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Session 113PD Investment-Related Assumptions

Track: Investment

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Summary: Attendees will learn what to consider when developing investment-related assumptions for use in long-term models. Specific questions to be addressed include: Are historical averages good enough? How much should current economic conditions influence long-term assumptions? What macroeconomic relationships should be considered? What is a reasonable set of interest rate scenarios? What responsibilities do actuaries have in setting investment-related assumptions?

MR. ROSS BOWEN: I work for Conning Asset Management. In our work as actuaries we use many types of long-term models: asset adequacy, pricing, appraisals and many others. What should we consider when we're setting investment-related assumptions? How should recent experience be reflected in these assumptions?

We have a distinguished panel here today to discuss these issues. Kurt Karl is head of Swiss Re's economic research and consulting, North America, and chief economist of Conning Asset Management. He supervises Swiss Re's renowned *sigma* papers, the research series on the insurance industry. Kurt has worked for Wharton Econometrics and was chief international economist at WIPA. John Ryding is chief market economist and senior managing director at Bear Stearns. He is responsible for analyzing and forecasting U.S. economic and financial market

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developments. Prior to joining Bear Stearns he worked at the Bank of England and the U.S. Federal Reserve. He is a regular commentator in the financial press. Michelle Smith is a consultant with Tillinghast. She has worked for Tillinghast for the past 13 years beginning in Melbourne, Australia. Her primary experience is building and reviewing asset liability models for appraisals, embedded value and insurance securitizations. She is a Fellow of the Society and the Institute of Actuaries of Australia.

MR. KURT KARL: I'll be going over how economists derive investment-related assumptions and give you an idea of the constraints that you might want to impose on your models, particularly on interest rates when you're trying to get some assumptions going forward on interest rate outlook. I'll cover inflation, real growth, interest rates, of course, and do a little bit on the equity market premium, a little bit on rule of risk scenarios in, for example, asset liability management (ALM) issues, and discuss using surveys for estimating tails of distributions. I know this is not the way actuaries like to think about estimating distributions, but it's useful to get some concept of the constraints that can be used.

We hold these truths to be self-evident—this economists widely agree on—long-term interest rates in equilibrium are equal to inflationary expectations and potential real growth. In the United States, empirically, this works well for the 10-year Treasury note and intuitively you can understand that the real growth of the economy should reflect the real returns you get from a risk-free asset. In arbitrage you get to that same rate.

A little bit more controversial, but not widely held, the first assumption comes from long-term growth theory. Inflation is unlikely to get very high in the future. This is not just in the United States; this is happening globally. Central banks are independent; they target inflation; and they know how to keep inflation from getting out of hand going on the upside. In Japan they're struggling a little bit with the deflation issue and getting it back up into the positive range, but generally central banks know how to control inflation when it gets a little too high.

With respect to the equity-risk premium, there is simply no similar agreement.

What are the implications of these widely held views? It's unlikely that we will have another Great Depression. This is something I've run into with actuaries, an assumption that we have to have a scenario to bounce our ALM issues off of. We must have a scenario of a Great Depression because that's happened in the last 100 years. It's not likely to happen because of the way the Federal Reserve Board understands how to manage monetary policy and inflation at this point. There were monetary policy errors by the Fed during the Great Depression. The inflation that we saw in the late 1970s and early 1980s is unlikely to occur again.

Interest rates will remain low due to low inflation. The model is based on 50 years of history. If you wanted to model interest rates over 50 years of history, you would

have misleading results on your distribution. Models based on the last 10 years are going to be more accurate because we have entered a new regime. We've had Paul Volcker and Alan Greenspan for over 20 years now. In essentially the last 10 years, Greenspan has been ratcheting down from the 3 to 4 percent range to the 1 to 2 percent range.

What does it mean looking ahead for interest rates? We're not going to get back to the 10 percent range or 15 percent range that we saw in that peak inflation range. We'll be in the 5 percent range, and this is not just the United States; it's Europe, in particular, Canada, but it's not Japan. Japan is the outlier, and deflation is lowering interest rates substantially.

So we're kind of back like to what it was in the 1950s. The implicit target from the Fed is somewhere around 2 percent to 3 percent for core CPI. The Fed likes to look at the core, a consumption deflator from the national income and product accounts; between 1.5 percent and 2.5 percent is their target. I think most economists would agree with that range. The core inflation is exclusive of food and energy.

The situation is sort of similar to the 1950s, particularly 1953 to 1959, when inflation averaged about 1.5 percent. Real GDP growth was 3.1 percent and the yield at the end of that decade was 4.6 percent on the 10-year Treasury note, but it did average 3.1 percent during that period. Economists would say during that decade that we started off with zero expectation of inflation and we rose to about 1.5 percent, and that's why the 10-year Treasury note yield rose.

Again, we are in a new regime. Inflation is not only lower than it has been historically for the past 50 years, but compare the volatility of the 1950s with the current volatility, which is much less. They really have this game down pretty well at the Federal Reserve Board.

Interest rates are inflationary expectations. They are also real potential growth. There are different ways to measure this. I think John will have more on this, but if you take real growth during some period of constant unemployment rate, you can take labor force growth plus productivity growth and this real growth refers to excluding inflation. You can take it directly from some sort of moving trend of 10-year moving average of geometric mean of real growth. Of course, you're going to survey economists, which is often done. Most estimates will put the potential growth between 3 percent and 3.5 percent.

Here's a simple way to estimate it: The unemployment rate was 6.1 percent in 1994; it's going to be about 6.1 percent this year. The average growth between those two points was 3.1 percent. Therefore, potential growth was about 3.1 percent. I chose a recent period because we get rid of the productivity issue. There is a lot of controversy in the economic profession about this productivity in the 2.5 percent to 3 percent range or in the 1.5 percent to -2 percent range. I think most

come closer to 2 percent than 1 percent of the labor force; you're still at 3 percent potential growth.

