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What If You Stretch Investment Yield and It Snaps?

Track: Product Development/Investment

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Summary: The low-interest-rate environment led insurers to seek ways to increase investment yield to keep their products attractive. Steps such as investing for longer durations and taking greater credit risk increase yields; however, they bring additional risk. Attendees gain an understanding of the benefits, costs and risks of choices in investment strategies to support a product.

MR. KENNETH P. MUNGAN: Basically we're going to be talking about the fact that we're in a low-interest-rate environment that creates a lot of pressure on life insurance companies in particular to reach for incrementally higher yields. We'll talk about both the opportunities and risks that are present in that type of activity. We have a great panel here today. I'm going to be the first speaker. I'm with the financial-risk-management practice in the Chicago office of Milliman. We help companies evaluate a full range of risk factors that they're exposed to, then manage those risk factors. Frank Cataldo is with Conning Asset Management in the insurance advisory group. Frank helps with investment strategy analysis. Prior to that, he had 20 years of experience with Travelers where he had a range of actuarial responsibilities, including pricing and asset-liability management. Frank has covered both the asset and the liability sides of the balance sheet. We also have Tim Swenson who is with XL Life & Annuity focusing on their institutional spread lending business, such as funding agreements and guaranteed investment

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Note: The chart(s) referred to in the text can be found at the end of the manuscript.

certificates. Tim has been involved in the development of investment guidelines and portfolio strategy, as well as managing XL's hedging process, which includes interest rates, foreign currency and credit derivatives. Hopefully at the end of the discussion you'll have a broad understanding of the issues involved, as well as specific strategies for dealing with these issues.

My presentation is going to address background information and a number of general topics on this issue. I have had a lot of experience dealing with strategies to assist companies in a low-interest-rate environment, both here in the United States and in Japan. I've been working in Japan over the last five years. I'm working on the asset side of a wide range of transactions. The past few years, U.S. senior executives at life insurance companies have said, "Oh, we don't have to worry about that; everyone knows that the U.S. equity market and interest rates don't both go down at the same time. That can never happen." But clearly that's what we're experiencing, and some of that experience has been helpful in coming up with strategies for the United States.

If you're in the position of developing strategy and then analyzing that strategy and setting goals for the performance of the various strategies, I'd like to caution you to set realistic expectations. Ultimately, at the end of the day, anything that you can do realistically will have some reasonable, incremental impact on your ultimate portfolio yield and will most likely lead to an incremental increase in the asset-liability risks that you're taking on your balance sheet. If you have unrealistic goals for increases in the order of hundreds of basis points, then that probably means you're taking some undue risks that you just haven't identified yet. That will come back and bite you at some future date.

Basically I'm going to be going through an overview of the broad issues that companies need to address in dealing with a low-interest-rate environment. Frank and Tim will be delving more deeply into detailed strategies.

As you may know, if you've presented at an SOA meeting before, you have to get your presentation in about a month in advance when they lock things down and go through their review process. At this point people were pulling their hair out, saying, "Boy, these are low rates!"

Table 1 shows the yields on a blend of 50% public A and 50% public BBB corporate bonds. You can see they range from 2.6% at the two-year maturity point up to 5.2% at the 10-year point. As we all know, things can change pretty quickly. What's happened since April 25 is that yields have gone down, down and down. We're now down to 2.35% at the two-year point and going up to 4.69% at the 10-year point, so everything's below 5%. All of these represent a drop of roughly 50 to 60 basis points from what I had when we looked at this at the end of April. That represents a pretty stressful situation for life insurance companies, as you can imagine. The value proposition for most life insurance company products is that you're getting some asset-accumulation benefit and the benefit of asset

management of the life insurer. When the interest rate that people are getting is getting down to this level, especially after you subtract the insurance company's spread that they're going to require, it starts to look like pretty slim products that the companies can put together.

Table 1
 Corporate Bond Yields
 50% A / 50% BBB Public
 Market Conditions on April 25, 2003

Maturity	Gross Yield (BEY)
2	2.61%
5	4.14%
7	4.77%
10	5.23%

Chart 1 is a summary of historical experience. It represents the yields on this blended portfolio of 50% A and 50% BBB public corporate bonds for a range of maturities, two, five, seven and 10 years, going back over the past five or so years.

You can see that the period of 1999 and early 2000 was just a great environment; everything was stable and at a very healthy yield. You don't see things moving around very significantly, but if there's one thing that I've learned from risk management work, it is that prices and yields can and do move large amounts in short periods of time. It's really not a question of whether these yields might change by a significant amount; it's really just a question of when. We will go through periods of both high- and low-interest-rate environments, and if everyone today is worried about low yields, we'll probably convene again three or four years from now and everyone will be stressed about the high-yield environment.

The really dramatic drop in rates from the middle of 2000 all the way through early 2003 has placed a number of stresses on the whole insurance company system. In addition to the change in the overall level of interest rates, the shape of the yield curve has changed as well (Chart 2). We've gone from an almost completely flat yield-curve environment to one that's extraordinarily steep. That's basically due to the Federal Reserve as they've reacted to the economic problems in the United States. They have various tools and levers that they can operate, and one is lowering short-term rates. They've pulled them down in a very aggressive manner, but they really control only the short end of the curve. They don't have direct control over the long end, so we're seeing this increase in the slope of the curve. If we go back to prior experiences when the Federal Reserve acted aggressively at the time in which they let go of those interest rates, then the whole yield curve popped up very dramatically. That would be one thing you'd want to keep in mind for any strategy that's being developed. Clearly, this shows a very steep slope, and that motivates insurance companies to push out to the longer end of the yield curve. The good news is that insurers have quite a bit of skill and experience built up over

the years in managing long-term fixed-income portfolios. The goal is to have appropriate asset-liability matching (ALM) in any change in strategy that you implement.

While I think it's a truism that every life insurance company would say that they have an ALM program, clearly any ALM framework has some flexibility in it. You need to have the flexibility to respond to changes in the environment. When there's a perfectly flat yield curve, you really don't have any incentive to move one way or the other. But with the steep yield curve that we have now, you definitely have the incentive to move out to the longer end. The challenge is to do a reasonable level of analysis so that you know when to stop. You need to consider a range of factors, such as the level of interest-rate risk that you're taking on, as well as all kinds of policyholder-behavior issues in terms of market-sensitive lapses and any other sources of revenue or risk that could be interest-rate dependent. In general, any asset-liability analysis is really a cost-benefit tradeoff, and it's not a realistic goal to say that you want to completely eliminate all risks. The goal should be to opportunistically take those risks where you're getting the maximum reward.

Chart 3 shows the yield pick-up per year of additional duration that you have on a portfolio. I show this relative to two-year bonds, and we're looking at extending out to five years, seven years and 10 years.

You can see if you're looking at going from two to five years, you're getting roughly 60 basis points for every additional year of duration, and then 50 or so for seven years and then in the mid-40s for 10 years. The whole economics of pushing out in the long end of the yield curve have changed. You didn't used to get much reward at all around 10 basis points no matter what you did, but now that's dramatically increased. If someone says, "We've done a very well-developed ALM analysis a few years ago and set our targets," clearly you'd want to re-examine that and see if any changes are warranted.

All of that goes to the level of interest-rate risk that you're exposed to. In any kind of ALM program, you want to balance a wide range of risks. Only by doing that are you going to be able to withstand the rapid changes in the environment that we'll definitely see, including interest rate risk, credit risk and cash flow timing. We're going to talk a little bit about cash flow timing. Pretty much every life insurer, I would say, has sophisticated tools at its disposal to evaluate this. On the asset side, there are all kinds of commercial products available to look at— mortgage-backed securities, pass-throughs, CMOs and PACs—to understand how their durations and convexities will change as the interest-rate environment changes. The key is really to evaluate that relative to the liabilities. In terms of yields back in late April when I was putting this together, a mortgage-backed pass-through backed by a 30-year collateral was paying roughly 153 basis points over the seven-year treasury. You could say, "Well, we could take this exposure to this cash-flow timing risk and get paid 153, we could buy a BBB bond and get a similar spread or we could balance the two." If you do your risk analysis you're most likely going find that some reasonable

balance is going to be a good strategy.

Chart 5 is an example of why you wouldn't want to put all your eggs in the cash-flow-timing basket (Chart 4). Here we have an insurance liability. This is clearly an interest-rate-sensitive liability, so that as interest rates shorten, for example, you could have market-sensitive lapses and your insurance liability could be shortened significantly. If interest rates go up, then all of a sudden all of your policyholders love your company and would never leave you, and they extend out as long as they can. Your assets are doing exactly the opposite. If interest rates go up, everyone is refinancing and your mortgage-backed securities are prepaying. If the rates go down, the opposite happens. Here you'd find that you're exactly balanced at the current point of the yield-curve environment, but whether interest rates go up or down, you have serious problems. I can virtually guarantee you that interest rates will go either up or down. You're not going to be in the situation where they just stay exactly the same. You wouldn't want to formulate your strategy around having interest rates stay exactly where they are for extended periods of time.

