

RECORD, Volume 30, No. 2*

Spring Meeting, San Antonio, TX
June 14–15, 2004

Session 240F

Capital Requirements for Investment Risks—Regulatory, Rating Agency and Economic Approaches

Track: Investment

Moderator: Michael J. O'Connor

Panelists: Michael J. O'Connor
Jose D. Siberon

Summary: Speakers discuss the approaches to quantifying investment risk (including the credit risk subcomponent and mismatch risk sub-component) in the three different types of risk-based capital (RBC) framework commonly used, such as regulatory, rating agency and company-specific economic-based formulas.

MR. JOSE D. SIBERON: I've worked at Standard & Poor's (S&P) for about four years. I analyze large insurance companies' financial services, and I have been analyzing structured finance transactions that involve insurance risk. All those new securitizations that we're starting to see in the marketplace come through us sooner or later. I'm also the gatekeeper of the S&P capital model. If you have any questions, I'm the right person to talk to.

Today we'll focus mostly on investment risk. For the presentation I'm going to start by talking a little bit about how we view investments and how we view current trends and industry strengths and weaknesses, mainly in the U.S. life insurance companies. Then I'm going to focus on how we implement some of the analysis of investment risk in the ratings, and how we can put those analyses into the different views and correlate them against other companies. This includes what kinds of measures we use and what kinds of qualitative and quantitative analyses we use to come up with ratings, as well as how we incorporate investments into it.

At the end, I'm going to teach by example some of the approaches we currently have in terms of credit risk, implementations for capital requirements and some of the advances in analytical techniques that we're starting to apply.

* Copyright © 2004, Society of Actuaries

I'm going to start with the industry strength of investment risk. We view the industry as a whole as one that has a high credit quality, mostly A and A- portfolios. You see a lot of companies' investments growing into the NAIC 2 or BBB range, but they offset some of those credit risks with mortgage-backed securities (MBSs) and government and other agencies to manage more of an average A quality of portfolios. We see a little bit of a shift over BBB because of the fallen angels and the downgrades that have occurred in the past couple of years, but companies are starting to rebalance their portfolios a little bit more and maintain an average BBB of between usually 25 percent and 30 percent of their portfolios.

We consider the people in this industry as experts in fixed-investment income. They have decades of managing investment income. Most of the companies have well-diversified portfolios in general. Especially for mutual companies and some of the public companies that don't manage so tightly to the returns on equity (ROEs), we see excess capital as an offset to some of the risks that they take in their investments. For example, we see some large mutual companies that take a little bit of an investment risk in equities for the long-term performance for the dividends that they want to give back to their policyholders, but they can afford to do that only if they have excess capital. Some of them lost a lot of their excess capital, so they can only do it to certain limitation now.

We see an excellent track record in commercial mortgages. Over the past 10 years I think any company that invested in commercial mortgages will show us the 10-year trend of perfect returns—above-average returns in the industry—and no delinquency. Who knows what's going to happen the next 10 years? But the last 10 years have been good.

There is better use of derivatives. Some of the companies are starting to use a little bit more of the enterprise risk management skills and are trying to figure out how they can use derivatives to maintain the same performance but reduce the risk at the same time. We're starting to see a little bit more use of swaps, swaptions and other types of exotic derivatives.

There are low investment expenses in general. Long-term investment strategy helps to alleviate some of the cyclical effects, and liquidity remains strong for most of it. The No. 1 risk that we see in the marketplace with the low-interest-rate environment is asset/liability management (ALM) risk. Interest rates were low in the middle part of 2003. They're coming back up now. In general this is a tough part in terms of the cycle for life insurance companies to measure risk and to manage risks in the next five years as interest rates continue to go up. Disintermediation risks and lapses will be key indicators for analysts to look into life insurance companies to see if the companies will have a little bit more trouble managing that risk. Companies will have to demonstrate a lot more what they are doing in the ALM processes and how they're managing this ALM—what kinds of tools they're using to measure some of this risk.

Corporate spreads, not just low interest rates, are also starting to tighten. Chart 1 shows the peak in '02 and '03. It was above the average in the past 10 years, but now it's coming back down quickly. Some of these companies are starting to be afraid of investing in corporate bonds because some of this risk that what happened might come back, and you might not be paid right now for it. You have to be careful what you invest in. For most of the investment managers that we're talking to, their biggest concern is where they put the money—in corporate bonds or MBSs. With equities you don't know what's going to happen, so commercial mortgages have been an alternative.

Asset-backed securities (ABS) and structured assets are other alternatives. If you invest in structured assets, you have to know exactly what you're investing in. It's a complex risk to analyze, to measure and to keep up and survey. If you don't have the expertise, you might end up getting a lot of investment losses like the industry had in the past three years with collateralized debt obligations (CDOs). Most of the insurance companies, when I talked to them in the past year, said their losses came from 1997 to '98 CDOs that they purchased a few years ago. When I went to the next company, it started to talk about CDOs. I said, "Let me guess—'97 to '98," and it said, "Yes." Most of the companies, somehow, started to invest in the structured assets at the same time, and they didn't have the expertise to know what was embedded in those CDOs and some of the structured assets.

Sector concentration has always been the key issue in terms of credit risk. Most of the companies that failed had a concentration in some kind of assets or investment or liability. I looked at one large financial services company that had a lot of losses. Everybody thought that it had a good risk management process a few years ago. It totally revamped the risk management process, and one thing it found out was that in the asset analysis it broke down its diversification by industry, but when it looked into its losses, most of the losses came from companies that were across different industries but had asbestos-related issues. They're now doing a lot of separating of the key issues in the macroeconomic levels and trying to find out correlations across industries to see whether its overexposed to one particular issue. Most of the companies struggle with hedging, accounting and regulatory and S&P constraints. You have to balance all of them.

In terms of asset allocation, I tried to find some data going back to '98 because I thought it was interesting that the market improved a little bit (see Chart 2). The asset allocation looks similar to five years ago, and I think that the strength will be more in maintaining that asset allocation that you had in '03. The main difference is a little bit of structured finance; structured assets have been increased a little bit, but there's not much shift in it. Commercial mortgages, surprisingly, have come down, but I think that's because yields have come down in commercial mortgages. Companies have been struggling to find good yields.

In general, companies in the past couple of years used MBSs as a way to park cash, and some of them did it too much. We'll see how much it's going to impact their

exposure. Some of them have shown us good spreads in terms of their earned rate versus what they pay out, but part of that is that there was a lot of prepayment that happened in '03 that helped to maintain those spreads. In reality, if you go deep into it, spreads have been compressing. We have to look into it. High yields have come down, which helped the average credit quality. At the peak, I think it was around 8.5 percent in the industry average. Now it's 7.5 percent and coming down. Most companies that invest in high yield feel comfortable at the 7 percent to 8 percent range. If we see a company going up to 10 percent, that's a big red flag.

In terms of corporate bonds, you have to invest in corporate bonds even though the spreads are tight, but companies are being smarter—I guess they're trying to find the best value in corporate bonds that they can find right now. It's difficult because everybody's starting to invest in the same corporate bonds or same issues that are available. The supply and demand are going to be key issues. Commercial mortgages is also another area that not everybody's looking at in hindsight to be one of the best-performing assets.

