talk about doing annuity models with one issue age; if you have qualified business (at age 70½ minimum distribution start) it would probably be worthwhile to do a little refinement on issue ages.

Other final points follow. The average face amount you get, if you were to throw all data together, may not be representative of your underwriting practices. Issue mode will affect the timing for lapses in your model. Date of issue is also important. In terms of issue years, you can make some simplifying assumptions by grouping older blocks of business together. They may represent a small portion of the in-force business. If you have a lot of annuity business that is out of the surrender-charge period, and nothing special happens at any given age, for all intents and purposes, it's basically the same business.

Liability Assumptions

Expenses are not marginal. We need to make sure that when we do a projection, the expenses that come out of the model and actually bear some resemblance to reality.

There are also dynamic assumptions that we need to make. We might have lapses positive or negative. We have now had a decreasing interest rate environment where we can track how policyholders react when interest rates go down. We need to be very careful, when setting lapse assumptions, that we don't build in our standard assumption rates resulting from the fact that there has been a decreasing interest rate environment. The unfortunate wild card in the whole process at this point is what happens when interest rates go up.

Another dynamic assumption is premium persistency, which may or may not be important, depending on the new-money/old-money strategy. We would want to approach policy-loan assumptions with a different amount of diligence, depending upon whether the loans are fixed-rate loans or have a fixed spread, or are zero-cost loans.

Credited interest is typically expressed as a function of target spread and a definition of a competitor rate.

We need to look at mortality and morbidity and make sure those validate to actual.

I think that we need to do a lot of sensitivity testing. I know it's a struggle to get out the seven New York scenarios, but that shouldn't be the end of it. As I mentioned, we do not have any data on what happens when interest rates go up. That is a good area in which to do extra testing. Given that the interest rate environment is in

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turmoil, it is important that we look at our assumptions and try to figure out whether recent or prolonged history is really a decent indication of our future experience.

There are guidance notes that talk about how to do testing for "obligation" or the C-2 risk.

Some assumptions need to be made at the company level. Federal income tax is one of them. What's your tax rate? Shareholder dividend practice is important for those of you who have a practice of making them. One of the important items is that in some of the scenarios where results are not good, results are good for a while. I think for those who have problems, in say, increasing interest rate environments, how good or bad those will be will depend largely where the interest rates came from before the date of the study. For example, if we go into an increasing interest rate environment today, it will take us awhile to get to where we were a year or two ago. We may not even realize how bad a scenario will be until we get several years into it. We need to look closely at how realistic it would be for us to continue paying dividends in the early years of the scenario that ultimately does not have desirable results. If you have a stated objective to build surplus, then it is perfectly appropriate to not pay dividends.

ADDITIONAL RESERVES

I have some final thoughts on when we do establish additional reserves. Doug talked a bit about the guidance notes that have been proposed, so I will not talk about that. We do need to remember that it's not just policyholder reserves, but AVR is available to offset defaults, and IMR is available to be spread into the future, as well as to offset any capital losses from interest rates.

In the past, various individuals have had conversations with New York. They have, on occasion, used a standard that if you fail two tests in a given direction (either increasing or decreasing), you may be asked to do special tests and set up reserves with either a 30- or 40-basis-point change in that direction per annum. There are also some questions as to how to judge adequacy of reserves. Do we look at the end of the projection period? That's typically the way it's been stated. Some guidance in the actuarial standards that says you really do need to look if you have severe deviations in your profits along the way. It's not just important as to what the endpoint is, but if you were to go insolvent before you got there, it is not going to do you or your policyholders much good. There are also questions as to whether we look at book value or market value. Some of the biggest issues we have had include, how good are the market-value numbers? There has been a lot of volatility in the junk-bond market. Mortgages, real estate and private placements may not have market values.