The other major type of risk that I mentioned is credit exposure. I have had one client say to me, "We managed credit exposure extremely well. We had a diversified portfolio, including Enron, K-Mart, Global Crossing and Argentina. We had them all." So clearly the current environment has been trying for just about everybody.

Certainly high-yield bonds are where you're going to see the most dramatic defaults. There was an almost 13% default rate on high-yield bonds in 2002. Basically, in terms of putting this in rough numbers, companies are experiencing roughly triple their long-term average default rates, and we have seen that in the past. While this environment is really difficult, it is consistent with the credit cycles of the past where defaults were basically zero in the late 1990s. People were having just wonderful experiences, and now they're at triple. You can think of roughly a range of 0% to 300%, maybe 400%, as the type of credit cycle that you'd experience over a decade, for example.

One of the challenges for life insurers is to evaluate how they're doing relative to the risks that they're taking, or the risks that they think that they're taking. Often they have a fairly broadly-specified investment strategy that has aggregate targets for credit exposure. If you find that your experience is that you're your default rates are suddenly at triple or quadruple their long-term averages, does that mean you're doing poorly? No. It means that you're going through the natural stresses of the credit cycle. There needs to be some mechanism in place to determine the difference between genuinely bad performance and performance in line with what you would expect. We're seeing a lot of interest in companies setting up shadow portfolios, which is an independent portfolio that's designed to mimic the broad credit-allocation targets that you have in your investment strategy. Often shadow portfolios are just something like, "Okay, we're going to have 30% of our assets in AAA and AA, 30% in A and the remainder in BBB. We're going to have some split

by industrials, financials and utilities, and then set up an algorithm to randomly select assets based on net cash flows and put them in this portfolio and track it over time."

Surprisingly, in examples where we've done that, we saw default rates go up to roughly triple their long-term averages. But certainly there have been companies where the investment manager was given a broad investment strategy and was evaluated on his ability to beat market averages. That creates an incentive to select the highest yielding asset in each and every class. Throughout the late 1990s, that would have been the debt on technology companies, telecom companies and so on. You would have seen your default rates go up to six or seven times their long-term averages. Having a shadow portfolio is a good way of capturing how you are doing relative to the normal fluctuations in the market, because if you just rely on anecdotal experience, you won't really know.

One of the other background pieces of information is to understand what baseline long-term default rates are. Table 2 shows rates calculated from the Altman study Professor Altman is a professor at New York University, and he's been tracking defaults for decades now. His group looks at every bond that is issued and tracks it until it either pays off or defaults, so his long-term statistics capture, by rating at issue, what the long-term default rates are. One thing to note is the enormous slope of this curve as you go from the high-end investment-grade categories down to BBB. You have a huge increase, and then, as you go to below investment grade, you have another huge increase. You definitely wouldn't want to think of default as a linear function of credit quality.

Table 2
Baseline Default Assumptions
Based on the 1971 to 2000 Altman Study

S&P Rating at Issue	Expected Default Loss Rate
AAA	0.01%
AA	0.02%
A	0.03%
BBB	0.31%
BB	1.10%
B	2.73%
CCC	5.30%

One of the most useless statistics that we often see is an average credit quality where each credit weighing is given a one, two, three, four, five, six rating, and you just take that and average it by book value or market value. That number really doesn't mean much of anything. You want to come up with a weighted average default rate using something like you see in this table so that you understand where your bets are really being taken.

You often do see companies do this type of static analysis. One of the points I want

to make in this discussion as you are evaluating different strategies is that you want to do not just this type of static analysis, but also stress tests around it. In Chart 5 we're looking at a wide range of different asset categories by credit quality and looking at their gross yield in the current environment. Again, this was in late April. We put in some reasonable estimates for investment expenses. Then we put in our long-term Altman default rates and come up with a cost of capital. Basically you need to have some capital; we're assuming 200% of the RBC factors to support this business. If you have lower quality assets you'll need more capital. You need to earn a return on that capital, some of which can be provided by the return on the surplus assets themselves. That will get you a net yield and then you can come up with a net spread versus treasuries. If we just went with this type of analysis, the answer would pop out at you and you'd say, "Boy, we want 100% of our assets to be in BBs, getting this net spread of 247." If you did that, it would be a ticket to bankruptcy in the kind of credit environment that we've had over the past few years. Clearly that goes against common sense. Everybody knows that you'd want to spread your risk out against a wide range of classes. In order to quantify that, let's do a simple stress test (Chart 6).

Here we look at a 300% default stress scenario, which is basically what we lived through the past couple of years. Now the picture of the net spread has changed completely. Here, the investment-grade categories—the single A and AA—look like the winners. By balancing out and having a range of exposure across the investment-grade category with some limited exposure to high-yield bonds, you'll be able to pick up some incremental yield in most pieces of the credit cycle, and then, when the credit cycle goes against you, you won't have huge losses.

One of the other strategies we're seeing companies explore is derivative strategies. Derivatives are great tools for risk management, but they are also tools for advancing your set of opportunities. You could think of using credit-default swaps, for example, combined with a fixed-income asset that has essentially no credit risk, such as an agency bond. This market has been growing at an exceptional rate. It's up to about \$2 trillion. It's not totally cut and dried to do these types of transactions. Right now there is an effort going on to harmonize the roles in the market so that hopefully the number of lawsuits can go down in terms of counter parties arguing back and forth with one another over exactly what it means when someone defaults. Also, I'm seeing a lot more activity in interest rate swaps. Essentially this allows you to separate the ALM problem from the problem of selecting specific assets. If your investment people say that they have found good assets at the 10-year point, but your maturity target for ALM purposes is at the five-year point. They can buy those 10-year assets, and then you can swap them down. Essentially you can use a number of derivatives as a tool to enhance your flexibility.

Chart 7 is an example of credit default swaps. It's amazing that we show the yield pick-up that you get—this credit default swap bid price—and it just pops right out at you that Goldman Sachs is regarded as a lower risk than the Republic of Korea. It's

amazing when I see the various countries lumped in there and treated as if they were another huge conglomerate.

The end of the story is that you might pick up some incremental additional yield by doing this. If you're analyzing it and finding that you're going to get a huge 200basis point gain, I would caution you that you should double-check all of your work. Most likely you've just overlooked some kind of risk.

In order to tie all this together, it's very important to do some risk analysis where you put the new strategy up against the old strategy in a financial analysis that looks at things like distributable earnings, GAAP income and maybe some kind of income rate (Chart 8). Here we have present value of statutory income over present value of statutory reserve. You should also look at a range of time horizons and a multi-factor model. If your model isn't stressing default rates, for example, you shouldn't be using it to evaluate a change in your credit exposure.

One of the positive strategy characteristics that would come out of that is that you're limiting your risk exposure to some reasonable level that you've agreed on in advance. I always hate these circular conversations where people embark on this type of analysis and you don't have targets set in advance. You might get the request from senior management asking you to show them what the results look like, and then they'll tell you what they want to do. It should be possible to have some fixed-dollar risk level beyond which you just will not go. Also, I've seen a number of strategies over the years that really rely on discrepancies between fundamental economic principles and a current set of accounting and regulatory rules. People often refer to that as accounting arbitrage or regulatory arbitrage. Keep in mind that those are short-term boons at best. Essentially, when things go against you, the rug will get pulled out from under you. The rules will change and regulators and other external parties will realize that there needs to be some kind of realignment of the rules with the underlying economic principles. Those types of strategies are to be avoided. Ultimately, you want to be able to defend this to external constituents, such as rating agencies, analysts and regulators.

I don't want to wrap up on a pessimistic note, but if we want to look at how bad things can get, these were corporate A bonds in Japan at the end of April (Table 3). It's just stunning. Every single one of them is under 1%. If you find people saying "Oh, don't worry, rates will go back up very soon," you might not want to rely on that. You might want to make some plans now for the potential for a sustained low-interest-rate environment. I've talked about a range of background issues, strategies and techniques for analyzing strategies. In order to get into more specific strategies, I'm going to turn it over to Frank and then Tim.

Table 3
Japanese A Rated Corporate

Maturity	Yield
2	0.27%
5	0.47%
7	0.77%
10	0.95%

MR. FRANK J. CATALDO: My focus is on interest-rate risk, primarily what happens to the duration of a portfolio as interest rates move up and down. But first I'm going to show some charts that you've probably been seeing over and over again, basically demonstrating that interest rates have been falling. Chart 9 shows the five-year Treasury yield for about the last four years. When it was running at just over 5%, I'm sure people were saying that you can't get much lower than 5%, but, as you can see, it has gotten quite a bit lower. As of the end of April it was just below 3%, and I think now it's running somewhere around 2.3% or 2.4%. I haven't checked recently. Treasuries aren't what life insurance companies invest in. They primarily invest in corporate bonds.