The yield on the 10-year Treasury note averaged 5.5 percent over this period. Core inflation averaged 2.4 percent and, lo and behold, we had an empirical relationship between the 10-year Treasury note and core inflation, giving us 3.1 percent—very similar to estimates of potential real GDP growth.

If you know the data issues you think, okay, inflation plus real growth, that's similar to nominal GDP. Nominal GDP is simply real GDP growth plus some inflation indicator, which happens to be the GDP deflator. So, that should track fairly well, nominal GDP and yields on the 10-year Treasury note. You could model this, perhaps, plus or minus some nominal GDP growth. Interest rates, if we did this, would range for the foreseeable future given that we'd have low inflation and 3 percent real growth, somewhere between 2.5 percent and 8.5 percent. The point of this discussion is simply to say that if your model comes up with something that has -3 percent inflation and 10 percent interest with 10 percent probabilities for those kinds of things, your model is likely to be misleading. In that, we show the calculation of getting those ranges. I would say that the 90 percent probability range for the yield on the 10-year Treasury note is 2.5 percent to 7.0 percent, but I just wanted to keep this simple and straightforward.

As we all know, sometimes modeling doesn't work out. In fact, we had yields in the 1950s, when the inflationary expectations were close to zero, below 2.5 percent. Yields on the 10-year long government bonds in Japan recently reached a whopping 0.4 percent. They've risen since then, but that's how low they go if you have negative inflation. We'll discuss inflation a little bit later from some survey work that we've done of economists.

Nominal GDP plotted against the yield on the 10-year Treasury note doesn't track very well. It's because of that inflationary expectation thing that I mentioned at the very beginning. Inflationary expectations during this period were behind actual inflation, so the yields were lower than nominal GDP. When inflation was falling, they were above the actual inflation. So nominal GDP was below the actual yield on a 10-year Treasury note. If you're trying to model it, you see that you don't have a lot of observations at the very tail, where it should be close to the same level, and that's the problem with using the long history or trying to use the nominal GDP.

These are the interest rate assumptions we'd be looking for. On a forward-looking equity premium, there is a lot of controversy here and no widely accepted viewpoint. From accounting asset management, we got a consensus view of the interested parties at 3.25 percent above the long-term yield. A reasonable range would be 2 percent to -4 percent. Ibbotson backward-looking, of course, has been 7 percent, a widely cited number, also. According to the latest Ibbotson stuff, if they do the forward look, he did a recent paper and it was closer to 3 percent to 4 percent. I can't remember the exact number that they came up with. In fact, I

don't think it was very different from 3.25 percent. So you'd better read your latest Ibbotson if you're using Ibbotson.

From our point of view, from discussion with the asset managers, we think the stock market indexes are not likely to get really strong gains in the future. The price/earnings (P/E) ratios are up. Markets are fairly close to fair value today, so this is why it's not 7 percent anymore and in the 3 percent range.

That has very big implications, of course, for insurance companies. A point made in the paper that John was one of the co-authors on—got low interest rates, got low equity returns; insurance underwriting is going to be very important over the next decade.

Just to show you what's been happening to the equity markets, they have improved. There was a big bubble in Europe, Canada and the United States recently. The Japanese had a bubble 12 to 13 years earlier. It has had a big market rally, but you can hardly see it. There was a big market rally this year—that 10-year fix.

So how did we really come up with our investment-related assumptions? We do accounting. We have a telephone conference call. If you're like me, you don't want these meetings. You can argue all day and, in fact, all year, about the equity premium as you probably know. We don't want that. An hour and a half is more than enough.

There is a heavy reference to the blue chip economic indicators. For those that are unfamiliar with this, this is a survey of 50 or 60 prominent, very intelligent economists who give a highly reliable indication of what's likely to go on. They've done some studies, and there's pretty good forecasting off the blue chip average. So what's a consensus view? Conning Asset Management, of course, has clients whose assets they manage. They don't want to have some singular person's eccentric view of the likely assumptions for the equity premium, interest rate, etc. These are as published and noted in the footnote from a Conning paper, the consensus estimates that we came up with after that one to two-hour phone conversation.

Conning's Assumptions via Survey/Consensus Technique

	Conning Consensus	1961-1981	1981-2002	1991-2002
Price Inflation (CPI)	2.5	5.7	2.4	2.6
+Real Returns (3-mo)	1.75	0.9	2.6	1.7
Short-Rate (3-mo)	4.25	6.6	6.0	4.2
+Tm-Prem (10yr-3mo)	1.5	0.4	1.0	1.6
Long-Rate (10 yr)	5.75	7.0	7.7	5.9
Equity Risk Premium	3.25	5.1	0.5	2.1

Source: Conning Asset Management, David E. Martin, "Setting Long Run Strategic Assumptions for Asset Modeling," in *Asset Management Viewpoint*, March 2003, Vol. 7, Issue 1.

This is partially a survey technique using the blue chip forecast in discussion among participants. You see 2.5 percent inflation. We might go down to 2 percent this year when we do that again. One and three-quarters real return on the three-month bill gives you 4.25. I think economists would generally agree that the term structure—the difference between the 10-year note's long run, the spread, and the three-month bill, as well as the spread between corporate bonds—is not changing a lot over history. Those are fairly constant. You can use those relationships: 1.5 percent on the spread there—the term premium. Long rates give you 4.75 percent and again the consensus view is 3.25 percent for the equity premium.

You'll notice that it's very similar to the last decade. These assumptions are closest over these three sets of periods closest to the latest decade. Again, it gets back to that new regime understanding and the way inflation and real growth is these days.

So what about the tail? We sort of have a view of 2.5 percent, maybe 7 percent range for the 10-year Treasury note over the next decade. We at Swiss Re in the economics department have been asked to come up with a set of scenarios—low probability, high risk—that we can use to stress test our asset liability book. They wanted to have a survey. So we decided to do a survey, and the probabilities will change. The scenario stayed pretty much the same; the probabilities would change over time depending on depth of recession and peak of expansion. We come up with the parameters for the scenario independently and then we do the results. The probabilities come from the survey.