Some of the smaller and mid-size companies are trying to get into the commercial mortgages arena, and it's going to be tough. A lot of the large companies are also coming down in size, investing in the one million to three million commercial mortgages. There's getting to be a lot of demand for commercial mortgages. That is going to tighten the spreads that you're going to see in those asset classes. Real estate and common stock remain a small portion of the assets, and then the commercial MBSs, ABSs and agricultural MBSs are the moving parts where companies come in and out and are starting to find value in those asset classes.

We estimated interest rates to be a key indicator of investment. The economists in S&P forecast a gradual increase in interest rates and a flattening of the yield curve where the 10-year Treasury is expected to reach 6 percent by the end of '05, and the short part of the curve is going to go up to 4 percent by the end of '05. It's going to flatten and increase slightly gradually. The gradual rise in interest rates is good for the life insurance companies because they can try to reinvest and manage that disintermediation risk a little bit better.

The credit default forecast is that it might further tighten because of the economic stability and the credit quality improvement, but you might see a more gradual coming back of the spreads to what the average has been in the past 10 years.

For the equity markets, we're forecasting in terms of what we embedded in the rating process. It's a stable market. We try not to predict rapid rises or declines in the equity market, with no repeats of the late '90 returns anymore. For those companies that have a lot of exposure to guarantees in variable annuities, we don't expect them to go away quickly. We expect that the companies will have to resolve those issues continuously.

We embed investment risk into our analysis in two ways. We look at the qualitative

aspect of the process, and this is the part where the analysts have to go and talk to companies, their chief investment officers, the investment managers, the ALM actuary and the chief actuary. The analysts talk about the investment organization, the ALM organization, the management strategy, how well the company diversified its portfolio, when it shifts allocations between asset classes and what kinds of risk metrics it has to measure its performance and risk tolerance. We usually ask for the investment policies and guidelines.

In the past few years, for example, a lot of companies didn't have the investment policies address a lot of the percentage limitation of assets. The analysts on Wall Street or the rating agencies, when they look at investment issues, look first at what percentage of surplus you lost. If you lose money in WorldCom, we don't expect you to predict WorldCom failure, but if you lost 10 percent or 15 percent of your surplus, we think that your risk management is in question. Instead of looking at percentage of assets, they're starting to put more percentage of surplus dollar amount limitations because they know that that's going to be one of the key metrics.

Risk management expertise, especially in credit risk and ALM, is going to be key going forward. I think everybody had problems in the past few years except a few companies. Mass Mutual and Protective did well. Some others were able to sustain the hurricane that came through in terms of investment risk. Going forward with the market improvement, there are no more excuses, so either you show that you have good control and metrics or you'll face the consequences.

In terms of liquidity, we have the capital model. We look at liquidity ratios. Do you have a lot of private placements and real estate? We want to make sure that you have enough liquid assets or liquid liabilities. Duration, convexity and DV01 exposure are some of those key metrics in terms of ALM, and we want to see how you're doing in that aspect. Some of the ratios that we are using a lot are high-risk asset to capital. High-risk assets might include high yields, common stock, some real estate and nonperforming commercial mortgages to capital. That is a high percentage of capital. At least you can compare that to the industry and other companies and peers. You can see which companies take an investment in terms of trying to compete or use it as a competitive advantage.

Total return, yields versus risk, concentration and maturity distribution are some of the keys. You start to see some smaller and mid-size companies buying a lot of MBSs—a negative convex asset that has a 20- to 30-year maturity. Some of them, we believe, are not going to make it to the 20- to 30-year maturity. If they're going to sell, they're going to sell at a loss. We look into that distribution. If they are too much into those high maturities, it could be an issue in terms of the rating.

Shifting a little bit into the capital analysis, we look at different investment assets, and then we try to apply a risk factor to that to come up with what we think the company should hold as capital to support some of those tail risks. This capital

model is adjusted substantially (see Chart 3). The analysis for affiliated common stock or affiliated bond portfolios is one of the big issues in terms of discussing with the companies what is embedded in those affiliated bonds or stocks. Last year we had substantial issues with a company. It started to lend money to the parent company for liquidity, but in terms of our credit analysis we don't like that to be as capital to support the liabilities. If you lend money to your affiliate, coming out of the operating companies, that's out. We exclude that from capital. You have to know that before you start to do some of those strategies. Sometimes companies do it for liquidity purposes, but they should be able to find liquidity somewhere else.

For advanced analytics, we're starting to implement different modeling techniques and are trying to learn from the industry, from stochastic modeling and from others how we can better implement what the company suggests to be better risk management and a better ability to manage risk. It doesn't want an industry average. It wants its own view of the risk. We're starting to implement more of those models so we can assess that if the company comes to us and says, "We have better liquidity. We have better ALM than the industry shows. We'll have little risk in this type of investment." We need to be able to model that and understand that.

As for the quality of capital, some of those assets might be intangible assets. Don't rely too much on them. We don't like them. The traditional model is a simple formula. It's a lot simpler than the regulatory RBC model. It takes the total adjusted capital less what we call C-1 asset-related risk divided by all other risk. You have investment risk in two parts: asset risk, which is mostly credit risk, and ALM risk and the interest-rate risk.

In general I'm going to talk to you today about the asset-related risk charges, C-1. Table 1 shows you what our charges currently are as of year-end '03. These are the factors that we calculate to be applied by the different investment asset classes, in this case fixed income, and the class is at the NAIC rating, which is what the regulatory rating is.

Table 1

	S&P Bond Charge (starting in YE 2003)	S&P Pref Stk Factors	NAIC Bond Pretax Factors (250% RBC)	NAIC Pref Stk Charge (250% RBC)
Class 1	.0051	.0084	.010	.0275
Class 2	.0391	.0652	.0325	.0750
Class 3	.0936	.1504	.1150	.1800
Class 4	.1740	.2744	.25	.375
Class 5	.2756	.4036	.57	.625
Class 6	.3	.6	.75	.75
S&P charges based on discounted 10-year gross default probabilities, 35%-50% recovery for bonds, no recovery for preferred stock.				

I tried to apply what would be the 250 percent RBC for that factor, and this is pretax. It's not tax-adjusted. It's close to it in Class 2 and then goes a little bit higher than RBC in Class 3. Then it starts to be a lot higher. When you calculate it after tax and apply covariances in the regulatory model, it might be a lot smaller than that, but that's just to show you an example of how the different calculations can come up with different answers.

In terms of how we calculated the factors for this year, for the traditional model we take a 10-year stress cross-default factor from our cumulative default factor table of S&P, discount that at 6 percent and apply a recovery factor of 50, 45 percent. The recovery factors vary by the class and the NAIC ratings. Depending on the NAIC rating, the recovery factor, the discount rate and the stress cross-default default factor we apply, we come up with the factors that we're going to apply to hold required capital for that bond class.