Chart 10 shows corporate bond spreads, not yields. The two bottom lines are A-rated and BBB-rated, and that's primarily what insurance companies invest in. The spreads there stay pretty flat, with a little bit of an increase in the BBBs, but not much. It's the below-investment-grade spreads that have widened out, but in this economy that hasn't been a really good place to be. As a matter of fact, the below-investment-grade bonds that most companies have may have been purchased at investment grade, so this spread increase is not a good thing at all.

The other asset classes that insurance companies invest in are agencies, mortgage-backed securities and asset-backed securities. They don't invest in these heavily, typically 15% to 20%, but the spreads on those items haven't changed very much either over the same time period (Chart 11). The lower line on the top graph represents agency bonds. Those have actually narrowed. The commercial mortgage-backed securities (CMBS) spread has narrowed a little bit over the time period. Fifteen year mortgage-backed securities are about the same. The only thing that has kind of widened out is on the asset-backed securities, where manufactured housing bonds have widened. Again, that in this kind of environment is not a very attractive asset class.

Investment yields on corporate bonds (approximately 80% of the life insurance industry's investments), have decreased (Chart 12). A-rated and BBB-rated have gone from just over 6% to around 4% over a four-year period, which is a pretty big change. That's a 33% drop in yield over a four-year period. You're used to hearing about 33% changes in spreads, not yields, so that's a pretty significant number.

What has this done to portfolio average yields? Conning does a study each year, the *Investment Profile of the Life Insurance Industry*. Chart 13 shows the gross investment yield for what we call "investable assets." Investable assets are assets where the insurance company actually makes investment-related decisions. By that I mean it excludes policy loans, occupied real estate and investments in affiliates. It's those things an insurance company wants to invest in for investment yield. That's shown a significant drop as well, coming down from just under 8.5% to 7.6% or so over the time period.

Now, the interesting thing to me in this chart is that it demonstrates the lag. I was showing yields down in approximately the 5% range around April 2001, going down to about the 4% range for corporate bonds, but companies were still earning 7.5% back in 2001, so that line is going to continue to drop. The other point is that interest rates are going to have to go above that line in order for this trend to reverse. You're going to see this drop for quite a while. Even if rates don't move any further down, you're going to see this line just continue to fall.

Many of you are probably familiar with the concept of duration. Basically, duration is a measure of the change in the present value of a set of cash flows if you have small changes in interest rates. Convexity is another measure that tries to refine that by bringing in the change in duration for a change in interest rates. If you have more than a small change, then the fact that the duration itself moves makes that not a good means of measuring the present value of those flows. Immunization involves either setting your assets in such a way that the dollar duration of your surplus is zero, making it insensitive to small changes in rates or matching the assets with your liabilities, which essentially makes the ratio of your surplus to assets insensitive to interest rates.

To demonstrate the impact that convexity has, I took some real numbers for a block of single premium deferred annuities (SPDAs). The left-hand corner has the liability side for a block of SPDAs, traditional life and universal life, and I blended them (Chart 14). I think it was one-third, one-third and one-third. The durations as of 12/31/01 were 3.7, 10.1 and 3.9, for a portfolio liability duration of 5.6, which is not unusual. I also list the convexities there. Now, convexity for life insurance liabilities tends to be very high, higher than the asset side, which I'm going to go over in a minute. There are a couple of things that cause high convexity. For a given duration, convexity is higher if you have disbursed cash flows around that duration. It's typical of single premium immediate annuities or structured-settlement-type liabilities. They have a certain duration, but you have level payments or quite a long stream, so those tend to have a high convexity. Another item that causes high convexity is optionality. A good example for that are SPDAs. Minimum interest guarantees cause high convexity. Surrender benefits also cause high convexity, again for a given duration.

On the asset side, a typical portfolio to back that set of liabilities might consist of around 80% corporate bonds and 20% commercial mortgage-backed and asset-

backed securities. I don't think that's too unusual. You started with a duration-matched set at 5.6. What happens if interest rates move? The next column on the chart, 9/30/02, uses the actual interest rates as of 9/30/02. That's the only thing I changed. I applied it to the exact same block of assets and the exact same block of liabilities. With just that one difference, and in less than a year, with about a 115 basis point move in yields, the duration of the liabilities goes from 5.6 to 6.6. Now, a lot of guidelines give you a one-year range. You've already moved the one year with nothing else going on, so you really need to keep an eye on that. On the asset side, it's hardly moved at all—from 5.6 to 5.8. If your goal is to have a matched position, you need to keep an eye on it, because it's not matched anymore.

A big driver on the asset side is the negative convexity on the mortgage-backed securities. That's where you see the -0.6. A friend of mine, Link Richardson, pointed out to me that in just about any other discipline they would call that concavity, not negative convexity, but for some reason the investment world likes to make it positive and negative convexity.

The duration for that particular group of assets actually fell. By the way, the graph on the lower left shows the interest rates behind the 12/31/01 and the 9/30/02 results. Then I also graphed on top of that 4/30/03 interest rates. and they are pretty much on top of the 9/30/02 for A-rated corporate bond yields. We're kind of in the same environment that led to the 6.6 and the 5.8, so that shouldn't have changed too much.

This session is about what happens if you stretch investment yield and it snaps. I've tried to put together an example of what would happen if you are tracking your durations and you match your portfolio at 6.6 (Chart 15). I put in the 9/30/02 liabilities, and I extended the portfolio to a 6.6 to match. Now what if interest rates go up roughly to the 12/31/01 level that we showed earlier? Your liabilities go back down to 5.6. Your assets are only going to go down to 6.4, and now you have a long mismatch. Your assets are much longer than your liabilities. Interest rates, by the way, have gone up—that's primarily what has caused this. What are you going to do about that? If you want to rebalance your portfolio, keep it immunized and keep it duration-matched, you have a couple of options. One, you can take whatever new money and re-investment what you have coming in and invest it really short. That would bring that 6.4 down. That might be hard to explain. As Ken mentioned, with the steep yield curve there's some incentive to go along. If that steep yield curve still exists, you're basically going to have to give up the 115 basis points that you now have available because rates have gone up in general, and start going short on the curve. You may have to explain to your management why that's a good thing to do. Your other option is to rebalance. You can take assets you already have in the portfolio that are longer than the 5.6 and invest them shorter. You still have the problem where you're invested in lower yields, and now you have a situation where rates have gone up. It's possible that you have realized losses on those bonds that you're selling, so that's another alternative that is not so attractive.

There is another way to look at the impact of duration. I mentioned earlier, that duration is a measure of the present value of a set of cash flows, and that's the graph that I have at the top (Chart 16). This is like a price/yield curve. The top line would be the present value of your assets for a given change in interest rates—in this case up 50, up 100, down 50, down 100—and the bottom line is the liabilities. We like to look at the difference between the two as economic value of surplus. Now, it doesn't really show that much here. There was an earlier session that exaggerated this quite a bit more, but the ends of the asset graph tend to not curve up as much. Under a different scale, you would see that the asset line is curved a lot less than the liability line, and that's the convexity that I talked about earlier. It's the curvature of those two lines. At extreme rate changes, the two tend to approach each other. The bottom graph shows the difference between the two upper lines.

There's a monograph by Krzysztof M. Ostaszewski, called *Asset Liability Integration*, available on the SOA Web site. We talked about immunization as reducing interest rate risk, but he looks at a graph like this and says that, in a way, you are actually maximizing interest rate risk. The idea behind that is, either way, you're going to lose. As Ken mentioned, interest rates are going to move. If interest rates move up 50 basis points you lose; if they go down 50 you lose. It's kind of ironic, because everyone thinks of immunization as reducing risk. You actually still are reducing risk, because in an immunized situation if they move down 50 or move up 50. Yes, you lose, but not a lot. But if you are in a situation where you're mismatched, half the time you're going to win and half the time you're going to lose. The difference is that you're going to lose a lot and you can win a lot, so it's still a risky situation. This situation where you lose either way is really an issue with convexity. It's not an issue of duration. It's a fact that insurance companies basically are net sellers of convexity. That's just the type of business we're in.

There are some pros and cons of duration matching. One of the pros is that it's reasonably effective at controlling interest rate risk. If you do keep an eye on it and are aware of the issues of convexity, it seems to work pretty well. It's easy to implement. It's easy to monitor. It's what everyone looks at anyway. The investment community is going to want to know what duration they need to manage to, so it's broadly accepted. You're going to have to do that. Rating agencies are going to ask you about it; everyone's going to want to know.