When you are balancing reserve adequacy, you also have to consider the capital and surplus strength. It is really nice to have reserves that are set up to be redundant. We really like those when we do testing. But we are given no credit for them when we look at risk-based capital. We should look at, not only how the results come out of our projections, but why they are what they are. You may be able to use this work in dealing with rating agencies, if you can prove that you have excess reserves that provide extra margins that are not specifically accounted for in the risk-based capital formulas.

MR. MARC F. PITONIAK: I will be covering a case study of UL, with an emphasis on the practical points the valuation actuary should consider when conducting cash-flow testing. I want to point out that I will be discussing one approach to cash-flow testing. Obviously, other approaches are possible.

The topics I will cover include basic Schedule D information, call and prepayments, spread assumptions, reinvestment strategies, and reinvestment parameters. I will briefly discuss the first two topics. Next I will discuss the dynamic elements that you should consider when you do your modeling. I will list the sequence of steps your model can take to do cash-flow testing. We'll spend the bulk of the time discussing the case study.

I'd like to talk a little about segmentation of your existing and future assets. Now when you file new products for approval, different state insurance departments are requesting information on the kinds of assets you plan on purchasing with the premium received and what your interest-crediting strategy will be. Also, the NAIC model regulation requires that the valuation actuary disclose each year any inconsistencies in the asset-allocation methodology. This intimate tying of assets with their liability counterparts is here to stay. An asset-segmentation methodology is becoming both a regulatory and a practical requirement.

My focus in this case study will be on bonds. When I use the word *profile* in the context of cash-flow modeling, I refer to the final set of assumptions and characteristics that are used in your projections. There is a wide spectrum of approaches you can use here. Schedule D usually provides a good starting point for me. My preference is generally to project each asset in a company's Schedule D, and I begin the process by requesting the data processing department to provide the most recent Schedule D that can be dumped onto a PC in ASCII format. This is obviously only a starting point, because you will need additional detail on calls, prepayments, sinking-fund payments, and CMO detail.

Let's assume this information is already available. The approach I take is to use a "social security" tag in each of the basic asset, call, and sinking-fund files that will link the information of a given security. By "social security" tag I mean the CUSIP and lot number of each security. I use this approach so that I am only restricted by the size of the hard disk. For a given security in the basic asset file, I check the call flag to see if it is true, if the bond is callable. From the call file I read the first and last call premiums, the first and last call dates, and the frequency of the change in call premium. Next, I check the sinking-fund flag in the basic asset file. If the security has any sinking-fund provisions, then I read the sinking-fund file to see if there is any current scheduled payments to be made. The sinking fund would contain the sinking-fund dates and the amount to be paid. A given security could, of course, have more than one sinking-fund date.

Next, you need some way to assign security-class characteristics to each of the securities that are in the asset files. I include these security-class assumptions in what I refer to here as the spread file. Examples of class assumptions are spread over treasury, call barriers, call percentages, default, and investment expense.

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Next, you will have to decide what your reinvestment strategies are. You will have to make key decisions, such as what your investment department will do in negative cash-flow situations. Do you borrow or sell assets? Also, you presumably will have different investment strategies to cover different shapes of the yield curve.

In the reinvestment parameter file, most of the fields would be similar to the spread file. For each reinvestment strategy you will need additional information, such as the amount of cash you want to invest in each security class.

Once you have made your asset assumptions, you can now shift your attention to developing your liability assumptions. Basic information you need is as follows: pricing spread, surrenders, crediting strategies, lapses, expenses, in-force data, loans, and valuation. Since I will discuss dynamic assumptions later, I will restrict my attention here to a practical approach you can employ to assimilate all of this information.

The in-force file contains all of the information you would need, such as issue age, issue date, etc, to calculate all basic values such as reserves, account values and guaranteed maturity funds. Again, just as in the asset section, it is desirable to download this information from the mainframe. You will want to model this raw data into model cells by using a model-cell generator.