For more advanced analytics, we have a different model that calculates credit risk using the specific default factor of the rating at maturity. It's a little bit more complex in terms of the data requirement because it's trying to match the maturity of the bond and the rating of that bond to a factor that is based on empirical data of S&P. In terms of the interest-rate risk, it also has a different methodology where you try to calculate the assets, liability and hedging, interest rate, delta and gamma and the Greeks. For the different embedded options that it has in the liability, try to isolate that and calculate what the risk exposures are based on that optionality. That's a little bit more cash flow-based. It's more intense in terms of the data, but some of the companies that have guaranteed investment certificates (GICs), institutional business, financial product companies and now companies that have a

lot of group annuities and pensions are starting to use this methodology.

Many people ask me what the level of credit tail risk is that you usually try to measure. Table 2 is an example.

Table 2

Asset Class	S&P Charges	Invested Amount	Required Capital
NAIC 1 Bonds	0.51%	\$5,000	\$25.5
NAIC 2 Bonds	3.91%	\$2,000	\$78.2
NAIC 3 Bonds	9.36%	\$500	\$46.8
Common Stocks	15%	\$200	\$30
Commercial Mortgages	1%	\$1,750	\$17.5
Schedule BA	30%	\$400	\$120
Others	5%	\$150	\$7.5
	Total:	\$10,000	\$325.50

It looks more like a normal distribution, that if you want a AAA type of risk exposure within a couple standard deviations of the empirical data, it doesn't apply to all the risk. This is a general rule of thumb that we use for some of the risk. These rating factors that I applied are the ones that are applied to our traditional model. I tried to put up a portfolio that is about 50 percent A or above rating, 20 percent BBB rating, 5 percent high yields, 2 percent common stock, 17.5 percent commercial mortgages, 4 percent Schedule BA and 1.5 percent other assets. That will be not atypical, not bad, in terms of our portfolio for a life insurance company. The capital requirement for this type of portfolio comes up to 3.26 percent, and it's a simple calculation of factor base times the amount of exposures.

For the advanced analytic approach (see Table 3), this is what I was talking about where you have metrics of default factors that stress different standard deviations that vary by maturity. This can be obtained from the empirical studies that S&P does of global default factors.

Table 3

Asset Class	S&P Charges	Invested Amount	Required Capital
S&P "AAA" 7 yr Bonds	0.39%	\$2,000	\$7.7
S&P "A-" 8 yr Bonds	1.11%	\$3,000	\$33.2
S&P "BBB" 10 yr Bonds	3.11%	\$2,000	\$62.3
S&P "BB" 10 yr Bonds	8.09%	\$500	\$40.4
Common Stock	15%	\$200	\$30
Commercial Mortgages	1%	\$1,750	\$17.5
Hedge Fund to Funds	10%	\$400	\$44
Others (Derivatives)	0.5%	\$150	0.75
	Total:	\$10,000	\$335.8

You pick the default factor that varies by the maturity that you have and the rating. In this case I assumed in the example that you have different bonds or different portfolios with different ratings and maturity, and I applied the amount of exposure to the metrics that you can find in here. You come up with factor-based but more detail-based of 2.36 percent.

It's a different methodology calculating capital requirement for credit risk, but in this case it doesn't mean that you're always going to get lower charges. It's just that it turns out that the way that the portfolio was allocated, the Schedule BA was hedge fund to funds, and we have another methodology that we apply in the advanced analytics that tries to use market value calculation and Monte Carlo techniques to come up with what will be the standard deviation of that specific hedge fund-to-fund portfolio. In this case it came out to be 10 percent instead of 30 percent. There's some other allocation into high yield and BBB that turned out to be beneficial for the company and that, because of the different maturities that they had, came out to be different factors, but the company could have longer maturity that could have a different effect.

There is the traditional model and the financial product capital (FPC) model, which

many people are starting to learn. The traditional model, as you know, is a factor-based approach using industry averages and is based on the NAIC rating, which might or might not be the same as the S&P rating. It does not consider hedging strategies. We could consider hedging strategies, but usually the company has to come forward with it. The good thing is that it's broadly applicable, it's easy to calculate, and you can compare companies easily from the Blue Book and from the statutory statement.

The FPC model is more exposure-based. It's company-specific, but it requires a lot of data from the company. It has limited application because it's not easy to compare one company that has the FPC methodology with another.

There is another example of the FPC where you end up having a different risk for credit and interest rate and operational risk in terms of measuring them from two different methodologies. The point is that you can have two different methodologies, one more sophisticated, but I think it might be a matter of data. Sometimes you have to balance between complexity and simplicity. For the purpose that we have sometimes in terms of getting ratings right, what we need is a simple view of the company's RBC. We might not need to get into sophisticated measures. Internally, where companies have to allocate capital to different asset classes or different liabilities, they might need to know specifically what the best way is to measure the risk and allocate that risk appropriately. For those types of companies we're providing a different model.

In general, in the future, we are trying to apply more modules to that advanced analytical model so that companies can do more than assets, more than credit and ALM. They can look at variable annuities, for example, with the new C-3, Phase 2. We've used the structured finance ratings model for calculating match-funded securitizations, medium-term note (MTN) programs and different funding agreements, catastrophic bonds and detailed analysis of the cash-flow risk. Some companies are starting to develop new financial products outside of the insurance companies that require sophisticated ALM where they're floating the assets and the liabilities, and it requires these types of methodologies in order to understand the risk.

We're trying to learn from the industry and trying to implement better measures of operational risk. I think a lot of the companies are still learning what the best measure of operational risk will be. There will be more stochastic and dynamic modeling. I think the regulatory implementation of C-3, Phase 2 will help companies have the tools, the methodologies and the data that can help us, and we can work with that information to better implement new tools and new methodologies of calculating risk. In general you can find everything that I just covered at a high level. Everything is in detail on our Web site (www.standardandpoors.com). You can always call the analyst. The analyst should be able to answer the question directly.

MR. MICHAEL J. O'CONNOR: I'm going to talk about some of the surveys done in the industry and discuss economic capital. I'll be focusing on the investment risk aspect of it. I'll also be talking about the evolution of the RBC methods and weaknesses, at least my perception. I'd be interested in your perceptions of the weaknesses in the current methods and potential future evolution. One of the things I'm going to be talking about is C-3, Phase 1. I'll be mentioning that a little bit, and I'm curious whether there are people here from companies that have to do Phase 1 right now. It looks like three. My understanding is that a limited number of companies have to do that but that's also going to be expanded in the future.

A couple of surveys have been done over the past few years. There was a survey done by Tillinghast a couple of years ago on enterprise risk management and one by the SOA in the same timeframe talking about economic capital. The makeup of the surveys was slightly different. For Tillinghast we focused primarily on life and health companies. The SOA survey included some other companies beyond the life and health industry. Both surveys had international and national companies represented. I think this has become a fairly well-accepted definition for economic capital: sufficient surplus to cover potential losses at a given risk level over a specified time horizon. I think this definition is definitely useful beyond the insurance industry. The specifics of the tolerance levels over the time horizon would vary by industry.

For example, I think in the bank industry its time horizon may be 30 days, whereas in the insurance industry it might be 30 years. For example, if you're in a bank running a portfolio of short-dated put options or equity options, your time horizon may even be as little as 15 days, and your threshold may be 99 percent. You'd want to have enough capital to withstand a 99th percentile shock over a 15-day period, and that's your capital charge.