One of the cons is that it's accurate only for small changes. Actually, in the form that I've been talking about, it's also only accurate for parallel shifts. That can be addressed as well. You need to be aware of convexity. It's also very sensitive to the liability assumptions and the investment strategy. Let's take the case of an SPDA. There's an interrelationship there between the investments and the liability duration. For example, if you are investing a little longer, you may get more yield, be able to credit a higher rate and that would maybe lengthen the duration of your product. So there's interdependency there. When you're trying to set your asset duration, you can't do it independent of what happens to the liabilities.

Duration matching is also fine for when you're looking at this idea of economic surplus or economic capital, but it doesn't really reflect the financials of your company. It doesn't reflect the accounting, target surplus, reserves or taxes. It can be altered to do that, but that can get complicated. It also doesn't reflect the fact that you may get some reward. Like Ken mentioned with the curve steep, there are some advantages to going long and some risk associated with going long. Duration doesn't really directly reflect that in the work you're doing. It's really a risk minimization type of strategy.

There is another approach that we like to use called creating an ALM-efficient frontier. It addresses a lot of the shortfalls of just looking at the duration. We run stochastic interest rate scenarios so we can look at a total set of possible futures. We identify the investment strategies we want to test. We basically test the whole range of strategies—short and long. Even within a certain duration we can have barbell-type strategies with short securities and long that average the same duration or bullet strategies. We project the balance sheet and income statements so we get the accounting into the mix.

One form of output from this type of analysis is your typical efficient-frontier type of graph (Chart 17). Each triangle on this graph represents one of the strategies that we're testing. You test a number of them, and you plot it against two different axes. One axis is whatever you choose as your measure of reward, which we commonly present value of distributable earnings (PVDE) across the interest rate scenarios. It could be something different for each company, but that's one of the most common. The other axis is whatever your measure of risk is. In this case here it's standard deviation of that number across the number of scenarios that you're testing. When you graph something like this, you get the typical efficient-frontier pattern and this lets you pick a point where maybe you don't want to immunize, which would be down in the lower left hand corner. You're willing to take some risk and some volatility in PVDE for a higher mean PVDE. You may move up to the right on some of those lettered points. You wouldn't want to be in those points without letters below that because you could earn more for the same amount of risk or have less risk for the same amount of earnings.

Chart 18 is just another way to show the same sort of thing. This basically shows the distribution of results. Each vertical bar is a portfolio along the efficient frontier. This is useful if you're interested in the downside risk. Standard deviation is good and bad, but you really want to focus on what's bad. You can look at those in the fifth percentile, the bottom of each bar, and say, "I'm willing to take a certain level for that. Let's see how high the bar can go, and that will be the position I want to take."

As I said, this answers a lot of the issues with duration. It covers your financials. It shows you reward, and it also takes into account issues like convexity through the stochastic interest rates.

MR. TIMOTHY L. SWENSON: One manner that fixed-income portfolio managers have stretched for increased yield or spread is by taking increased liquidity or structure-complexity risk. I'm going to talk today about an asset sector that's received press over the last two years from some "snaps" (I figured I'd work in the whole title) that caused insurance companies to either realize losses or take write-downs for asset impairment.

This is going to be a primer with respect to collateralized debt obligations (CDOs). I'm going to cover the basics of the deal structure, terminology and key factors that rating agencies look at. I'm going to talk about investing in CDOs for my portfolio-management framework and considerations for their inclusions in a portfolio, and then give a brief overview of the market and recent trends.

Traditional CDO structure has many similarities with the structure of other asset-backed securities. You start with a collateral pool and a CDO asset manager (Chart 19). A collateral pool is a diversified pool of assets. We'll cover common forms of collateral later in the discussion. This pool is assembled and managed subject to guidelines and restrictions that are in the deal's indenture. The asset manager assembles, monitors and actively manages the collateral pool. Through a special-purpose vehicle (SPV), the CDO is funded through the issuance of several security classes. The majority of the capital structure is highly-rated securities and then below that you have mezzanine tranches. At the bottom of the structure in the first-loss position are unrated notes or equity.

Given the fixed-floating profile of the collateral pool and the liability structure, it may be necessary for the CDO manager to use swaps or other interest-rate derivatives. A trustee ensures that the covenants are being followed and provides periodic reporting on the collateral pool. That's the traditional structure.

Over the last few years, synthetic structures have become extremely popular as a result of the rapid evolution in the credit derivatives market (Chart 20). The collateral pool contains credit default swaps and cash equivalents and has the benefit of eliminating the ramp-up period that often comes with assembling a pool of securities. It provides the pool with instantaneous exposure to credit experience. The role of the asset manager in the SPV is similar.

The capital structure looks slightly different in that much of the structure is unfunded. Funding is raised only for the cash that's needed as collateral (or if you want to think of it as reserves), given the risk exposure of the CDO. Again, there may be interest-rate hedging that needs to take place given the asset-liability profile of the collateral pool or the assets in the CDO liability that has been issued. The trustee's role is also similar.

The life of a CDO starts with the development phase where guidelines are developed. The deal is marketed, goes through a ratings process and is priced. Portfolio construction also might start here through the warehousing of securities.

After the deal is funded, the portfolio is assembled. The ramp-up period typically takes a few months. Over the next several years the asset manager monitors the portfolio, re-invests cash flows, and, depending upon the deal terms, the deal may be a static pool or it may be more actively managed. Note holders are paid interest and principal subject to the deal structure and the priority of payments in the deal's indenture. Eventually the deal winds down and principal payments are made per the deal's covenants.

CDOs are categorized in several ways. One way that they're categorized is by the motivations of the issuers. In a balance sheet transaction, typically the issuer is a bank or an insurance company who is looking to remove loans or bonds from the balance sheet, achieve capital relief and improve the return on equity profile for their business. In an arbitrage transaction, the issuer, through the equity tranche, is looking to profit from the excess spread between the collateral-pool of assets and the CDO notes that have been issued.

CDOs are also classified by the manner in which collateral is used to pay CDO obligations. In cash flow transactions, principal is paid down via collateral maturities, and this is fairly analogous to a cash-flow-testing type of problem. In market-value transactions, principal is paid down by selling collateral, and these tend to be more actively managed.

CDOs are also categorized by the underlying collateral (Chart 21). I have an asterisk between the "C" and the "O" because the types of collateral that have been collateralized and structured in the deal issued pretty much run the gamut from high-yield corporate debt to investment-grade debt, high-yield bonds, emerging-market debt and other structured-finance types of securities.

As investors analyze a deal and rating agencies assign ratings to the various tranches, the main aspects that are analyzed are the underlying collateral pool, the structure of the deal and the asset manager. In analyzing the collateral pool, rating agencies will look at the composition of the individual securities and ratings; expected ratings-migration trends; default rates and recovery; the diversification of the pool across and within sectors and correlation implied from that; and volatility and liquidity of the underlying collateral.

The structure of the deal will define the priority of payments to the various tranches. There may be internal and external forms of credit support. As rating agencies look at deals, there are various coverage tests. For example, an interest-coverage test, which looks at the interest from the assets that are in the collateral pool relative to the interest owed to the noteholders. Other tests include quality tests, weighted-average rating factors and diversity of the pool.

The asset manager is extremely important to the ratings and pricing of various deals. The track record of managing CDO deals comes into play, as well as past experience as a CDO asset manager. This is not a style of management that fits in

with all asset managers. The infrastructure to support the investment management and administration is also important.

I'll provide a brief history of CDOs. It's not a new asset class. Insurance companies were the first issuers. The first CDO was originated in 1988. Insurance companies were seeking capital relief by removing high-yield bonds from the balance sheet. It was a slow-growing asset class until about 1996. Since 1996 it's been the fastest growing portion of the asset-backed-security sector, and now represents about 10-15% of total asset-backed-security volume. This substantial growth has been fueled by the arbitrage transactions. CDOs have also, over the last four or five years, been increasingly looked at as a mechanism for asset managers to increase assets under management. There has also been rapid evolution in the structured-credit markets and credit derivatives.

As far as investment considerations, you want to take a holistic view of the asset-liability portfolio and most importantly the liquidity demands of the liabilities that your asset portfolio is supporting. CDOs tend to be very illiquid and can be classified as more of a buy-and-hold investment. On the liability side, to the extent that liabilities are extremely illiquid and these portfolios cannot accommodate a level of illiquidity in the asset portfolio, there may be a fit.

One of the benefits of investing in CDOs is that investors are compensated for bearing the illiquidity or liquidity risk and for analyzing the complexity of the structure. What it also brings into play is increased diversification. You might gain exposure to asset sectors that might not normally be included in investment portfolios, for example commercial and industrial loans and emerging-market securities.