The scenarios I won't cover for expedience of time. There is the usual cast of characters, similar to a depression, but not as severe as the Great Depression, a Japan scenario, inflation, a crash in the market, etc.

So we surveyed approximately 40 economists—20 in the U.S., 20 in Europe. Of course, we received many more responses on the U.S. side because the Europeans are sure they know what's going on in the United States, and the U.S. economists are a little less sure that they know what's going on in Europe. So we got only 25 responses on the European questionnaire and 35 responses on the U.S. questionnaire.

There is heavy overlap and a 90 percent response rate, which is very good, of course. We've done this survey since April 2001 for the United States and Europe. You ask the question: What's the probability of a 10-year stock market slump? Even during the worse parts of the stock market slump, there's still quite a bit of optimism, about 5 percent, not likely.

Another question is: What's the probability that the U.S. economy averages negative growth for the next five years? (This is kind of your depression question.)

Only about 2 percent thought so, but it got a little higher after September 11, 2001.

What's the probability of average CPI inflation of 4.5 percent for the next three years? It's only about 5 percent. Again here's where you're getting towards the estimates or understanding of what economists view the likelihood of the tail. We don't ask them what inflation is. If you ask them what inflation is going to be for the next 10 years, they'd all say 2 percent. But, you don't know what the tail's going to be. So you ask them specifically about the tail so they can get a sense of that. Likewise for the other side of the tail: What's the probability that the CPI index falls for the next five years? Only about 3 percent—not likely to get deflation.

What are the conclusions? Interest rate models need these characteristics; otherwise they'll prove to be misleading: low inflation, with a mean of about 2 percent to 2.5 percent; a tail of about 5 percent for deflation probability; and a tail of about 5 percent probability for inflation of around 4.5 percent. That's what it came up with from the survey: 5 percent real growth. I'd have it lower personally, but they didn't want to listen to me—real growth in the 2.5 percent to 4 percent range; U.S. economy, lower, of course, for Europe, and lower yet for Japan.

Long-term rates are going to be in the mean somewhere between 4.5 percent and 6.5 percent; a tail of 5 percent probability for 8.5 percent and above and a 5 percent probability for 0 to 2 percent.

Equity premium. We've done some search of the literature. There's somebody that does a CFO survey, and they come up with 3.5 percent. So you know you're in the ballpark with the 3.25 percent.

If you want the risk survey, just contact us. We do an economic outlook, and of course, the sigmas are on the Web.

MR. JOHN RYDING: My primary mission in life at Bear Stearns is helping more on the shorter- to medium-term trading-investment horizons and on what we have learned over the last year as it affects the long-term outlook.

What have been the big issues that we have wrestled with over the last year or so? One issue, which is a very important long-term issue that began in the 1990s, was the extent of the productivity acceleration. There was a great deal of controversy in the late 1990s about the acceleration in productivity growth. I remember going to a lunch in 1997 at which then-Governor Meier was making a presentation. He said that perhaps long-term productivity growth had risen from around 1.25 percent, which it had averaged from the mid-1970s to the mid-1990s, to perhaps 1.5 percent. But the productivity growth, and this is a rolling five-year average, has accelerated to north of 3 percent.

Now, there were those who have said in the academic literature that the surge in productivity wouldn't be sustained—most notably Professor Gordon from Northwestern University. The test of the sustainability of productivity would be recession since productivity growth typically declines in recessions. What you see is that we have come out of the recession. Productivity growth has exceeded the rate that we saw in the go-go period of the second half of the 1990s. So, I take from that that we are looking at sustainable productivity trends for perhaps the next 10 years that will be in the ballpark of 3 percent, and that with population growth would certainly support an estimate for trend GDP growth in the higher end of the range of 3 percent to 4 percent. So to put it in the framework of what you see to try to maintain consistency, I think we're looking at at least potential GDP growth, possibly a little bit higher. I should point out, in case you're wondering, how you add three and one, you get to four, and I'm saying maybe it's more like 3.5 percent. You have to remember, productivity measures are private sector estimates and GDP as a whole includes the government. The government sector, not surprisingly, tends to pull down productivity growth. That's why you would tend to end up with a 3.5 percent trend GDP growth.

If you look at GDP growth by decade, over the last three decades GDP growth in real term averaged 3.2 percent, so there really isn't a lot of volatility that comes out of the GDP growth numbers. What we will see over the next decade though is that more of the growth in GDP will tend to come from productivity gains, whereas in the 1970s more of it came from an expansion of the labor force. There had been a long trend over that period to increasing female participation in the labor force so labor force growth expanded rapidly. The baby boomers were closer to entering the labor force than leaving the labor force, as they are now about a decade or so away.

So I would see real potential GDP growth in the 3.5 percent area, and you probably won't go too far wrong. In contrast, you have a lot more volatility in inflation and inflation rates by decade. They have been all over the place, and we are sinking back to the kind of inflation rates we saw in the 1950s and 1960s. I would reiterate the point therefore that the outlier experience was the 1970s and 1980s, especially the earlier part of the 1980s and that naive statistical models that might be created for the kind of statistical analysis that you might do—the Monte Carlo studies in projecting out interest rate paths—would be way too wide based on that experience.

Now, perhaps to put some flesh on why that is the case—why central banks have learned to be better controlling inflation—it's worth thinking very briefly about monetary history. In the post-World War II environment, the world was governed by a monetary arrangement called Bretton Woods. It's a nice little place up in New Hampshire. There's a very small ski run. It had the first ski tow in the United States. The runs are called Suicide 6. I happened to have skied it when I was speaking at the conference there. But, from that little place came the monetary system that held for the better part of three decades, and under that system the

Fed promised, the United States promised, to maintain the supply of dollars such that the price of gold would be held at \$35 an ounce. And foreign central banks and foreign treasuries agreed, for monetary authorities agreed to link their value of the currency to the dollar, at particular fixed exchange rates and that system worked great until the U.S. government ended up with too much cheating in the 1960s. They tried to monetize the emerging fiscal deficits and that let foreign central banks say "Wait a minute, I'm not very comfortable holding this fixed exchange rate and holding these dollars, give us the gold." Foreign central banks are the only ones who are allowed to cash in their monetary chips and take the gold instead of having the dollars, and it led to a breakdown in that system.