With the exception of the valuation menu, each record for each of these menus has a field called the product code. In addition, each record in the in-force menu contains a field called the valuation code. Now for a given policyholder cell in the in-force file, you have a link established with the valuation menu so that you can calculate basic values according to the proper valuation basis. In addition, for this same policyholder cell, you have a link established with all of the other menus so that you can summarize results at the product level.

Next we'll discuss C-1 and C-2 assumptions. As you probably realize, there are still many areas in which the actuary will need guidance as he or she does an asset-adequacy analysis. Donna Claire has recognized this need as the model regulation is implemented and continues to evolve. To this end, Donna has formed a committee called the Practice Notes Task Force that will address these areas. Two practice notes of particular interest to us in this presentation is the guidance note on C-2 assumptions by Craig Likkell and the guidance note on defaults by Michael Zurcher. Michael has also been very active in developing the future risk-based capital requirements.

In his practice note draft, Mike states that current approaches that most valuation actuaries employ to project the costs of defaults lack sophistication. Some of the weaknesses are: (1) the practice of applying static default factors to each asset quality class, (2) the lack of integration of default assumptions with both economic conditions and the interest rate scenarios, and (3) not recognizing portfolio characteristics, such as the number of assets, the size of individual issues and concentration of assets with specific characteristics.

Now the asset valuation reserve (AVR) requirement that is in effect with the 1992 annual statement will require the appointed actuary to recognize the differences in

defaults among the different asset-quality classes. Though the anticipated risk-based capital (RBC) requirements are not part of the model regulation, the RBC C-1 factors will recognize C-1 risk through quality, size and concentration factors. As you model defaults assumptions for the asset-adequacy analysis, it would be appropriate for you to also recognize the additional factors defined in the RBC C-1.

Ultimately, the valuation actuary will probably want and/or need to incorporate some stochastic generation of default factors for the securities. I will mention that the Committee on Valuation and Related Areas (COVARA), with the help of Peter Deakins and Laird Zacheis, is currently working on developing such an approach.

Now we'll get into dynamism. There are parameters that should be dynamically recognized in your cash-flow testing, including asset defaults and calls, crediting strategies and lapses, disinvestments and reinvestments, and policy loans and policyholder dividends.

Calls obviously should recognize the coupon value and the current market interest rates. Two tests that you should model for are the spread between coupon rate and current market rate and also the cost to the borrower of calling the bond. Unless you are modeling mortgage securities, where there is always some financing that occurs regardless of the interest environment, you generally should assume that the call will not be made unless it makes economic sense to the borrower.

To assign a value to the asset you may be selling, you also need the capability to calculate market value of assets. This means that you should have the capability to determine both scheduled and nonscheduled cash flow and price compression of bonds with embedded options. When you do a market-value calculation, you have, in effect, one projection process nested within the primary projection.

For crediting, unless your business is captured, you will have to explicitly recognize the difference between your crediting strategy and the competition's. Your crediting will be a function of your competition, your portfolio rate and your pricing spread.

For lapses, it's important to recognize fund, premium and policy lapsation. The lapse assumptions are a function of your credited rate and the competition's and the degree of surrender-charge protection you have. Also for noninterest-sensitive lapsation, it may be desirable to recognize a base lapse assumption with select and ultimate characteristics.

Once you have made all of your asset and liability assumptions, a sequence of steps that you can follow in the actual projection includes:

1. First process the assets. By process, I mean that for each security or modeled security, you must first determine the spread over treasury of comparable maturity, the default to be attributed to this security, and the investment expense. Next, for the given security, you want to conduct tests, such as is there a coupon payment or any calls or sinking-fund payments. What about maturity? Answering these questions will allow you to determine both the cash flow and investment income.

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2. Next, for each issue, calculate reserves, account values, guaranteed maturity fund values, and credited amount, premium, cost of insurance, expense charges, mortality, and lapse assumptions. Sum the results at the product level.
3. Next, at the product level, determine your general expenses. These last two steps (2 and 3) allow you to generate the insurance cash flow.
4. Next, generate both an income statement and contribution to surplus.
5. Finally, given your previously defined investment strategies, invest the total cash available and repeat the process.