There are also some costs of investing in CDOs. Asset-management skills to appropriately manage a portfolio of CDO investments may not currently exist in-house or at investment managers that you're currently using, and it may be more prudent to use specialty managers. You also need to factor in the cost of liquidity, and, as just as it was in the credit markets in the second half of 2002, this was an extremely illiquid asset class.

Having said that, liquidity has improved over the last few years in the CDO marketplace, in particular in the secondary market where two years ago perhaps you had one to two deals per week. Now you have seven dealers actively engaged in secondary market trading and maybe as much as \$2 billion per month is trading hands in the secondary market. It is an extremely illiquid asset class. It's not uncommon to find bid/ask spreads of, say, four points.

As far as other risks, of course the performance of a CDO is going to depend upon the performance of the underlying collateral in the asset pool. It's also going to depend upon the deal structure and your placement within the deal structure based upon the note that you've purchased. One thing to also consider is that potentially

there are conflicts of interest for the manager. The manager often has subordinated manager fees which can be looked at as incentive-type fees, and they may be incented to manage the deal structure in a manner that would be less than preferable for the note holders and more to the benefit of the equity-type tranches.

As was mentioned earlier, this is a marketplace that has seen dramatic growth over the last five years. It has slowed down a little as we've moved into the new century, as have many of the sectors of the credit markets. Over time arbitrage has become the primary motivation for issuance, and synthetic structures have become the vehicle of choice. There has been a shift in collateral types over time going back to the mid-1990s (Chart 22), where typically when you were talking about a CDO, you were talking about something that was collateralized with high-yield bonds. That has definitely come down over time, and preferences have shifted such that other structured-finance securities, including asset-backed securities, commercial-mortgage-backed securities and CDOs, have become preferred and are the leading collateral choice thus far in 2003.

Additionally, high-yield loans are being issued quite a bit. Investment-grade bonds are also being issued, but you've seen much less of that in the second quarter of 2003. The arbitrage opportunity available to the CDO issuer has come in quite a bit in that corporate bond spreads have been zooming in for the last month and a half, whereas CDO spreads in terms of the funding costs have remained rather sticky.

Chart 23 shows the allure to fixed income managers of the asset class. What's being compared here is spreads on CDOs at comparable ratings relative to other competing asset sectors such as credit-card-asset-backed securities and corporate bonds. You can see as you move down to the A and BBB ratings categories that the pick-up is often 50 or 100 or so basis points relative to other asset sectors—that's compensation for bearing the liquidity risk and then also analyzing the complexity of the structures.

In terms of performance—ratings migration or downgrades—trends are determined by the performance of the underlying collateral. Generally this follows broader credit market ratings trends. You've seen the majority of downgrades over the last year or two in CDOs that are collateralized by corporate debt. We alluded to corporate defaults earlier and also the general downgrade trends that you've seen in corporate bonds within many sectors and across the economy.

Over the last few years, however, the downgrade history for CDOs has been lower than for corporate bonds. You've seen collateralize loan obligations and the structured-finance CDOs outperform those that have been collateralized by corporate obligations. There are other trends that you've seen in the marketplace over the last couple of years include growth of the synthetic market that I mentioned earlier. CDO technology has expanded into new asset classes. Last year we saw the first collateralized fund obligation (CFO) issued, and the collateral pool there is hedge fund-of-funds. I think over the last year and a half you've seen four

of those deals come to market. One other trend I want to mention in the marketplace is that you have seen much increased transparency. Deal information is being provided to data vendors such as Intex and RiskMetrics by the deal's underwriters. This is a new phenomenon. This has really helped liquidity in the secondary markets. By that I mean you're seeing decreased turnaround times in terms of time to analyze a deal. When you go to sell out a position one aspect of liquidity is the time that it takes to liquidate your investment. Then also you have seen increased volume in the secondary markets and more efficient pricing over time.

MR. DAVID J. MERKEL: Over the last five years I had the fun of managing first mortgage bonds—CMBS, mortgage-backed securities and asset-backed securities. After that I had the odd experience of being catapulted into being the corporate bond manager for a reasonably large account. One of the things that's always kind of depressed me about residential mortgage securities is that almost all of our OAS models have failed. None of the models out there have ever really fully captured the true variability of how much interest rates can move. They don't move in a lognormal process; they move in regimes. We're up all the way to 1979 to 1982. We are down, down, down, with a few up-jogs here and there for the next 20 years. These are not things that our models typically take into account. I would honestly say that if you wanted to do real stress tests, you would need to take a look at how your strategy would work investing from, say, September of 1993 to November of 1994. Can you survive the curve going up that much? Can you on the other hand survive 1992, where the curve goes down incredibly? You have a bullish steepener. Typically our models don't do that. They tend to be far more up, up, up, up, such that I would almost say that if you get the results back from your model, use a totally different method like game theory. There you look at the worst possible result or results and then you ask yourself how many of your competitors or peers are prepared for those. If you say to yourself that almost all are prepared, you can pretty much depend that that one won't happen. If you say none of them are, then you could probably protect yourself, because there will be a tendency - if you get close to that - for people to begin preparing themselves and hedging into it, which will exacerbate it when you move into that problem.

We had about 14 CDOs in our portfolio. Most of them were high-yield collateral. The ones that were investment-grade collateral or diversified collateral actually did okay. There were some that were bank collateral or re-collateral that did fine. But the high-yield collateral ones did horribly, and the covenants that were set up in there that were ostensibly for protection actually led to the picking of bonds. We had our own dedicated high-yield group, and they'd look through and say, "Oh my." But they chose the worst bonds in every single rating class in order to optimize the initial return for the equity-holders. It led to basically a cascade where the equity would get its payment initially, and then bit by bit, tranches would get shut off. The severity was 100% if you lost in any of the subordinated or mezzanine tranches. I even saw a tranche that was rated A that basically got a zero when it was finally wiped out. You got interest for five years, boom, nothing. With CDOs you're

doubling- and tripling-down in some cases on credit risk and, at this point in the credit cycle, that could look pretty nice. Start trolling for secondary deals that blew up in the past and maybe you can get something out of buying some of the tranches that are kind of on the bubble right now. But through the last period of time when we went through the credit-risk cycle where it was default-high and for a long time, CDOs were incredibly weak holders of credit in that point because they just could not hold on to obligations to the same extent. So I view some of these things, knowing how they work, with a bit of skepticism simply because I've seen the blow-ups. I know a lot of companies that have just dropped out of the CDO market entirely, and I don't blame them. There are probably better ways to do it.

MR. MUNGAN: I'm definitely a fan of stress testing, and I think often people's eyes glaze over when they try to comprehend exactly what's included in any kind of stochastic analysis. I'm actually getting a lot of requests from senior management to show strategies that you have seen over the last five years or 10 years, and we're finding that the most difficult scenarios are the ones that have actually happened. That's just my general approach.

MR. SWENSON: I just want to touch a little bit on the conflict between the equity and debt that we discussed a little bit. That is a concern in the marketplace. One of the things that has been important to ratings and pricing is the track record of the manager. If you're a manager that has had one deal blow up and managed the deal to the note holder's detriment, you're not going to find demand there when you come to market again. The track record of the manager is very important.