Central banks, prior to the Great Depression, had experienced a system where they were largely irrelevant. The world was on a gold standard and that kept inflation stable. Then, when we came off that gold standard, the monetary mistake was deflation in the 1930s. Now we're in an episode where again money has no commodity backing, and we entered a period of inflation as central banks created too much money, and we had a second equally unusual episode in monetary history—as unusual as the Great Depression of the 1930s was the inflation explosion of the 1970s, which we spent the better part of two decades reigning in.

Central banks now appreciate the importance of maintaining a low inflation rate and have learned from the experience of doing it. That's why I totally concur that the likely range of inflation is somewhere in the 2 percent area as we go forward. Countries that have explicit inflation targets like much of Europe, the monetary union area, the United Kingdom, New Zealand, informally, increasingly the United States, were all somewhere in the 2 percent area.

Going back to what we have learned over the past year, the big issue that emerged, the outlier issue, was the risk of deflation and that was much talked about from November 2002 when the Fed suddenly cut interest rates by a half point and started talking a lot more about deflation, through still continuing yesterday with the Fed maintaining its policy bias that the greater risks to outlook for inflation is if inflation falls too low, though they would say it's only a small probability.

I think it's really small, much smaller than that 5 percent tail. If I were to say what I look at when making forecasts that I consider in a sense more useable forecasts over the short term—the sort of weather-forecasting equivalent of looking at just beyond the horizon with the Doppler radar and seeing what's coming in—my major indicators aren't the unemployment rate, GDP growth, economic face models, the market face models and commodity prices in gold have tremendous short-term predicted power, in my opinion, over the outlook for inflation. Now, these markets showed the decline in inflation that was brewing in the second half of the 1990s, despite the strength of the economy, despite the decline in unemployment rate, despite the Fed telling you over this period the greater threat to the economy was a pick-up in inflation. These markets, which are smarter than the Fed and smarter

than economists, pointed to a sharply falling inflation rate. If you look at what's happened over the last two years, gold prices have climbed out of that danger zone. That's why I think the probability is much, much less than 5 percent.

The same story is true on commodity prices. Indeed, the commodity price index on industrial metals has spiked sharply higher and is back up at the levels we saw seven years ago, above where it was in 2000. If you think of what the Fed is promising to do, the Fed is promising to keep inflation higher than it is, to get inflation higher. We can debate whether the Bank of Japan is in this category as well, but the Fed is the first central bank that has decided to go down the path, informally for now, of having an inflation target with the objective of getting the inflation rate up. Most central banks, when they went to inflation targeting, introduced it as a credibility device to help them get the inflation rate down. So the policy emphasis is on the higher inflation rate. It's a similar story on the dollar. The dollar has been falling. We've given up the gains of the last six or seven years. It seems to me the risks of a monetary-induced deflation are extremely small, and if anything, the greater risk is that inflation runs up. I would actually be somewhat asymmetric in the risks of that. We might accept one tail as inflation above 4 percent, as previously suggested, and the other deflation/inflation below zero, though I think both are small probabilities. I think the distributions are heavily skewed towards repeating an episode of the 1970s, rather than repeating an episode of Japan in the 1990s and the present time or the United States in the 1930s.

Now, taking from that, interest rates right now in the short term are just abnormally low. How do we link the short term to the long term? Let me try to talk a little bit about that because obviously that is still pretty important.

A 1 percent Fed funds rate, where we currently are, is unsustainably low. I think the Fed will start raising that rate before the market anticipates. I think that increase could come as soon as March of next year, but I would agree that that rate has to get up eventually over the next year and a half or so into the 4 percent to 5 percent range to have a premium above inflation to reflect the productivity growth rate of the economy. Strong productivity growth means different things for the short term than for the long term. For the short term, the Fed takes comfort. The strong productivity growth will mean there's going to be plenty of unused resources around and the labor market isn't going to tighten very quickly, so it can take more risks with inflation. In the long term, strong productivity growth means higher equilibrium real interest rates, as was correctly stated in the previous presentation. Yes, short-term rates have to start adjusting, and the sooner they adjust upwards, the lower is the risk that we have an overshooting experience. I completely agree that the equilibrium rate on the 10-year Treasury is somewhere in the ballpark of 5.5 percent, although clearly the market at the present time implicitly has a disagreement with that by virtue of the fact that the 10-year Treasury is at 4.25 percent because if everybody thought that we were going to get back in a relatively short period of time to a 5.5 percent 10-year Treasury, who would hold 10-year

Treasuries at 4.25 percent knowing that they have to see a price decline to reflect 125 basis point increase in the yield on the 10-year Treasury? But for now the markets are still perhaps held by the notion that deflation may be more of a risk, still perhaps held by the notion that the Fed could still become the buyer of last resort of Treasuries, the unconventional, and the chances of which have dropped enormously since the Fed first floated them earlier in the year. I think right now trading types who look at the 1 percent funds rate and are playing the cost-of-carry game holds us. It doesn't mean that when the interest rate adjustments come, the movements in the Treasury market could be as violent as those that we saw earlier in the year. Remember, if we would have held this presentation in the second week of June, you would have been doing it at a time we had a 3.1 percent 10-year Treasury and one might have thought that 5.5 percent looked kind of like an absurd medium-term target for the 10-year Treasury.

What has been happening, though, is we have had the market rallying most recently because of a decline in real interest rates. What has happened, even over the last few weeks, is Treasury rates have fallen from the highs we got to, that inflation expectations are creeping higher and real yields are declining. To me this stands in marked contrast to the evidence that productivity growth continues to accelerate. There is a major disconnect built into the market and that adjustment process is one that we are going to have to learn to deal with, unless we go to deflation, I think the declines in the 10-year Treasury are over.