Now we're ready to start the case study. Let me first start defining some terms. I will use the standard New York Regulation 126 seven scenarios in these projections. Of course, projecting under the seven scenarios does not constitute an adequate spectrum of interest environments. You should test at least 100 additional scenarios that can be randomly generated.

"Level" means that the interest rates for securities of different maturities stay constant. In the up environment, uniform means interest rates increase 500 basis points in the first 10 years. Up and down means interest rates increase 500 basis points in the first five years and then decrease 500 basis points in years 6-10. Finally, spike means interest rates increase immediately by 300 basis points. The down environment is described similarly, but with the interest rates headed in a different direction from the up environment.

Please refer to Chart 1. The issuer of the callable bond I modeled was not allowed to call until 1994. The jump in the level scenario in year 1994 indicates that the borrower has exercised his or her call option. For 1994, in the other scenarios, we see that because interest rates increase beyond the critical call point, call activity doesn't occur, except marginally, for the uniform scenario. Notice that in the year 2001, however, the original bond is called in the up-and-down scenario, because interest rates have been decreased to their original levels.

The next observation is that in the up-and-down scenario, cash flow becomes very negative. This is because the company's crediting strategy is not staying competitive with its perceived competition, and as a result, there are considerable surrenders occurring. It is not until 1999 that the company's crediting strategy, portfolio rate and competition become more aligned.

Finally, note how level the cash flow is in the spike scenario. This is because the spike scenario results in an interest rate that is not substantially different from the portfolio rate, so that surrenders and premium lapsation don't occur to any great extent.

Chart 2 is rather boring. In the down environment, calls occur in all scenarios. Also, the reinvestment strategy of this study was to purchase noncallable bonds with sinking-fund payments that commence five years from issue.

Because the original bond was called in 1994, all these scenarios show that in 1999-2001, sinking-fund payments are being made from the bonds that were purchased in 1994.

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CHART 1
Universal Life Cash Flow
(Up Environment)

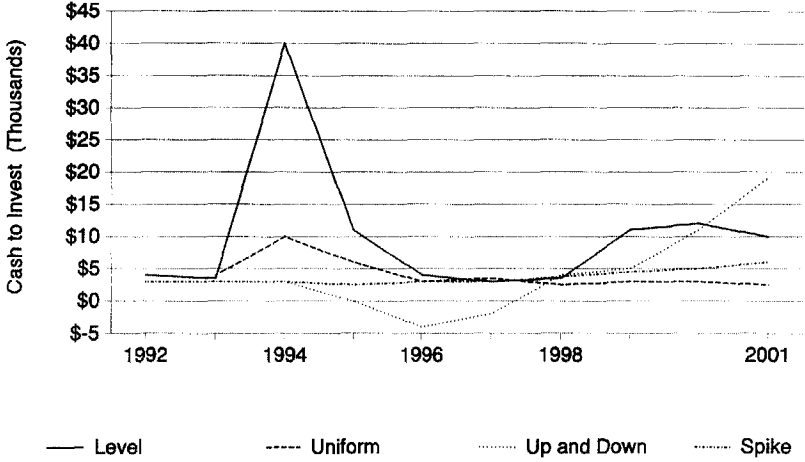
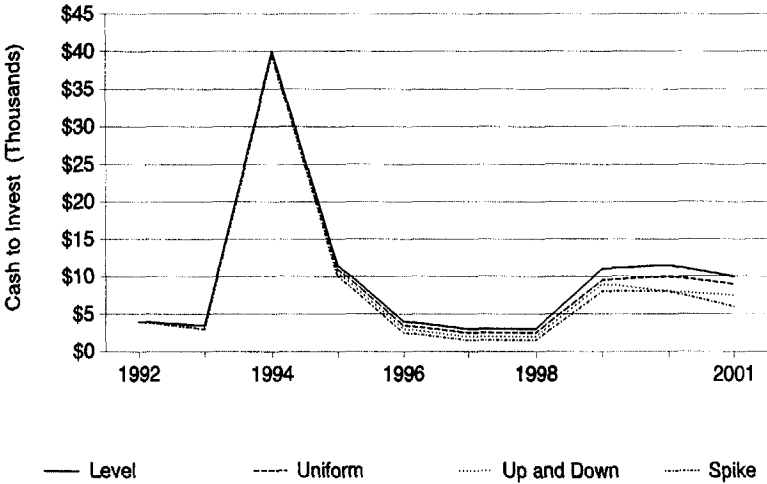