Chart 1

Yield Summary

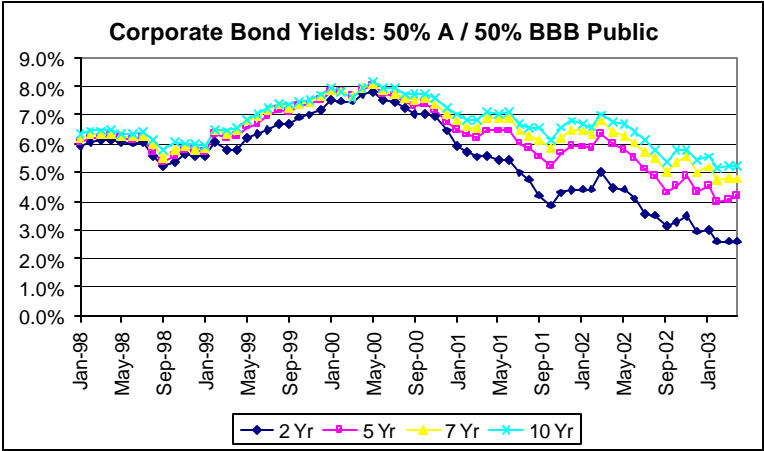


Chart 2

Steep Yield Curve

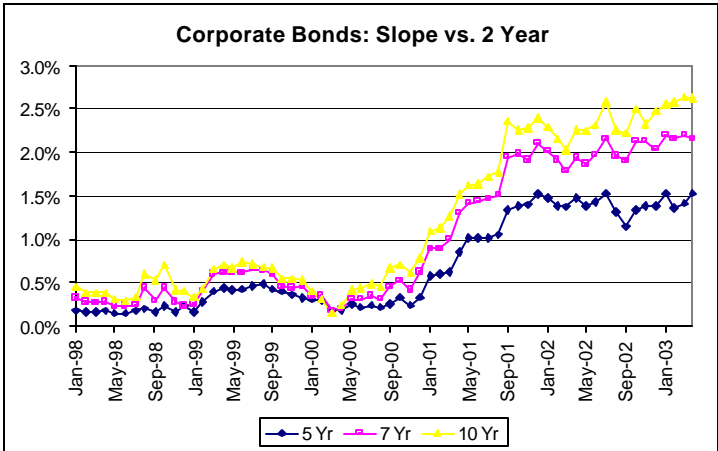
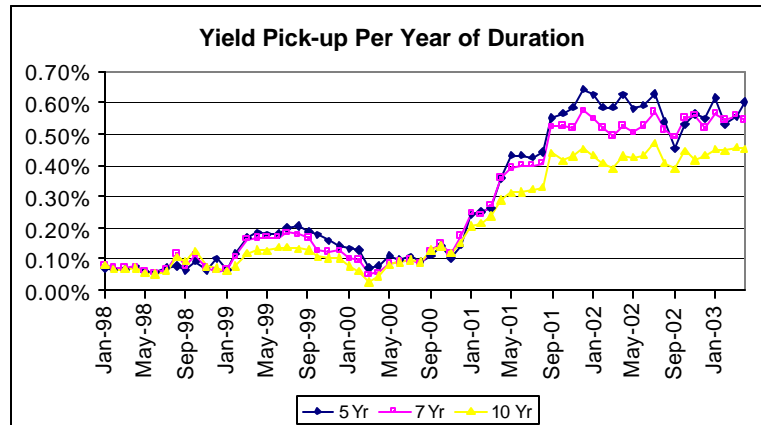


Chart 3

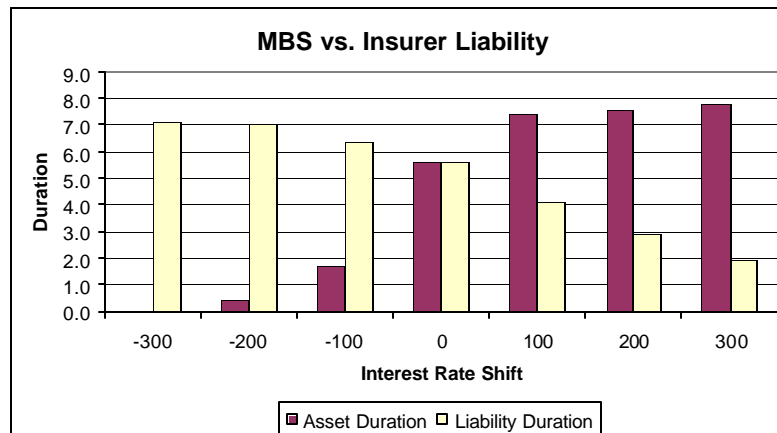
Steep Yield Curve



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Chart 4

MBS Passthrough Analysis



Page 9

Chart 5

Yield Analysis

Capital Adjusted Yield Analysis 10 Year Maturity						
Asset Type	Gross Yield	Investment Expenses	Default Loss Rate	Cost of Capital	Net Yield	Net Spread Vs. Treasury
Treasury	3.91%	0.10%	0.00%	0.00%	3.81%	0.00%
Corporate AAA	4.71%	0.10%	0.01%	0.08%	4.52%	0.71%
Corporate AA	4.86%	0.10%	0.02%	0.08%	4.66%	0.85%
Corporate A	5.00%	0.10%	0.03%	0.08%	4.79%	0.98%
Corporate BBB	5.46%	0.10%	0.31%	0.27%	4.78%	0.97%
Corporate BB	8.39%	0.10%	1.10%	0.92%	6.28%	2.47%
Corporate B	8.92%	0.10%	2.73%	1.99%	4.10%	0.29%

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Chart 6

Default Stress Scenario

Capital Adjusted Yield Analysis - 300% Default Stress Scenario 10 Year Maturity						
Asset Type	Gross Yield	Investment Expenses	Default Stress Scenario	Cost of Capital	Net Yield	Net Spread Vs. Treasury
Treasury	3.91%	0.10%	0.00%	0.00%	3.81%	0.00%
Corporate AAA	4.71%	0.10%	0.03%	0.08%	4.50%	0.69%
Corporate AA	4.86%	0.10%	0.06%	0.08%	4.62%	0.81%
Corporate A	5.00%	0.10%	0.09%	0.08%	4.73%	0.92%
Corporate BBB	5.46%	0.10%	0.93%	0.27%	4.16%	0.35%
Corporate BB	8.39%	0.10%	3.30%	0.92%	4.08%	0.27%
Corporate E	8.92%	0.10%	8.19%	1.99%	-1.36%	-5.17%

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Chart 7

Credit Default Swap

Credit Default Swap Quotes				
Source: Creditex				
Issuer	5 Year Treasury	Agency Spread	CDS Bid Price	Gross Yield
Deutsche Telekom	2.88%	0.30%	1.33%	4.51%
Republic of Korea	2.88%	0.30%	0.94%	4.12%
Goldman Sachs	2.88%	0.30%	0.40%	3.58%
Reuters Group PLC	2.88%	0.30%	1.32%	4.50%

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Chart 8

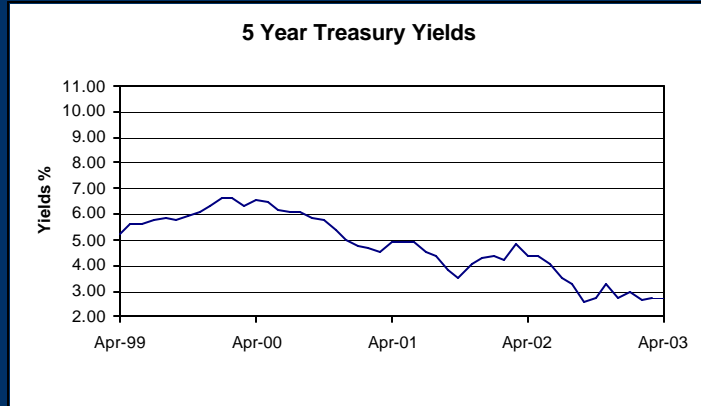
Risk Analysis

- Financial measures
 - PV(Distributable Earnings)
 - PV(Stat Income) / PV(Stat Reserve)
- Multiple time-horizons
 - 1, 5, 10, 30 years
- Multi-risk factor model
 - Interest rates, defaults, derivative pricing

Page 16

Chart 9

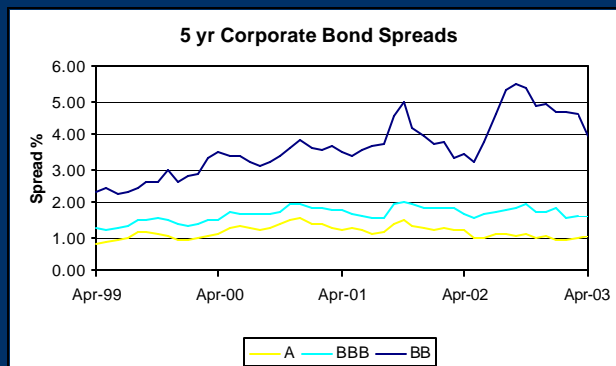
Treasury yields have dropped.



1

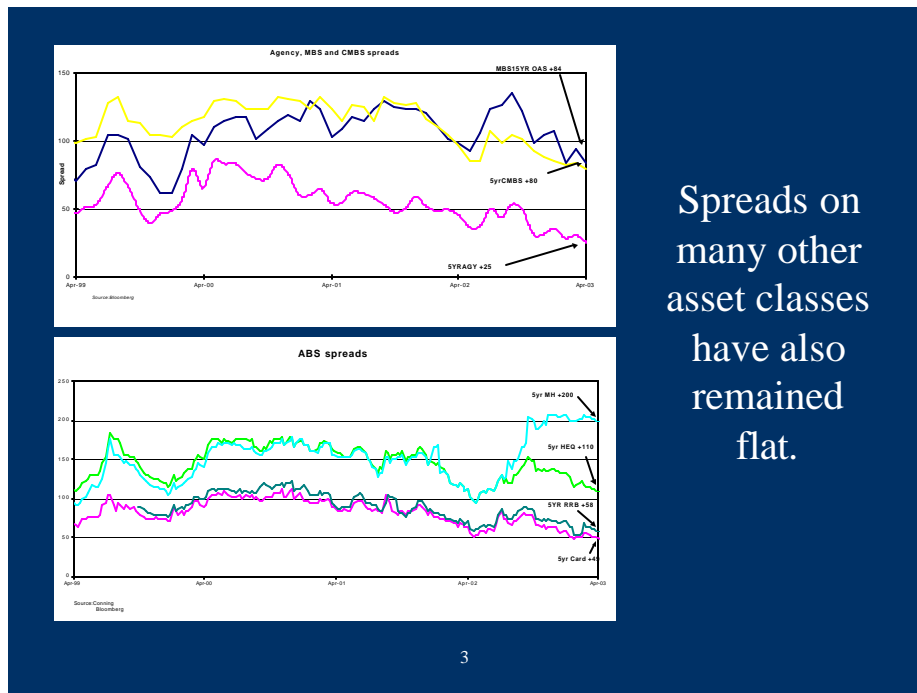
Chart 10

While investment grade corporate bonds spreads have stayed flat.