I have a couple of brief comments to round things out to dealing with other issues that were touched upon. First I'll talk about corporate spreads. This has been a very unusual recession we're coming out of. It's been a recession that's been a profits and capital spending recession. It's a recession, therefore, that took a heavy toll on corporate bonds and corporate solvency. Corporate spreads have narrowed considerably. I think there's room to go there, therefore, from a mix as one thinks forward. One of the pluses that may mitigate some of the capital losses implied by moving back to an equilibrium 10-year Treasury yield could be further narrowing in corporate spreads. That's certainly consistent with a rising profit share of GDP. I'll touch on that in a moment.

On the equity market, there may be more room than in the corporate market. This, by the way, was an improvement in profits. One thing that was different about this recovery was that the corporate profits recovery was sensed in the corporate bond market earlier than it was sensed in the equity market this time around. Usually that pattern is reversed and it probably reflects the fact that corporations were increasingly thinking about survival and therefore paying bond-holders in an environment where there have been a lot of defaults rather than thinking quickly about growth. If I look at the equity market by comparing profits divided by bond yields, there still seems to me to be significant upside appreciation room. I don't take the numbers too literally to necessarily imply where the market is going to go, especially when I think the bond yields are going to be rising. But there's still a significant disconnect between the amount of profits the corporations are

generating—discounting them at current low levels of interest rates—and where the market value of equities currently stands.

I think interest rates will rise over the next year, but I think profits will rise too. Profits are a share of GDP. Really, in the end, when profits hit their equilibrium share, the economy will see profits grow at the same rate as overall GDP. If we think overall GDP is going to be running at say 5.5 percent in nominal terms, 3.5 percent real, 2 percent for inflation; in equilibrium profits are going to be growing at around 5.5 percent. When one hits an equilibrium in terms of valuations and interest rates, then that would tend to be probably where the trend growth in equity prices would settle, but the issue is: At what level of profits in terms of the economy does that equilibrium reach? Now I'd point out that we are recovering from record low shares of profits as a percentage of GDP and that there is still significant upside room. If you think about the current economy, we are in a position where GDP growth in the quarter behind us probably accelerated to around 6 percent. Employment still declined. Productivity growth was around 7 percent. It was around 7 percent in the previous quarter. We are getting strong shifts in the distribution of income at the present time towards capital, and that is something that supports both equities and bond prices.

MS. MICHELLE D. SMITH: I'm going to talk about how we actually set assumptions when we're doing actuarial predictions, which tends to be very different than what the economists have talked about. When we set interest rate assumptions in actuarial predictions, at least what we end up with in terms of interest rates and what a lot of companies have been using as a methodology to set interest rate assumptions is actually quite similar to the types of interest rates that both Karl and John were talking about. One of the most important things for us to think about when we're setting our investment assumptions, and I am going to talk about more than just interest rates—the risk-free rate—I'm also going to talk about setting asset spread assumptions and setting default assumptions and various other assumptions, but the driver of how you set rate assumptions really depends on the purpose of your financial projections. Then I'm going to cover the main type of assumptions to set in actuarial projections, setting the risk-free rate for interest rate, setting equity risk premium, your risk premiums on corporate bonds and other assets, and the other big one, which is setting your default assumptions. Then there are various miscellaneous assumptions about how your asset-backed securities are going to behave and things like that. Then, at the end of that, I'll touch on various issues of best practices and consistency issues—consistency between different lines of business and consistency and assumptions used for different purposes.

We've heard from both Karl and John that sometimes your focus is on the mean or the average of your distribution. Other times you are actually more interested in the tail of a distribution, or you're actually looking at your distribution of results, values or costs of a guarantee or something and you're actually interested in the tail of those costs. Whether you're looking in the middle of a distribution or you're

looking at the tail, you need to think about where you're looking in the distribution to think about where you want to set your assumptions. Most of the time we are looking in the middle of a distribution. A lot of the times we're setting assumptions for appraisal values for M&A and we're interested in the mean results of a distribution.

The same thing is true for embedded value accounting. Like a lot of our assumptions, we're actually setting an assumption, a deterministic assumption that represents the mean of a distribution. Then when we're calculating values, we're interested in calculating a whole distribution of results and then taking the mean of that as the final value that we're looking at. In GAAP projections, product development, and planning and budgeting projections we're also most interested in the average outcomes.

For things like setting capital requirements, setting economic capital, cash-flow testing to some extent is stress testing and giving you some idea of what's going on in the tail. We're seeing more securitizations of insurance business and sometimes, even for some parties in a securitization transaction, what's more important than the mean of the results or the mean of the distribution is actually the stress test that you do. For example, the bond insurer in a securitization transaction is most interested in the worst scenarios because they want to make sure that it's very unlikely that they're going to have to actually pay out. In that situation, how you set your assumptions for the stress test actually sometimes is more important than the middle of the distribution.

What sort of assumptions are we talking about setting for all these different purposes: product development, doing embedded value taxations, GAAP, and so forth? The first one is the risk-free rate and that was a large component of the previous two presentations. I haven't come across any companies that we work with that projects LIBOR as opposed to Treasuries. Most companies are projecting the Treasury yield curve and then if they need to project LIBOR in their transactions, in their projections, they'll basically set an assumption for the relationship between the LIBOR rate and the Treasury rate.

Depending on the purpose of what you're actually doing your projections for, you may just have a single deterministic scenario for your interest rates, or you may generate 100 scenarios using simulation techniques or risk-neutral scenarios.

There are really two other big investment-related assumptions—risk premium and defaults. In setting the risk premium assumptions, we want to set out assumptions for asset spreads over Treasury. The main impact this has in our financial projections for most actuarial models is on the new money rate. When we get cash in our models, what rate does it get invested in? To some extent, it also affects the valuation of our existing asset portfolios—because you may be setting market values off of the risk premiums you program into your system—but I think most modeling systems, you don't necessarily want to trust the market values that have

been calculated by those modeling systems, at least you're opening market value. So you start with the actual market values that you have in your asset accounting system and project a spread from that and use that going forward. The main impact of your risk premium assumption is going to be on investing in new assets and what rate they're earning. Keep that in mind when setting that assumption.