CHART 2
Universal Life Cash Flow
(Down Environment)

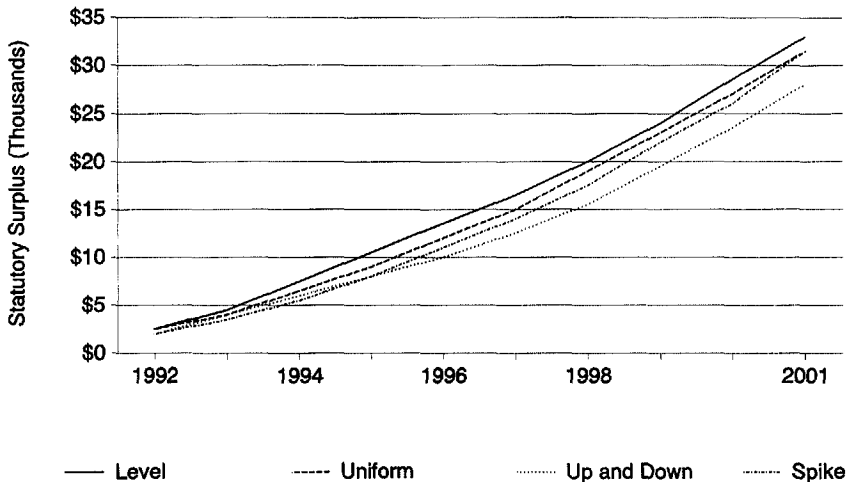


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There are two reasons why there are not greater differences among these scenarios. The first is that even the level scenario is enough to trigger substantial calls, and the second reason is the floor I used for Treasuries negates the full effect that the other scenarios would otherwise experience.

Chart 3 displays the statutory surplus build-up in an up environment. The level scenario does better than the other scenarios. The up-and-down scenario does the poorest. Recall that in the corresponding cash-flow graph, that was a significant amount of negative cash flow. This graph illustrates the result of having to fund excessive surrenders by selling assets at a market-value loss or borrowing at a higher interest rate.

CHART 3
Universal Life Surplus
(Up Environment)



In Chart 4, we see that the level scenario again does the best. The other scenarios are fairly close to the level because the floor assumption is in effect. Lower values indicate the effect of a lower reinvestment rate.

Now, as you know, the AVR/IMR requirements are now part of the asset-adequacy analysis. If anyone would like to see the comparable surplus graphs with the AVR/IMR requirements in effect, please see me.

We should also look at the market value of surplus in Chart 5. The spike scenario is no surprise, considering that interest rates immediately spiked 300 basis points. The up-and-down scenario should start out slightly below the uniform and level scenarios. Note that the company has the worst experience under the up-and-down scenario. It isn't until 1999 that the company starts to recover, relative to the other scenarios.