2

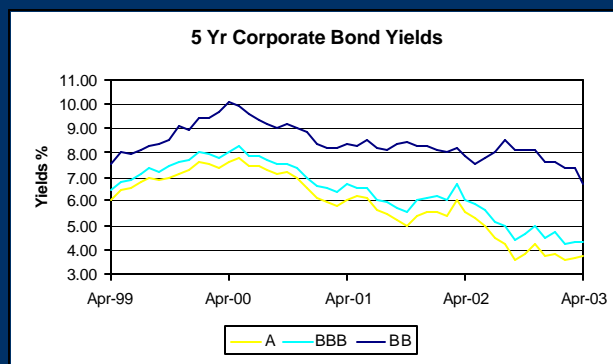
Chart 11



3

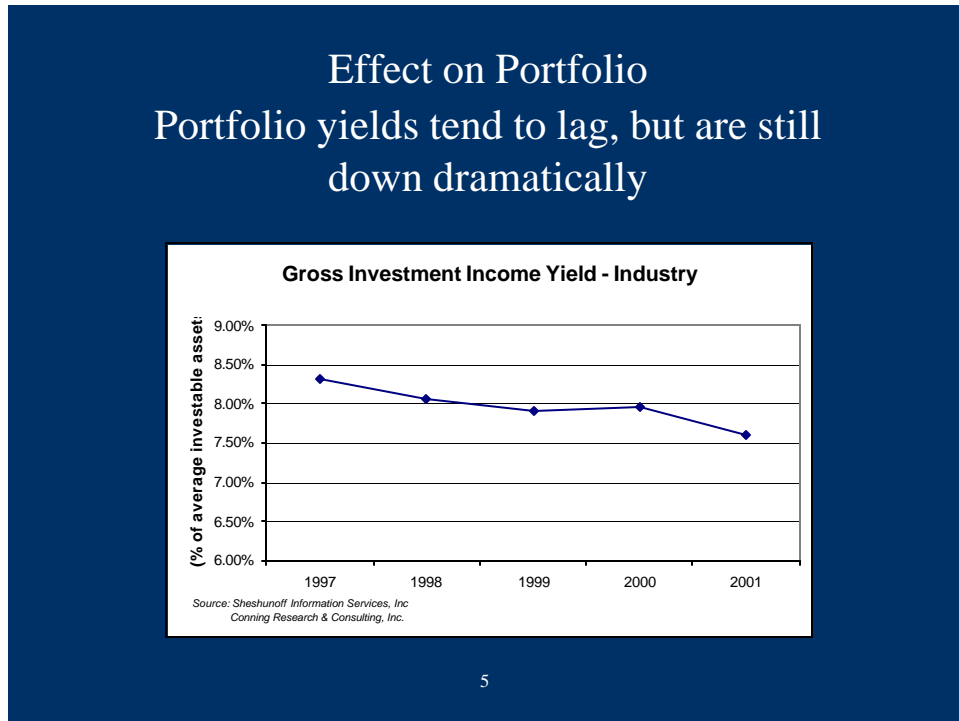
Chart 12

Net result: Lower investment yields.



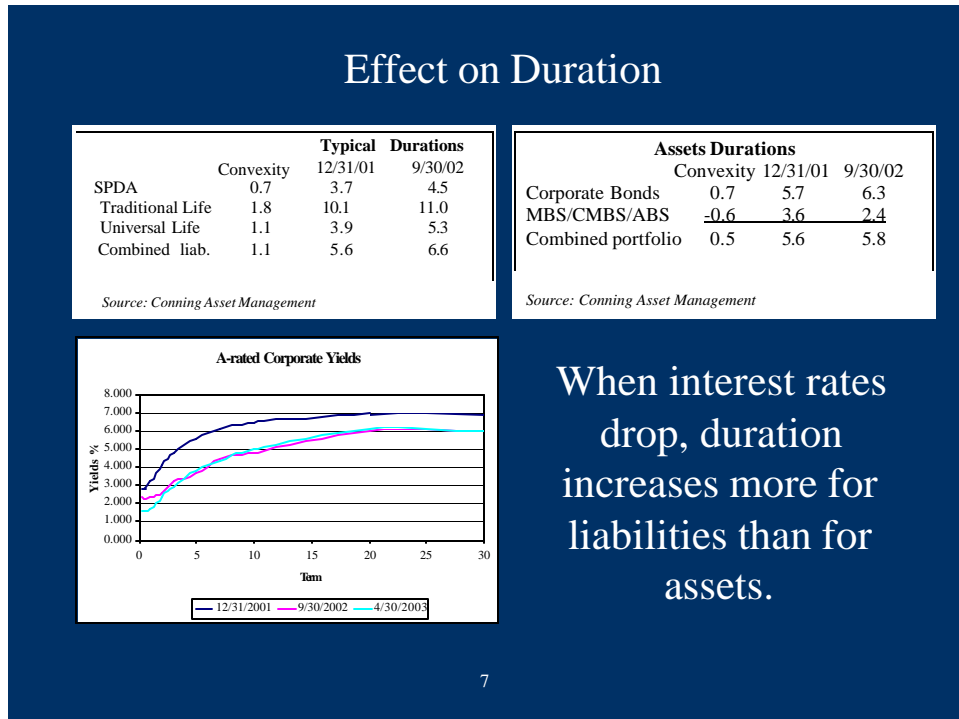
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Chart 13



5

Chart 14



7

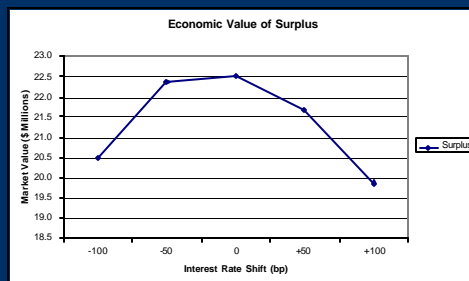
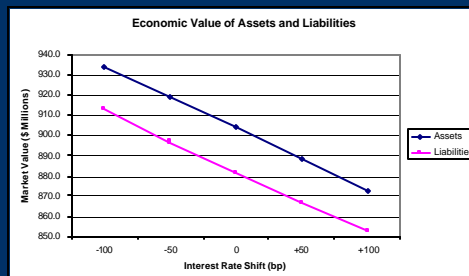
Chart 15

Typical Durations			Assets Durations		
	9/30/2002	?		9/30/02	?
SPDA	4.5	3.7	Corporate Bonds	7.2	6.5
Traditional Life	11.0	10.1	MBS/CMBS/ABS	2.7	4.1
Universal Life	5.3	3.9	Combined portfolio	6.6	6.4
Combined liab.	6.6	5.6			

Source: Conning Asset Management

If yields were to rise, liability durations will fall more than asset durations.

Chart 16



Either way, when rates move, the economic value of the firm declines.