We see most companies now using a deterministic default assumption. There is increased interest in generating stochastic scenarios for defaults. We also see that the common practice with setting default assumptions is to use a level annual default cost, which represents the mean of where you expect defaults to be, but not necessarily the pattern of how defaults will turn out.

For asset-backed securities and mortgage-backed securities, for practical reasons, most companies that we're working with and we ourselves tend to rely more and more heavily on the sort of "black box" systems that maybe we don't fully understand. We know that they're very sophisticated in terms of modeling asset-backed securities like using the Andrew Davidson model with the Intex system to project the cash flows for those types of assets. We're relying on the prepayment models in those systems and having to do less and less worrying about how to set the prepayment assumption ourselves.

There are derivatives. Most of the derivatives that we have modeled to date, and that we see companies reflecting in their financial projections, have been fairly simple interest rate swaps and call options on equities. There are not really too many modeling issues but I was wondering yesterday, during the credit derivative session, if those become more widely used by the insurance industry, that may pose some interesting modeling challenges.

I think the biggest issue with modeling derivatives involves having to model market values and bring in the right modeling assumptions and methodology to do that. But generally we don't have to model market values for those, so that's not an issue. Now, this section of my presentation really overlaps with the main topic covered in the previous two presentations, which is: In our actuarial projection models, how are we setting the interest rates? John, I think you were a little bit concerned with some companies using very long-term averages. We've seen that but then a few years ago the very long-term average, like the 30-year average, has gotten so ridiculous compared to current rates that it looked like you were cooking your numbers because they were so much higher than current rates. For a lot of blocks of business it looked unreasonable. Now, for quite a number of years, we've been using the 10-year historic average as either your long-term rate in deterministic projections or your reversion target for scenarios. It just happens that I did the calculation for the 10-year historic rates in August, which is a little bit after the historic rates that you had in your presentation, Kurt. The rates I came up with were exactly the same, I think, as the Conning consensus rates that Kurt talked about. I thought that was interesting. I guess the argument there is that

using the arguments that they've used is that the monetary policy regime over that period is consistent with what you're saying in your projections.

That's one way of setting your long-term rate, whether it's for your reversion targets in your scenarios or a deterministic interest rate scenario. But, we also see as appropriate and common practice just using the current yield curve going forward to project your interest rates. Right now that would be a very low yield curve. Because all the European insurance companies do embedded value, we have a whole lot of data on what companies are using as their interest rates going forward. In almost every case, with the exception of one company, in embedded value calculations, companies are using the current yield curve in their calculations going forward. Whether they're doing a single deterministic scenario, or whether they're using simulation scenarios, their reversion targets are basically based on the current yield curve. I think the issue there is that maybe you have a different absolute level in a lot of interest rates in the long term than what the economists are agreeing is the appropriate level, but you ought to have a discount rate that's consistent, that's based on the risk premium of the current yield curve. For a lot of blocks of business, the main driver of value is actually the difference between your discount rate and that risk-free rate, not so much absolute level of interest rate. So, I don't necessarily see that as a big inconsistency.

The other method we see, perhaps a little less, is the use of the forward rates in the current yield curve to project your interest rates. It just so happens that if you look at the 10-year Treasury, if you followed the forward curve, and I did this last night for the July 31 yield curve, then your 10-year actually comes out closer to 6 percent, looking forward say about 8 to 10 years. That is also consistent with that level of interest rates that we've been talking about.

The 90-day, however, if you looked at forward rates, actually shoots up really quickly because the yield curve is so steep and after about eight years, when I did this calculation last night, the yield curve starts getting inverted. You probably don't strictly want to use the forward rate as your projected interest rate because you are going to get some wacky results in the current yield curve and a lot of yield curves are going to get some wacky results, but I guess as a guide to whether this level of projected interest rates appropriate, that's another way of getting at the same number.

Even though I've talked about three different methodologies that basically get you to the same level of interest rates, there's still a problem in the three different methods: looking at 10-year historic rates, following the forward curve and also the economists' consensus view. Depending on the type of project you're doing and who the audience is and what they're going to think about the results, if you start with the current yield curve and, even worse, where it was if you were back at the start of the year, if you were in June before the yield curve popped up and then you were reverting to these much higher target. To the extent that your business is dominated by business whose assets are shorter than liabilities, people are going to

think you guys are poking the numbers from the current yield curve up to this much higher yield curve. Like I said, it depends on the purpose. If you think that that's going to be a concern of your audience, you may think about just using the current yield curve going forward. Obviously, for cash-flow testing, your scenario number one is just following that current yield curve all the way. For purposes like that you might tend to be on the more conservative side.

Then the other problem that arises with this scenario-generation method, apart from picking the reversion targets, is the issue of using simulation scenarios versus risk-neutral scenarios. In pricing, companies are using simulation scenarios and, for embedded values and appraisal value calculations, we would most of the time use simulation scenarios. This gets to the whole argument of the differences between fair value and embedded value calculations and what sort of scenarios you should be using. Generally, the use of simulation scenarios doesn't become a problem until you go out to the market and start hedging risk, and then you just have this huge disconnect in value. If you're pricing with simulation scenarios and then later on in the life of the business you hedge interest rate risk or equity risk, you have this huge disconnect that was never priced for in the business and that's where the problem exists.

The other big assumption that we said is risk premiums, your asset spreads above Treasury. The main impact of that assumption is determining your new money rates as opposed to your market values on your existing assets, which you probably plug into your models in the first place.