In the insurance industry the tolerance levels are still in a state of flux. Obviously the NAIC is starting to draw its line in the sand, but in terms of companies' definition of what level to use for internal purposes, that's moving around a little bit as well, and there's not a lot of consensus on what the appropriate time horizon is.

In terms of economic capital, obviously what you're focusing in on is the tail, and you want to make sure that you have enough capital to withstand those shock events. You tend to rank/order your scenarios if you're doing stochastic scenarios to take a look at wherever your threshold is. If it's a 90th percentile, 93 percent up to 98 percent doesn't matter. If companies use the NAIC approach and what's being used up in Canada, the conditional tail expectation (CTE) approach, you would average over some range of the scenarios in the tail.

Economic capital, in theory, is supposed to take into account all of these different aspects. In practice, that's difficult. For today we'll be focusing on interest rate and credit risk. For liquidity risk, from what I can see in the industry, companies tend to make sure that they have sufficient liquidity on the asset side to cover a run-of-the-

bank scenario. I believe there's an Academy committee looking at liquidity and potentially bringing that into some of the NAIC tests.

A key, though, is that the economic capital should reflect the company's specific characteristics. What are your liabilities? What are the behavioral characteristics of your policyholders? That will differ by company. Even if all of you were in the fixed-annuity market, there are a lot of different niches within that market. It's driven by the product. It's driven by your distribution, and so a lot of those things would come into the company-specific characteristics. As I mentioned, at least right now there's no consensus on time horizon. People tend to look at it over the life of a policy, but I know some companies look at it more over the next 10 years, but it's clearly a long horizon. Using the other extreme of the spectrum, it's not as though you're looking at it over the next 15 or 30 days for what type of capital you need for that type of a shock. However, if you do develop economic capital within a company, you still have to deal with the real-world situation of where you come up with a number, the NAIC formula or C-3, Phase 2. We'll come up with a different number.

Next I'll discuss insurance rating criteria. Different rating agencies have different formulas and different factors, so the ratings that you'll have will be a big driver of the real capital you and your competitors hold. The main thing is that you have to look at your own specific situation, but you also have to balance these other criteria. If you think you need only \$100 of capital, but all your rating agencies are telling you that you need \$125, it's difficult to hold \$100 and maintain the ratings that you have.

How are people using economic capital? About half of the people who responded to the SOA survey said that they use the concept of economic capital and expect it to be used on a much more go-forward basis. Within Tillinghast we've done surveys of chief financial officers (CFOs) over the past six months. It's a much smaller group of CFOs that we're surveying, but it's focused on the life and health companies, and I think we have most of the top 50 companies represented. They also expect that they'll be going to more of an economic capital model. I think there are a lot of reasons for that. C-3, Phase 2 is a form of economic capital. In effect, the FPC model you were talking about is a form of economic capital in that you're looking at the specific circumstances of a company, cash flows, rather than using a factor-based approach.

Why are CFOs interested? They want to make sure that they're using capital efficiently and that they're managing the risk and rewards of that capital. In some companies they're using their internal performance measurement based upon their economic capital formula, not the actual capital that they're holding. As they continue to enhance their internal capabilities, they want to be able to then influence and get the rating agencies to agree that they don't need to hold this much capital. They could hold this amount of capital. For now there are a number of companies, clearly not a lot of companies but some companies, that are using

their own economic capital numbers for internal performance measurement, not the actual capital that they're holding.

What are some other reasons for calculating economic capital? Some companies also are using the results of this economic capital to drive pricing, especially when they get into newer products where even from a factor-based approach it may not fit well. On the mergers and acquisitions (M&A) side, as well, there are a lot of instances I've seen where under the NAIC formula there's a covariance adjustment. Hopefully you're all familiar with that, but where the covariance comes in is where you have a lot of C-1 and C-3 risk and a lot of C-2 risk.

Sometimes in an M&A situation companies are looking at the marginal capital that they will need if they reinsure the business into the company and at least for NAIC purposes not have to have an extra dollar of capital because of the covariance adjustment and the fact they only need 20 percent of that amount of capital or a much lower amount. I have seen situations where companies that are at least driven by NAIC capital would do that. Again, another driver is discussions with rating agencies.

In terms of setting economic capital, what are some of the key issues? Obviously for C-1 the concentration risk is one. For the NAIC formula, you have to double-count capital for your 10 highest securities to calculate your asset concentration risk. Some of the rating agencies' formulas don't have that particular component, but they pick up asset concentration diversification perhaps in some other way.

I think spread of risk is referring to some of the things that Jose mentioned, CDOs. Companies that invested in them may not have clearly understood that, for example, in their general account they might have had exposure to all these companies in the low investment grade area. Those same companies didn't accurately pick up their exposure through their investments in CDOs. That is one problem that a number of companies had. They didn't understand the additional issuer concentration that they had. C-2 I'm not going to mention.

When C-3, Phase 1 came into place, I think it was roughly '99, my recollection is that at that point in time there were fewer than 50 companies that had to do this testing. There is a threshold for having to do C-3, Phase 1. The ratio is 40 percent of your reserves have to be fixed annuities or other similar types of contracts with disintermediation risk, excluding equity-indexed annuities (EIAs). You had to meet that threshold. Again, there were fewer than 50 companies, and the number is lower now.

Those companies have to do scenario testing to determine capital independent of the actual factor-driven amount. If you've looked at the C-3 instructions that are part of the NAIC RBC blank, you'll see where some of the numbers would come through. Basically what the regulators are getting at for at least right now for a small number of companies is that you should look at your capital from a scenario-

testing basis, not a factor-based basis, again excluding EIAs. I think that's a good thing, and I'll mention that type of approach later on as well.

That would also then give you credit for ALM, for example. If you're in that situation, and you're looking at your whole portfolio of risks on the liability side, it would bring in, for example, on your fixed annuities or now with C-3, Phase 2 the guaranteed benefits that you have. It will reflect the interest-rate risk. For Phase 1, the scenarios are prescribed. You can use either a set of 50 scenarios or a set of 12. You can't use your own scenarios.

While liquidity risk is an important risk, especially for some lines of business like funding agreements or GICs, companies tend to analyze that separately from trying to do a cash-flow-testing type of scenario testing. Operational risk is another aspect that is difficult to quantify. Diversification of risk, especially combining your C-3 and C-1 with your C-2, is a bit of an art. The NAIC has its own approach. Some companies I've seen that do this apply correlation factors. For example, I think between the C-1 and C-3 even they would have lack of correlation factors coming into it to reduce the total capital, so they calculate a C-1 component, calculate a C-3 component and then apply some correlation factors to reflect that not everything is going to be bad in the same scenario. That is, in effect, what their covariance adjustment in the NAIC model is attempting to do.

What are some other issues to consider? ALM is becoming more and more important. C-3, Phase 1 came in a few years ago. As Jose mentioned, some companies, for special lines like GICs and funding agreements, now are applying a different capital model and getting reduced capital requirements from the rating agencies. C-3, Phase 1 is in there for a limited number of companies. C-3, Phase 2 will allow capital credit for hedging. The details of that are still being worked on.