CHART 4
Universal Life Surplus
(Down Environment)

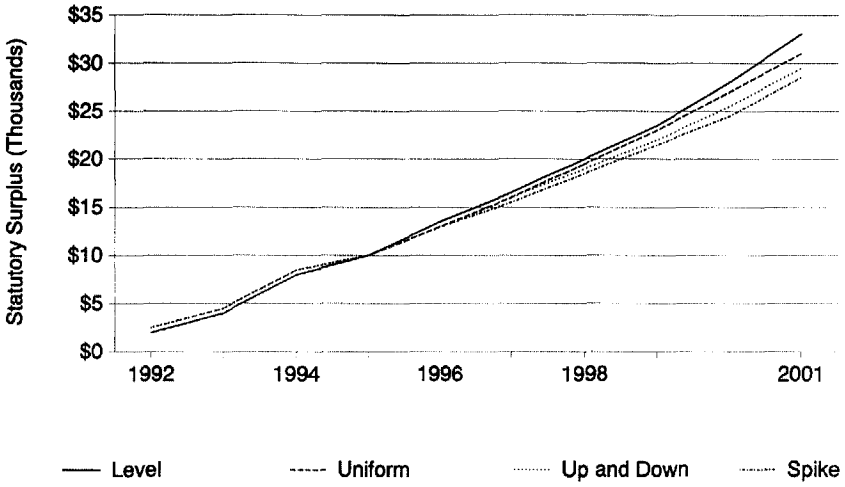
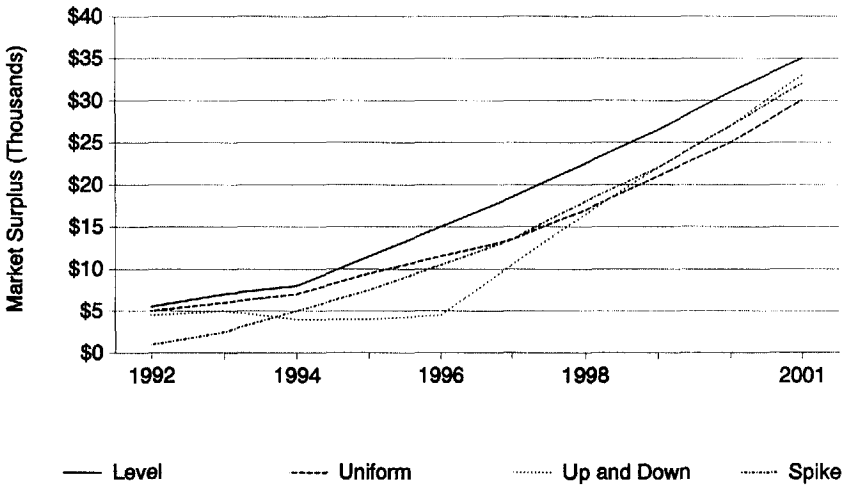


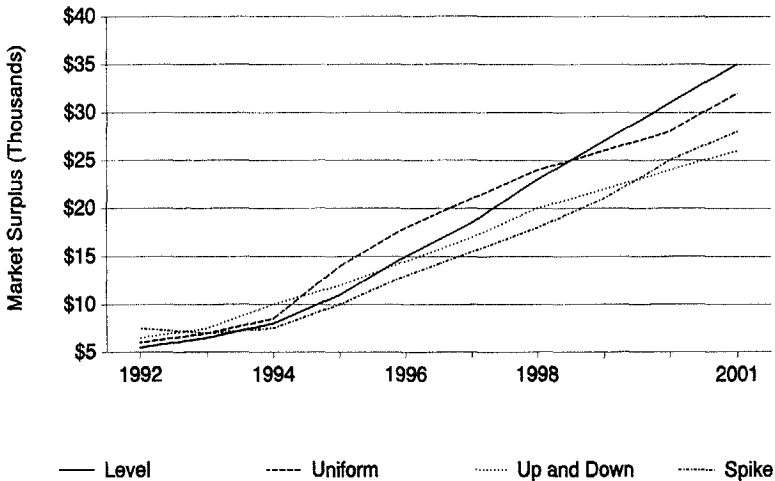
CHART 5
Universal Life Surplus
(Up Environment)



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In Chart 6 the level scenario ultimately prevails again, but the uniform scenario does better for 1994-98. This is because the company is able to, for a while, maintain larger spreads in its interest-crediting scheme. Ultimately, the effects of reinvesting at a lower rate causes the uniform scenario to fall behind the level scenario.