This can be a difficult assumption to set because it's not like the Treasury curve where you just go onto the Federal Reserve Web site or you go onto Bloomberg and pretty much you see some differences depending on how the numbers are defined, but you don't see wild differences. When you start looking at data for corporate bond spreads, depending on who the source of that data is, you can actually see very different results. Also, different vendors of data have different periods for which they actually have the data available. Generally, some people may get their spread data from Bloomberg. Some people may get it from Lehman or Solomon. Different vendors are going to have different ways of defining the universe of bonds that they include in different categories and also different methodologies for coming up with what they actually call the spread for that group. I've found this to be a generally large source of frustration. At the end of the day you have to understand exactly the methodology that the data vendor is using to come up with its average historic spreads and current spreads and also, make sure that it is consistent with what I'm actually investing in. Is it consistent with the sector I'm investing in—the quality grade and so forth?

You see that data difference is both with current spreads and with historic spreads. I don't think there are errors in anyone's data. These are just differences in definitions and how they come up with the numbers. From a practical perspective, for most reinvestment portfolios, you're normally talking about fairly simple assets.

It's normally not very hard to set a reasonable spread assumption. To the extent that you do have some of the private bonds that are not publicly traded in your portfolio, I now think that a lot of the companies we work with are comfortable with setting the spread assumptions for private above public based on what they've seen in their own portfolios and generally feel fairly comfortable with that. Normally the spreads for private versus the corresponding public are in the range of 25 to 40 basis points. We've seen that consistently across a number of different companies.

I think the only other issue that comes up here is where current spreads on your assets are very much different than historical averages. The way that we have been approaching that—and we have seen a lot of companies do this in their own models as well—is to start with your current spreads in the model and grade some kind of an ultimate assumption. We'll talk a little bit about that in defaults as well, because we can do that with default assumptions. Once you've finally figured out the right data source for your spreads, if you're building a model at the beginning of the year, start with your current spreads and then lay it over a three- or four-year period into an ultimate spread assumption that's based on historic data—maybe 10-year historic data or maybe a little bit longer.

At the end of the day, you want to make sure that the spread assumptions you're coming up with actually correspond to what you're buying. There's some validation against actual spreads.

One problem over the past couple of years is that we've seen the portfolios of asset-backed securities get more complex, and it's not just mortgages any more. It's all kinds of different asset-backed securities or equities, puts and calls, corridors and so forth, and so we would just throw up our hands and say, "How are we going to set up new payment assumptions for this?" Unfortunately, theoretically that's very complicated stuff. From a practical perspective now a lot of people have access to something like an Andrew Davidson model and the Intex model for asset-backed securities and so now a lot of the actuarial projection systems plug into these models so if you rely on those fairly sophisticated asset-backed modeling systems, you no longer have to worry about setting those assumptions yourself.

I think Kurt touched on equity scenarios. How you go about generating equity scenarios can be very controversial. There is the whole issue of risk-neutral versus simulation scenarios. How you set your volatility assumption or project volatility is a big issue in equity scenario generation.

Then the big other assumptions are the default assumptions. This is about to become a more sophisticated piece of modeling. Projection systems are available now and are going to be able to generate more and more variables stochastically. I think people are interested in generating distribution of defaults as opposed to just using some mean assumption.

A practical problem in our models is that the only time we know the rating of a bond is at the valuation date, so if you're, for example, eight years out into the future, you don't know the rating of that bond in the future. You only know what it was eight years ago, so you really have to set your default assumptions based on historic data like Moody's or S&P historic data, but not the one-year sort of loss rates; you need to look at the cumulative loss rates over some assumed holding period. That's generally how a lot of companies set their default rates. Then you have several options. You can assume that holding period and come up with like a level annualized cost, which is fairly commonly used, or you can have an annual date from the valuation date default rate so that for AAA it has almost a zero default rate. Over time that rate would increase further out into your projections.

If you're setting your assumption by looking at those cumulative defaults over an assumed holding period, you're also taking into account the fact that you may actually sell a bond before it defaults because it's the credit quality that is deteriorating. You can take a loss on that, but by that process of assuming a holding period and looking at cumulative defaults over that holding period, implicitly you're really taking that type of loss into account as well.

In the future, I think we'll see more companies interested in generating scenarios for defaults. That's something like the new Basel capital accord. The Basel accord, for folks who are not familiar with it, is basically setting the capital requirements for banks. This will be the new standard for how banks set capital requirements. It's interesting to look at how they set the capital requirements for C1 risk because as the speakers in yesterday's product derivative session were talking about, that's really probably going to influence how C1 capital requirements are set in the insurance industry as well and that is, under one of the methodologies, explicitly looking at the tails of distribution of default.

The other interesting thing in our projections is that sometimes rather than have this level annual cost all these years out into the future, unless we want to look at cycles because defaults are never level, they always move. In the mid-1990s actual defaults were zero and then, of course, in the late-1990s they started ramping up. In the 2000 to 2002 cycle, defaults were huge. That's not how we do our models, but we are seeing some of that in like stress testing—trying to replicate the down cycles of the default cycles, and for some purposes you might actually want to try to replicate what's going on in the business cycle as opposed to this flat-level cost of production looking at year-by-year projections.

What sort of assumptions do you need to model derivatives? Like I said, most of the derivatives we use in our actuarial projection models, at least the ones that I've come across, are not too complicated and may get more complicated if we have to start modeling things like credit derivatives.

The main modeling issue that comes up is when you have to come up with an assumption for the LIBOR rate, because interest rates swaps are driven off LIBOR. I

think the most common methodology we've seen here is to do a regression on the past 10 years of LIBOR versus Treasuries and then come up with a formula based on that to set that assumption. Really the only other issue that comes up is this whole market value issue and using simulation scenarios so the value of your swap is actually different than the market price, so that can actually cause a disconnect and be a problem.

Then there is the issue of discount rates. Like I said before, sometimes more important than the absolute level of interest rates you have in your projection is the relationship between discount rate and your interest rate. So if you're using a current yield curve the whole way through, you might just be using a discount rate that's a risk premium; 300-400 basis points is generally what we see so for embedded value calculations. You want to be careful that you're not using that same discount rate in projections where your interest to yield curve is going up.