I'm not sure how familiar you are with that sequence of events, but C-3, Phase 2 is similar to what's been in place up in Canada already for three years. I think '01 was the first year. In '02 it was definitely in place for their forms of variable annuities. They also allow hedging. My understanding, though, is they allow up to a 50 percent credit for hedging, if you can demonstrate that much. On a one-on-one basis they will allow potentially a higher percentage, but you have to, I think, go in and prove that your hedging will justify a credit more than 50 percent. What the Academy is working up does not have that 50 percent limit, but the details of exactly how you would demonstrate credit are still being worked on.

Rating agencies are getting to be a bigger influence, and this comes up in our survey of CFOs. Part of their motivation for wanting to do more scenario testing and more ALM work is because they're getting asked more questions. If you look at some of the 10Ks and 10Qs by a handful of companies, they're disclosing more and more about their risk management practices and about their ALM. There are a number of companies in the industry who are raising the hurdle, if you will, in terms of ALM purely from the disclosure side. The CFOs are aware of that, and

they're getting asked questions by analysts and by rating agencies because the rating agencies see what the XYZ Company is doing and disclosing.

One area of coming up with economic capital that gets low satisfaction on the surveys is that you have to frequently update and refresh your models. If you were calculating economic capital today for the second quarter of this year compared to the first quarter, look what's happened to the yield curve environment. Toward the end of March the 10-year Treasury started to increase, but I think it was still below 4. Right now it's around 4.8. Just look at what's happened in this one quarter, really during the month of April and partly into May. If you're going to be doing this, you have to be able to update your model frequently.

Attributing capital to business segments is a tough one. A company I was at back in the late '80s and early '90s was doing economic capital internally. Even within one legal entity it had business units ranging from huge GIC and funding agreement operation and home service business—door-to-door debit operation. If you were in the late '80s, early '90s, you had to have a AAA or a AA+ credit rating to be in that market. For the home service industry, they didn't care. How do you allocate capital? Who pays for that capital if you're in the same legal entity? It's the legal entity that's rated. It's also in the reserves and the liabilities of all the other business units that have to have capital to maintain that AAA rating. That is one of the thorny internal issues. If you're in a segment where ratings don't matter, you'd be perfectly happy with a low A, but you have an operation that needs a AA or AA+. Who pays for that redundant capital?

Next is the issue of properly assessing financial and nonfinancial. For nonfinancial I again would also include liquidity. Including operational risk and economic capital, I haven't seen any internal economic capital models where that's a quantitatively driven component. I think could change pretty dramatically in the future.

There are different ways of allocating economic capital. You can look at value at risk, which is a typical banking measure, especially for the asset side. The lower areas where, for example, the NAIC, Office of the Superintendent of Financial Institutions (OSFI) up in Canada, and I think companies internally tend to look at some type of percentile threshold, CTE, or a multiple of standard deviation. I've worked with one company that has a very, very high threshold. Most companies, though, tend to do it in the percentile or CTE, again, 90 percent, 95 percent and so on.

Diversification is also difficult to model, especially if you have different types of business within a legal entity. Let's say you had long-term-care business in the same entity as a bunch of fixed annuities and variable annuities. Trying to bring all that together into one model and show the impact of diversification is a challenge. Another example is let's say you have a block of LTD business. Health is not my area of expertise, but I clearly remember one from the exams 20 years ago that there were at times claim levels that would be driven by the economy. If you're

building an econometric model and trying to model all these nuances, you'd have to bring that into play as well, I would think.

Next is evolution of the RBC methods. I think one thing you have to keep in mind is what the different methods are. What are the goals of the different methods? NAIC structure is aimed toward solvency. It doesn't care if you're holding 250 percent or 300 percent. It does care once you hit a certain threshold. Again, its focus is solvency. However, when you're in the marketplace trying to sell products, credit ratings are important. For example, the S&P framework, the AM Best and Moody's are trying to differentiate a AAA from a AA+ to a AA, AA- and so on. They're trying to differentiate the strong companies.

The NAIC and the regulators are trying to figure out where the weak companies are. Where do they have to be careful? Where might they have to step in or where might they have to start initiating conversations with a company? They're not worried about AAA/AA+. If you're in a company, though, you're trying to get the best use of your capital. These different purposes will drive some of the framework. Models can produce different results such as convexity risk. In the S&P formula there is an explicit charge for assets that are convex. In the NAIC, there's not. Actually, there's a little piece. If you look at the C-3 component of the NAIC, there is a slight potential charge. If a security is currently callable, then I think you have to include half of the call premium as a charge.

Also, different RBC models will categorize single-premium immediate annuities (SPIAs) into different categories. Sometimes different approaches will say that's a low risk, a medium risk or a high risk. Risk is also sometimes in the eye of the beholder. With a block of SPIAs you do have a lot of reinvestment risk. If rates go up, that block might look well. If rates go down, though, depending on where your fixed-annuity block is relative to your underlying guarantees, you could have a block that is just going to exacerbate your situation.

Focusing on just a C-3, how could companies come up with different results? I'm talking specifically of companies that are looking at their fixed-annuity block, for example, for economic capital. The interest rate generator alone will cause different results, depending on how much or whether you even use a mean reversion. We see some companies using some lofty mean reversion rates and/or the SPIA, of which rates will revert to that level. You'll get different scenarios depending on which time horizon or historical time periods you're looking at. Obviously if you're looking at things on a real-world versus a risk-neutral basis, your scenarios could be different.

Another source would be equity-growth generators. For C-3, Phase 2, the NAIC is prescribing not the scenarios, per se, but the calibration of those scenarios. You can use your own scenarios as long as they meet this careful calibration so that the scenarios produce the type of returns that the model will require.

Another obvious example is differences in assumed policyholder behavior. Again, I'll focus on a fixed-annuity block. What's your competitor rate definition? What's your dynamic lapse formula assumption? Again, from an M&A perspective, we see a lot of different variations in companies in terms of both of those things. Different companies will define a competitor rate that might be different as much as 75 basis points.

Some companies will have excess lapses kicking in even though there might be a large surrender charge like 8 percent or 9 percent still there. A lot of assumptions like these can drive the results. For example, there are the SPIAs. I took a look at the NAIC and the AM Best model. Maybe this is something that Jose can mention. For example, if you look at the NAIC and the AM Best model, SPIAs are considered low risk. I think on an after-tax basis that's a 0.5 percent capital allocation. In the S&P model, it's in the high-risk category. On the convexity side, like I mentioned, it's not explicitly captured in the NAIC model other than it should be at least implicitly picked up if companies have to do C-3, Phase 1 testing. S&P has an explicit charge. I don't think AM Best has an explicit charge.

I'll talk about recent evolution at least at the NAIC level. Again, I think that C-3, Phase 1 started in '99. I think it was just a week ago today or so that it became official that C-3, Phase 2 is pushed off to '05. I understand one of the long-term goals is to expand Phase 1 to include more companies. In theory that's what should happen. The 40 percent threshold was somewhat arbitrary, and maybe that won't even be started until next year. Maybe it won't be until '06 before the different committees start looking into it.