CHART 6
Universal Life Surplus
(Down Environment)



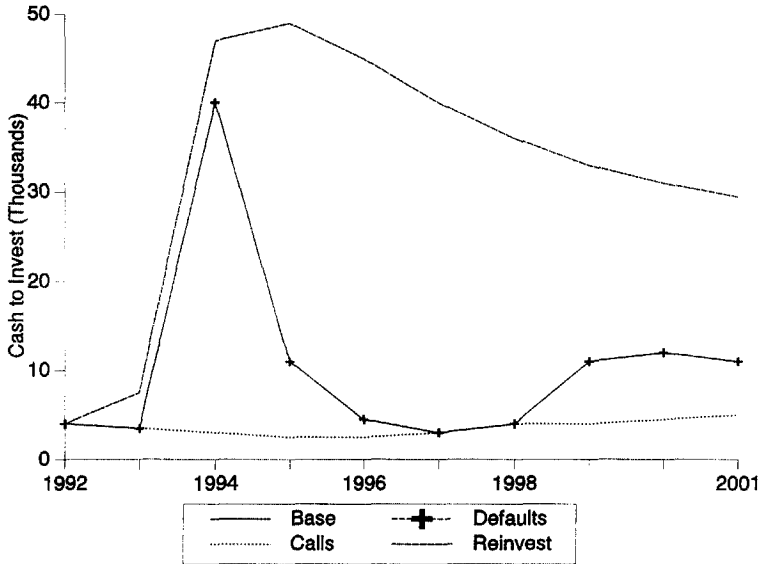
I will touch on the kinds of parameters upon which you should perform sensitivity testing and illustrate some of the effects of the testing. It is expected, however, that the valuation actuary performing sensitivity testing should go far beyond this illustration. For example, with respect to reinvestment strategies, you should consider securities of different qualities, kinds and maturities.

The base scenario will be the one referred to as the level scenario in earlier charts. Because the base scenario used callable bonds, I want to illustrate the effect that *noncallable bonds will have on surplus*. Also, to see what shock a change in reinvestment strategy will have, I will assume that the company wants to stay in a cash position and will invest in one-year securities.

The crediting scenario will assume that the company follows the market with no consideration of what the underlying portfolio rate is. The company is looking for just its pricing spread. This study assumes the universal life (UL) policy was issued 10 years ago to someone of age 35.

In Chart 7 the base, default and reinvestment scenarios all show quite a bit of call activity in 1994. Because the company is investing in AAAs, we see that even doubling the default rate has no observable effect on the cash flow. The call scenario shows that the cash flow remains level throughout the projection period. The reinvest scenario shows a level of cash to invest in every year after the original call activity.

CHART 7
 Universal Life Cash Flow
 (Asset Sensitivity)



In Chart 8, we really don't see much differences in the cash flow, because of the quality of the securities purchased and the age of the policyholder.

In Chart 9, we see the effect of losing the spread that is generally associated with investing longer term. Sure the company has no cash-flow shortfalls, but the cumulative effects of such a reinvestment strategy considerably hurts the company's level of surplus.

In Chart 10, we see the effect of changing the crediting strategy and surpassing the performance of the base scenario. Finally, the mortality scenario illustrates the cumulative result of increasing mortality by 50%.

MR. GOOTZEIT: The cash-flow testing survey that was mentioned was published in the June 1992 issue of *The Actuary*.