The main thing at the end of the day is to make sure you validate the assumptions you set. If your investment department can provide the actuaries that are doing pricing on embedded value or other types of projections with the actual investment rates they are earning on new investments, and if you can also validate your opening portfolio yields in your existing assets and your opening market values, then you can start feeling fairly comfortable with your assumptions.

MR. ALEX MERRICK: I have a brief question about corporate bond yields. Recently there seems to have been negative correlation between the underlying risk-free interest rate and the corporate bond spread. Is that something that any of you would consider putting into a model, which would reduce obviously the overall volatility of the corporate bond yield?

MR. RYDING: I would say that a lot of what we saw recently would be like the 1998 to 2001 period, where the predominant thought process was we're going to run government surpluses so large that the Treasury market is going to be paid off in 10 years. And for a brief period of time the Treasury market ceased to be a representative benchmark for interest rates and people started to move off and think about other things. I think now with the \$375 billion deficit behind us and projections of deficits growing next year, the Treasury market is going to be just much more like a normal benchmark for interest rates, and the behavior would be much more like we have seen in the past. That's my opinion.

MR. KARL: Yes, I'd agree with that. I think the thing you have to bear in mind is we've been through a credit cycle. With a credit cycle you can have the Fed cutting rates and the Treasury rates following that down. At the same time, things are going to "hell in a hand-basket" with defaults and the blowout in spreads on the corporate side. Going forward our view is that we're in a situation where those spreads will narrow—that's our baseline forecast. Obviously, things can go wrong with that, and we'll have a much more consistent relationship, as you'll see, over a longer period of time there on corporates versus the Treasuries.

MR. JOSEPH KOLTISKO: You heard a lot about international economics over the last few months. There are large foreign holders of U.S. Treasuries and in the next 20 years Japan is really on the leading edge of the elder-wave worldwide. Is there a mechanism that we should know about as far as repatriating assets to Japan that have an impact on our interest rates? Is that knowable, and is that something we should be concerned about in looking at interest rate forecasts?

MR. KARL: As you correctly point out, there are a lot of Treasury bonds and bills owned by foreigners, including Japan. It's not just Japan, but Japan is a heavy purchaser of those, particularly when it's attempting to make sure its currency doesn't strengthen too much, and that process could revert. We do it simultaneously with the exchange rate because it means something to the relative value of the currencies too. So if Japan switches and instead of buying Treasuries, starts off-loading them, we have a pressure on the currency as well as on the interest rates. Predicting is not really easy to do. I can't see any great, simple way to do that. It could happen any time. It is often a factor that people talk about for affecting the market of interest rates and exchange rates, but I think ignoring it has some merits. We've been over this in my forecasting history for the last 20 years and things that happen to be affected by that tend to be short-term. However, there are periods of time, and I think we're in one now, where you get increasing pressure on the dollar simply because I think more important factors with big federal deficits and a very large current account balance, higher relative to GDP than our normal GDP growth, will have pressure on the dollar so we'll have a weakening dollar. I don't think it will have a major impact on the interest rates over the next 18 months though.

MR. RYDING: I just had the thought that Japan is not the only big holder of Treasuries out there either. China is extremely large and growing too, and these are big controversial issues even for the here and now. Tomorrow, I believe, Treasury Secretary Snow is going to be talking to Congress on the attempts by the administration to get China to liberalize its exchange rate. But by tying this exchange rate to the dollar and running surpluses versus the United States, China is constantly plowing money into our Treasury market. These foreign investors, to a large degree, own Treasury or Treasury-like assets—The Bank of China, the Chinese Exchange Reserves, the Japanese Exchange Reserves. And probably if you're thinking about ultimately rates of return on private sector assets, what foreigners may well be doing is affecting much more the spreads between official assets like Treasuries and private sector assets like corporate bonds rather than really affecting much the overall level of rates, but these are enormous uncertainties and to pretend to know we have the answers would be misleading.

MR. RICHARD J. LAURIA: I haven't heard anybody speak about equity volatility. Will it be higher or lower than it's been in recent years?

MR. KARL: The answer to that is yes.

MR. RYDING: We talk about volatility, but we don't really mean volatility. In a sense, we're not indifferent to the direction whether markets are going up or down. The question is—we had a big bubble in the equity market and are we're likely to get a big bubble back again? I think that the answer to that is probably no; not only are we burned, but also what produced that was a transition in the U.S. economy. We transitioned from a two-decade long period of productivity growth that ran at 1.25 percent to now this much faster rate of growth of productivity. We got too optimistic about the outlook as the economy was in that transitioning process, and at the same time, monetary policy made tremendous errors. They made errors in trying to curtail an inflation problem that they thought would be a result of that adjustment process. So they squeezed profits, and we had big profit swings. My guess is that we are much more used to the kind of growth environment we are likely to see. We're not transitioning from a low productivity to a high productivity environment, and we would have a much more normalized outlook.

The other thing, of course, is part of the thing that also tended to push equity prices up from the mid 1980s to 2000 was the fact that we were coming from a huge disequilibrium in the bond market. We had these double-digit Treasury yields, so those double-digit Treasury yields meant the equity multiples were in single digits and were too low, so everyone's forecast is less volatile than the past. It's just a given of the forecasting procedures. I do think that we will not see the kind of bubble run up and collapse and we'll see a much more reasonable, if I can use such a subjective term, behavior for the outlook for equity prices.

MR. KARL: I agree with that. We have less volatility in inflation, and I think less volatility in growth. The length of time between the down-turn is getting further apart. They're more mild and certainly if you look at the first half of the last century, GDP growth is much less volatile than then. However, I wouldn't discount animal spirits and if we have another bubble it wouldn't surprise me in the least. Likewise, it wouldn't surprise me if it goes the opposite direction because it's very much still psychological in my view, which is not a universal view, but it's not entirely economic fundamentals. There are a lot of animal spirits determining equity valuations.