Also in the future it would include EIAs, which are currently exempt. I think the rationale for exempting them is that it's both interest rate risk and equity exposure for an EIA, and so you have to produce scenarios that bring into account both of those movements for an EIA. I think a couple of years ago that was the rationale to exempt them because the committees that were developing it and the regulators thought that would take too much time. Not that many companies would be covered by it. They tried to focus on the regular mainstream fixed annuities.

I want to discuss some of my perceptions of the weaknesses in the current methods. I think in general the risk charges and the covariance adjustment, as in the NAIC model, are all generic. Obviously C-3, Phase 1 was one first step to get beyond that, and C-3, Phase 2 was a huge step, getting beyond being generic. Liquidity is not currently in the NAIC approach, at least in terms of the specific capital calculations. Even under C-3, Phase 1, you cannot combine product lines. Let's say that your biggest risk for a fixed-annuity block was interest rates rising. If you had a payout block, that block might be a nice buffer to your fixed-annuity block, but in the current framework you cannot bring those two together.

When you do cash-flow testing for reserves you can combine those, but for capital purposes you can't. I'm not sure to what extent that, if you have a hedge program

in place, that's really reflected. Again, if you're not swept into C-3, Phase 1, and you're just factor-driven, then the fact that you're doing hedging wouldn't come through your capital results at all.

I think one weakness is some product lines that do have interest rate risk just don't get a charge for it. C-3 is, even when it's labeled interest rate risk, disintermediation risk that it's picking up now with annuities and life insurance, but there is clearly interest rate risk on blocks like LTC or disability income, where you can have a significant buildup of reserves over time just from the collection and accumulation of premiums in the future. Your investment/reinvestment risk can be quite substantial on some of those blocks.

What's some of the potential future evolution? Back in the mid-'90s, regulators were asking, "Is the actuarial profession up to the task of using cash-flow-testing models to determine anything—reserves or capital?" The answer back in the mid-'90s was, "No." The specific environment this question came up in was for EIA reserving. The reserve standards were set in '97. In '96 people offered up to the regulators that if there is a question of asset adequacy hedging, just rely on the actuary to do cash-flow testing to make sure that everything's okay. The regulators basically said they were not going to allow that because they did not think that the profession or the technology available to companies at that time was up to it.

However, look at the big change with C-3, Phase 2 now, and even C-3, Phase 1. The regulators are clearly embracing and requiring now that actuaries have models to pick up a company-specific risk profile. That's a huge change in the mindset of the regulators from roughly '96 to '99. C-3, Phase 2 was in active discussions and negotiations going back two years ago. Over a five- to seven-year period, there was a real shift in the regulators' mindset.

There are a lot of other broader issues to look at risks, and specifically the Risk Management Section was formed to help actuaries deal with, learn and understand looking at other risks. Even though I'm not in the Risk Management Section (I'm on the Investment Section Council), I'll put a plug in for the Risk Management Section.

Let's also look at what's happening in other countries, and I'll mention three in particular—Canada, England and Germany. All three of those countries have one regulatory body for both the banking industry and the insurance industry: OSFI in Canada; Financial Security Assurance (FSA) I think it's called in England; and I forget the name of the group in Germany. There are a number of other countries in Europe that have that same approach of one regulator for both banks and insurance companies.

New York State's Capital Markets Unit is the unit formed within the New York State Insurance Department roughly two years ago. They are focusing on capital markets risks, investment risks, interest rate risk, credit risk, operational risk, liquidity and a few other risks, but it's a group focusing on insurance companies. The people that

started that unit came from the banking industry, and the examination manual that has been developed is clearly a type of approach that could be used in a bank or an insurance company. That's a big, quiet shift, but that has happened in the New York State Insurance Department.

I mention fair value accounting because if and/or when that does ever come to the United States, that could change a lot of things. I think it could change the capital environment as well. I think what the regulators are saying with C-3, Phase 1 and what OSFI said a couple years ago when it set up its framework is that the capital should be related to the specific risks of a company. If you look at what's happening in the banking world and what the Capital Markets Unit in the New York Insurance Department would like to have happen, that's clearly the direction it's going in. That's clearly what the rating agencies want, too. They want to have capital that is company-specific, and that's where actuaries come into play in terms of having the models and the capability to reflect on both sides of the balance sheet the real risk profile of a company.

MR. NATHAN W. HARDIMAN: I have a question for Jose. I think you said it was 10 percent of assets and high yield is kind of a red flag. Another quantitative measure that you listed was duration and convexity, and I wondered what red flags are for that. Can you discuss what ranges you see in companies and what ranges you and other rating agencies like to see?

MR. SIBERON: On average I think the industry has managed duration well. Now it is forced to manage convexity by our convexity model, but in general the duration mismatch has been half a year. Most of the bankers and people that we have in advanced analytics also came from the banking industry. They hate the word duration. They think that's '80s. They look at DV01 and more cash-flow exposures. In general the companies present to us in the management presentations duration and convexity. In general half a year to a year is what they presented to us on average. More than a year I think would necessitate a more intense discussion with them.

Negative convexity was high last year. Most companies have only slight positive convexity. A handful of companies have a large negative convexity because of the MBS portfolios and callable bonds. Some companies at issue try to get yield by getting more callable bonds. MBS show it in the model and have a substantial effect in terms of capital exposure to negative convexity. In general the industry has been close to zero in terms of convexity and half a year to a year in duration. If it's more than a year, I think it will be a red flag for rating agencies. Three years will be a rating factor definitely.

We're getting more trained on this as the companies become more sophisticated. We're getting Charles Gilbert from the SOA come to us to teach us a little bit more in detail advanced ALM for the analysts, what we should be looking for in terms of asking questions to the companies and what the red flags are in terms of asking

them about duration and convexity. Especially for companies that are more into the annuity fixed products, we can go to their ALM experts and talk to the people that are doing the work, as opposed to the CFO or the chief actuary, just showing duration and convexity. It will be getting more involved in the next few years.

MR. O'CONNOR: Are people familiar with how the convexity risk charge is calculated? Maybe it would be worthwhile to explain that.

MR. SIBERON: I want to mention also that we recently, if you're not aware of it, changed the industry outlook from negative to stable, which is positive news for many companies in the industry. It will probably signal that it's going to slow down the number of downgrades that we've been seeing in the industry. I don't think we're going to get a lot of upgrades in the coming year, but at least the ratings will stabilize where they are right now. That will take a little bit of pressure off management people that have been dealing with a lot of rating agencies and credit analysts on Wall Street. This will allow them to concentrate more on their internal projects and try to improve their internal capabilities as opposed to dealing with external issues.

Chart 4 will give you a little bit of the convexity calculation. It's applied to a traditional model, but it's applied more intensively in the FPC model for those companies that choose to use the FPC. We usually use the DV01. It's a concept that I learned taking actuarial exams, I guess, 220 or 231 of those actuarial exams. You rarely see it because the actuarial community uses key rate duration more often, which is the same thing. DV01 is more specific than key rate duration because DV01 just shifts one basis point as opposed to key rate duration that sometimes might shift 50 to 100 basis points at different points in the yield curve. Why DV01? Because you're trying to take away some of that convexity that comes into play when you shift more than one or 10 basis points, so that error margin will be a little bit off. DV01 will also help you isolate the delta risk.