Chart 17

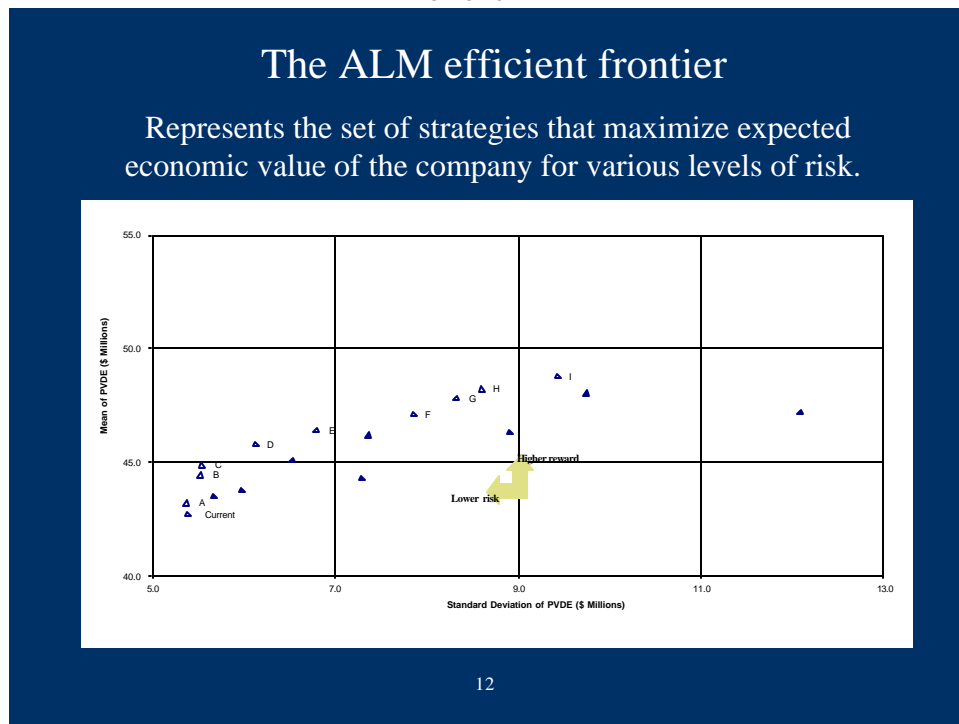


Chart 18

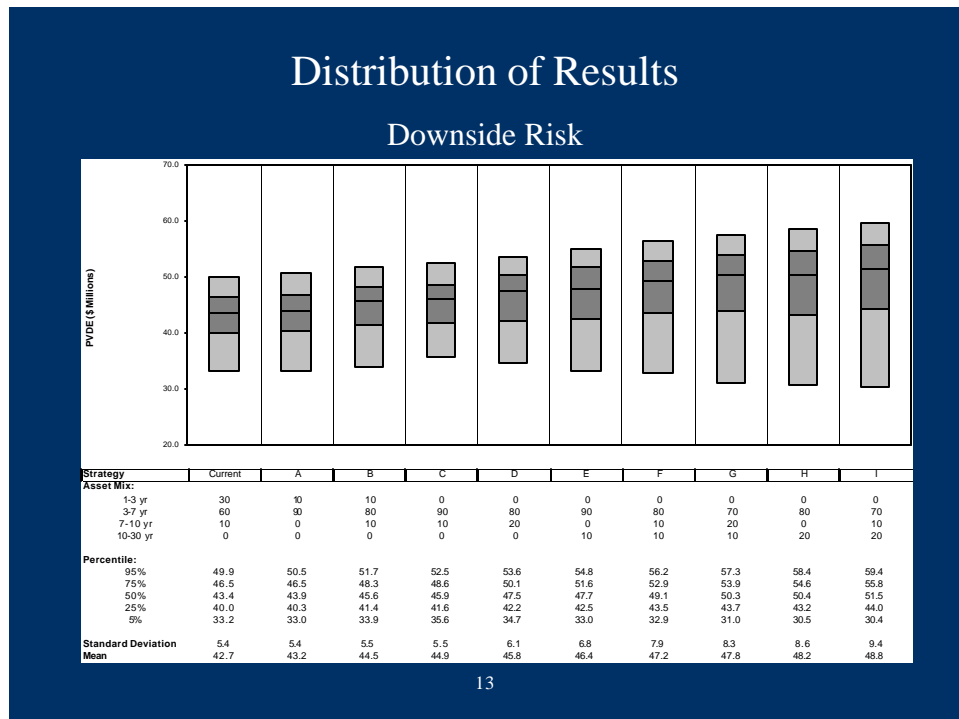
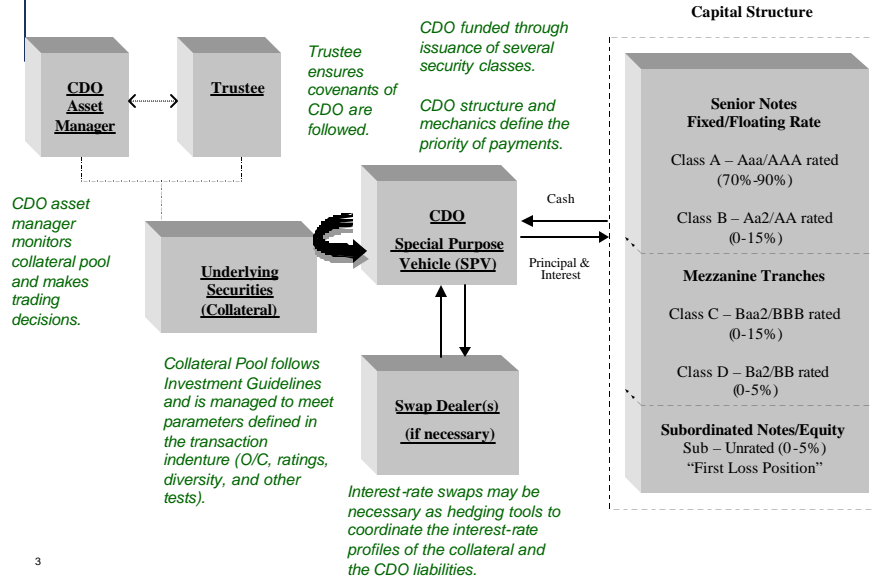


Chart 19

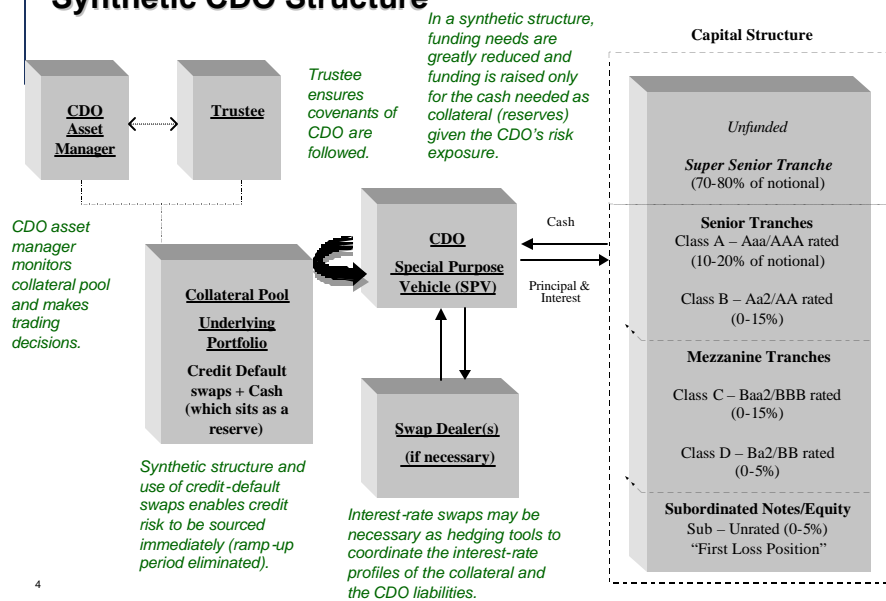
Introduction to CDO's Traditional CDO Structure



3

Chart 20

Introduction to CDO's Synthetic CDO Structure



4

Chart 21

Introduction to CDO's Categorizations – C*O's

CDO's are also categorized by the underlying collateral.

- HY CBO's – high yield bonds
- IG CBO's – investment grade bonds
- EM CBO's – emerging market bonds
- HY CLO's – high-yield loans
- CDO Trups – trust-preferred securities
- SF / MS CDO's – structured finance / multi-sector – ABS / CMBS / RMBS / CDO's
- Synthetics / CSO's – credit derivatives
- CFO's – hedge fund of funds, private equity fund of funds etc.

8

Chart 22

Market Recap and Trends CDO Asset Class Distribution by Deal Count

Historical CDO Issuance by Collateral Type

Year	High Yield Bonds	Investment Grade Bonds	High Yield Loans	Structured Finance (ABS/MBS/CDO)	Emerging Markets	Other
1996	66%	8%	13%	0%	13%	0%
1997	45%	17%	17%	1%	17%	2%
1998	35%	14%	35%	5%	10%	1%
1999	44%	15%	25%	6%	8%	2%
2000	25%	21%	21%	19%	12%	3%
2001	14%	34%	19%	19%	11%	3%
2002	6%	36%	25%	25%	3%	5%

Source: JP Morgan Securities

21

Chart 23

Market Recap and Trends
New Issue Spreads to LIBOR/SWAP

Generic Spread Levels (to LIBOR/swap) for CDO's and Competing Sectors (as of 4/17/2003)

	High Yield CBO	IG CDO	HY CLO	SF ABS CDO	ABS - Floating Rate Credit Cards (10 year)	Corporate Bonds
AAA/Aaa	58	68	60	65	30	2
AA/Aa2	95	120	100	110	n/a	12
A/A2	170	220	175	200	85	70
BBB/Baa2	310	350	290	310	190	137

Source: JP Morgan Securities
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