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CHART 8
 Universal Life Cash Flow
 (Liability Sensitivity)

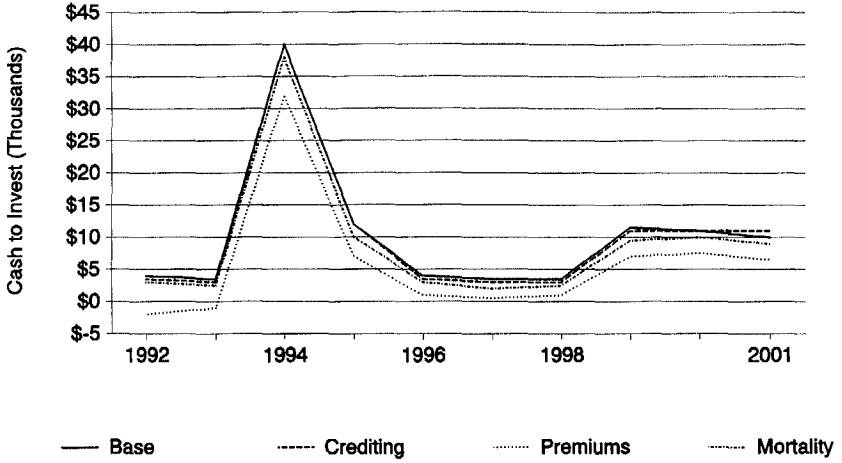
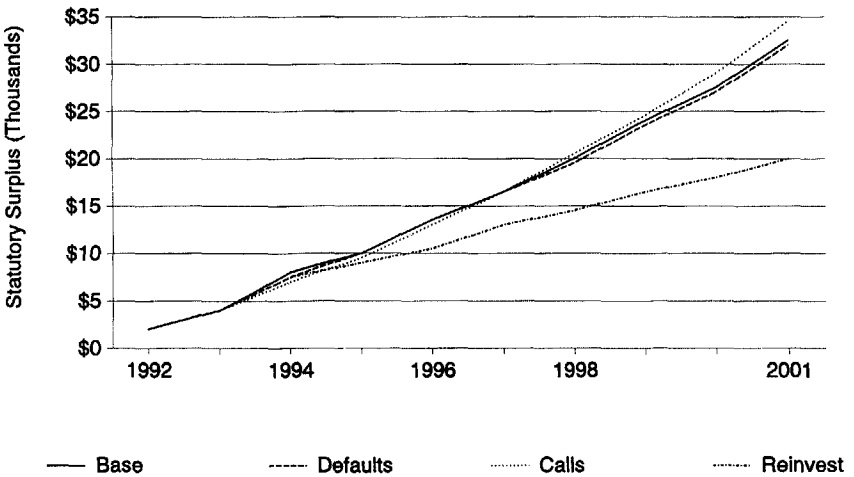
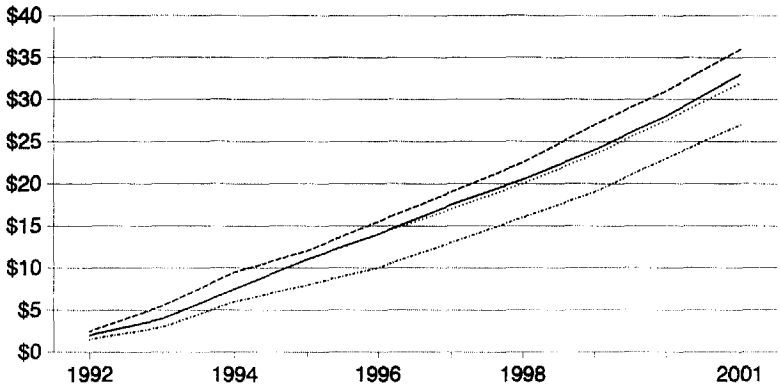


CHART 9
 Universal Life Surplus
 (Asset Sensitivity)



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CHART 10
Universal Life Surplus
(Liability Sensitivity)



— Base - - - - Crediting Premiums - Mortality