In the convexity, we're trying to isolate the delta risk, the shift in interest rates that affects the price but concentrate more of the shift in duration. We assume that your duration matches. If your cash flows do not behave, for example, if you're duration-matched, that's because of convexity. The maximum application is different interest-rate sensitivity, and we don't give any credit to positive gamma. We assume the positive gamma or the positive convexity is to offset some of the positive convexity in the liabilities. We assume that you should be matching the positive convexity in the liabilities with the positive convexity of the assets. We don't give any credit for having positive gamma in the calculation.

In terms of the exposure-based calculations, we'll ask the companies to provide us the market value shift—100, 150 or 200 basis points, and in the traditional model, 250 up, and then down 100, down 125 in a traditional model. We want 125 because the yield curve is so short that we don't want the companies to start dealing with negative yields. You still have to deal with negative yields, but we ask them to

apply the same asset adequacy testing approach which is to have the current yield. In terms of calculation, the companies provide the market value changes to the different shifts in interest rates, to the MBS portfolio and the callable portfolio.

We calculate the change based on the change in interest rates. We will calculate the market value shift from 150 to 100, and let's say that's about 20 right there. We assume that if the DV01 is 10, the shift of 50 basis points should be 50. The difference will be -30. That -30 is because of convexity. We'll look at all the negative numbers and add them up on the upper scenario. We'll look at the negative exposures or the difference between what is expected and what your market value shift is coming up in the down scenarios. We'll take the worst, and then we'll divide that by your model assets and come out with the factor. Let's say it's 3 percent or 4 percent.

Most companies have shown an increase in the past year. The average in the industry was about 2.5 percent in '02 and about 3 percent to 3.5 percent in '03. That's about equivalent to a BBB exposure in terms of credit risk. It makes sense because we're basically saying that all that negative convexity is almost the same amount of risk of invested in a BBB corporate bond. Some companies will show substantially higher than that. Some companies hedge by buying swaptions to hedge the negative convexity, and we ask them to model that into it. In this case it's modeled separately, as you can see, and the swaption might be able to offset some of that negative convexity.

Asking the company to provide the market value changes is a little more company-specific. The small and mid-size companies, especially, at the beginning struggle coming up with market value changes for shift in interest rate. That's an indication of risk management issues—why they invest in a negative convex asset when they cannot even model their own cash flows. In general most of the companies are able to do it. Sometimes they send the survey that we sent to companies to junior people or a different department, and they don't know how to deal with it. If they ask, most of the companies are doing GICs and funding agreements in the daily calculations. It's not a big deal.

MR. O'CONNOR: I'm curious whether audience members can comment on either their C-3, Phase 1, or if they're doing economic capital internally, what some of their observations are in terms of difficulty, management acceptance and that type of thing.

MR. CHRISTIAN J. SHIEMKE: We do economic capital at Jackson National, and I think it's an interesting process. You learn something, but until S&P takes it more into consideration, it's not going to drive any business decisions. What S&P says our capital is is what S&P says our capital is, and that's what we're going to do. I think it is interesting, and it is a useful process. Do you find that people do economic capital just on in force or if they include new sales projections?

MR. O'CONNOR: What I've seen is in force only. They might use the results of the analysis to price new business, but a few companies that I'm familiar with do not include new business.

MR. SHIEMKE: We don't include it yet. To get a real view of the future you have to include it, but then once you include it, if interest rates go up to 50 percent in our stochastic scenario generator, what are sales going to do? What are variable annuity sales going to do versus fixed annuity sales versus life sales?

MR. O'CONNOR: I don't know. Who knows?

MR. SHIEMKE: I think those are all constraints.

MR. SIBERON: I want to add that it is critical to show your economic capital and your assessment of economic capital to S&P and other rating agencies. The future is changing. Even though it might not come up in the modeling, the capital requirements or the quantitative aspect, it's becoming a different factor in terms of rating. Some ratings in the next few years might start to shift up because it's clear how the competitors are handling different risk and how they're understanding the different drivers of new business versus interest rate versus all the sources of earnings and sources of capital and the different factors that drive any of them.

It's important for management to communicate that to the external parties, and they're starting to do so. It's becoming clear which companies are standing out right now. I think those companies' analysts are paying attention and are starting to think about potential differentiation between them and the other companies that currently have probably the same rating, maybe either shifting it up or moving it. There's some differentiation in the marketplace now that is showing up, just from the ability to communicate to us what the drivers of the risk are. How are they managing it? Some of them are helping us develop more modules into the advanced analytics to be able to measure those new and advanced risk management techniques and exposures. If they can demonstrate that, it can be beneficial beyond the quantitative aspect.

FROM THE FLOOR: I'd also like to say that your new MBS charge model is much better than the old one.

MR. JEFF L. GIMBEL: We have a New York affiliate that we do the C-3, Phase 1 testing for, and it's been positive for us there. We've been able to decrease the C-3 amount quite a bit. There are a couple of factors we seem to attribute that to. We have an ALM process in place, so we're managing that risk well. It's an older block of deferred annuities that has no surrender charge left, so the reserves are relatively high. We're attributing it to those two factors, and it points out a flaw in the RBC approach or the factor approach. The higher reserves you hold, the more C-3 factor-based RBC you have to hold.

MR. O'CONNOR: I'm familiar with about four or five companies on the C-3, Phase 1, and I've seen companies at both ends of the spectrum. I think the floor is half the regular factor. You can't go below that. There's a cap in there also. It's two times the regular factor. If you're in the high-risk category of 2 percent, you'd only have to go up to 4 percent. If you're holding a 250 percent ratio, that's what your 4 percent would be multiplied by, but I know two companies that hit that cap, and it's basically because of MBS.

They had so much convexity risk in their asset portfolio either way where if rates went down, a huge amount of their portfolio prepaid, and so they had to reinvest at much lower rates, and then the opposite would happen. If rates went up, they had so much extension risk in there that they got hit on those types of scenarios as well. I have seen a couple of companies because of their prepayment and extension risk where they held twice the amount of capital for their C-3 for the fixed annuities that they had to test.

MR. SIBERON: One issue they're asking us right now is what we are we going to do with C-3, Phase 2 given that it's moved to '05. Will the rating agency or S&P implement something earlier than the regulators? It's tough to do that because the regulators can demand systems and data requirements for the entire industry. We cannot do that. But for those companies that can demonstrate that they have capabilities right now, they can come to us and talk to us.

The one thing that we have issues with is we measure capital in aggregate first. You have companies that have 17 subsidiaries. We try to aggregate. We have companies that are global—Swiss Re, Munich Re, etc. We tried to connect somehow the London and the Asian people and the Asian offices with the New York offices and tried to come out with a consolidated group capital. Hedging strategies in variable annuities might be done on a business level different from the legal entity level, and there might be consultants and others in the industry that will go around and try to isolate all the risk into one legal entity so it benefits the isolation to implement the hedging strategies for the C-3, Phase 2.

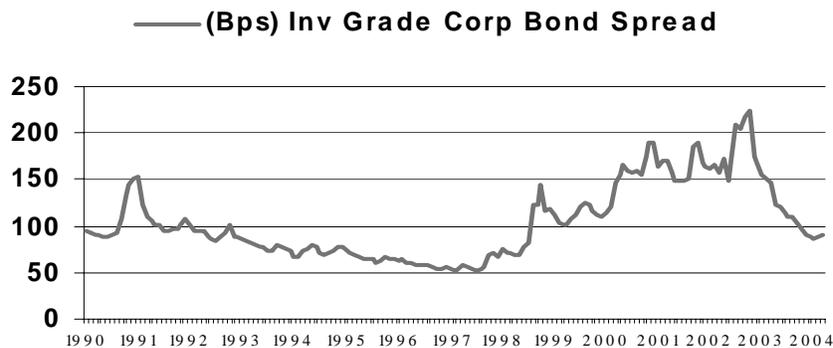
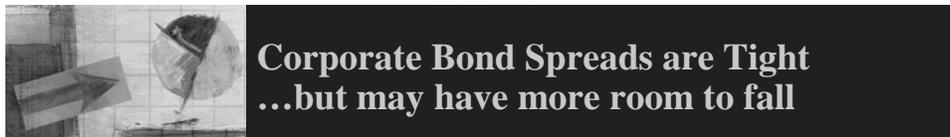
We would like to know how the hedging strategy will be allocated. How is the capital going to be maintained by the legal entity versus the aggregate? How are you going to dynamically measure that, not just once a year in March or February, but constantly monitor the dynamic hedging? I think most companies will have to hedge in order to survive this requirement. It seems to be volatile. How are the companies going to manage that volatility of capital requirement and reserve requirement? It's going to be interesting. If you don't hedge, it's going to be almost impossible, I think.

For us, we would like to see the regulators look into a more dampening effect and at more long-term views as opposed to an every-year requirement—14 percent versus 1 percent another year versus 10 percent another year. It's too much, especially when the markets go down substantially and you have a bear market.

Based on some other modeling that I've seen from consultants, the requirements can triple or quadruple. Then the companies have fewer management fees, and they're struggling with the earnings. Other macroeconomic issues might come up. I don't know how they're going to get the capital to support that business in those scenarios.

It'll be interesting to see what happens, but right now we're taking a look and discussing with the companies what their views are and discussing with the regulators and consultants to see what we can implement that covers everything. The ideal thing we'll be able to implement is something like the CTE, modified CTE or some kind of cash flow-based approach that shows the exposure and then discuss with the companies how they're going to measure that exposure and feel comfortable with it. Even in C-3, Phase 2, we would like to see what that 10 percent of scenario is. Can you show us how you come to the interval on that expected average or mean? One scenario could be driving that whole thing. We would like to see some of that detail, and we look forward to talking to companies about that.

Chart 1



Bps--Basis points. Sources: Standard & Poor's Global Fixed Income Research

Chart 2

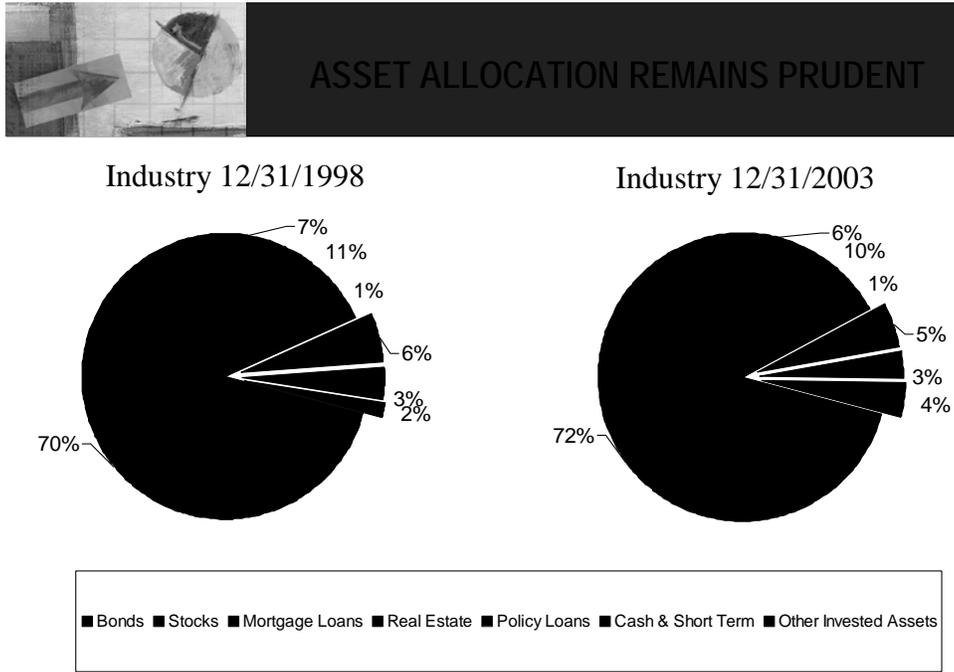


Chart 3

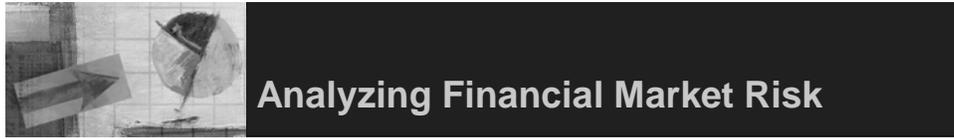


Standard & Poor's Capital Adequacy Ratio

$$\begin{array}{r}
 \text{Total Adjusted} \\
 \text{Capital} \\
 \hline
 \text{Mortality/} \\
 \text{Morbidity} \\
 \text{Risk} \\
 \text{(C-2)} \\
 + \\
 \text{Interest Rate} \\
 \text{Risk} \\
 \text{(C-3)} \\
 + \\
 \text{Other Business} \\
 \text{Risk} \\
 \text{(C-4)} \\
 \hline
 \text{Asset-Related} \\
 \text{Risk Charges} \\
 \text{(C-1)}
 \end{array}$$

Capital Adequacy Ratio is only a starting point for judging capital adequacy

Chart 4



Analyzing Financial Market Risk

Calculating MR_1 "Delta" Risk Charge

Step 4:

S&P determines expected losses by multiplying "bucketed" DV01s by applied volatilities (ignoring covariance between buckets)

"Bucketed" Risk Point Exposures				
Risk Points	Combined DV01s	Applied Volatilities (bps)	Combined Gain/Loss	Absolute Value
1 to 6 months	(\$1,526)	226	(\$345,312)	\$345,312
12 month	\$4,600	201	\$922,669	\$922,669
24 month	(\$8,346)	201	(\$1,673,909)	\$1,673,909
36 to 48 months	(\$16,923)	201	(\$3,394,170)	\$3,394,170
60 month	\$8,811	195	\$1,721,902	\$1,721,902
120 to 360 months	\$15,340	194	\$2,978,190	\$2,978,190
Totals:	\$1,957		\$209,370	\$11,036,152

- Assumed losses = sum of absolute values
- S&P conservatively assumes perfect negative covariance exists between risk buckets. (i.e. rates rise for "long" exposures and decrease for "short" exposures)
- **Expected losses = \$11,036,152 or 1.104% of GICs**