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Session 29TS
Credit Derivatives

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Summary: Topics include: techniques used to price credit derivative accounting and required capital treatment of investment strategies involving credit derivative; size and growth of the credit derivative market in the U.S. Canada and globally; and early experience and performance of credit derivatives in an actual default case.

MR. MICHAEL J. HAMBRO: I'm a vice president and managing actuary at Aon Consulting. My speaking partner is Larry Rubin. Larry is managing director at Bear Stearns. He focuses on risk management and earnings enhancement for the insurance industry. Prior to joining Bear Stearns, Larry was at TIAA-CREF for 17½ years.

Why are we talking about credit derivatives at the valuation actuary symposium? It really seems remotely related to AG33 or AG34. I think there are some good reasons, and one is that I'm on the planning committee, and I proposed this session in January. What is more important is credit derivatives are a very fast growing part of the global derivative market. I have some slides that demonstrate that. Currently, credit derivatives are used in the financial institution area. Insurance usage is still emerging. Insurance companies can participate in credit derivatives directly or indirectly through securitized transactions. As we are all aware from insurance company portfolios, there has been significant credit problems in investments in 2001 and 2002, and that will continue in the future, so we need to look at ways to really manage credit risk.

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

Since its inception, the cash-flow testing requirement, the Actuarial Opinion Memorandum Regulation (AOMR), has pretty much focused on interest rate risk. We need to heighten the awareness of appointed actuaries about credit risk because that is a very prominent risk that management is going to need to be apprised of.

Let's discuss the growth of credit derivatives. Globally, it started out in 1996 with about $40 billion of notional amount. By the end of 2002, it will be up to approximately $2 trillion. It currently forms about 2% of the total derivative market globally. In the U.S., it's about 1%, but it has been a steep slope.

The first thing I want to do is take you through the basic types of credit derivatives as a building block approach, and then extend it to some of the real usages that credit derivatives have. One of the things that Larry is going to specifically focus on is the usages that insurance companies would be involved in with credit derivative transactions.

There are three basic types of credit derivatives: total return swaps, credit default swaps, and credit spread options. For these transactions, they're almost all over the counter, and they're not on any exchange. Total return swaps are derivatives in which the total return from one asset or a group of assets is traded for the total return of another group of assets. The way it usually works is one party will pay the total returns on a defined underlying asset and receive a stream of LIBOR payments or LIBOR-based payments. The principal amount of total return swap of the assets is not exchanged, and they're usually constructed so it's a zero-sum game at issue. The value of the swap would be zero at the inception.

I'd like to give an example of how this might work. Company A might be a bank that has expertise in manufacturing loans, but right now it's full. Its investment guidelines say no more manufacturing loans. It specializes in making loans to the clothing manufacturing business. It has a great customer, XYZ, that has requested a $100 million loan to do some plant building. Company A is full of this sector, but it still wants to keep its relationship with manufacturer XYZ. It will make a loan to the company, and then it will enter into a total return swap with

investment bank B. Let's say that the loan interest is 8% payable semi-annually, and the swap is priced at LIBOR. Every six months, Company A is going to send the fixed interest 4% over to the bank, and the bank is going to send back six-month LIBOR. Actually, what's going to happen is there's going to be a net settlement. They're not going to send each other a check. Based upon the maturity alone, since it is a total return swap, if there's any principal deficiency, there's no upside in the loan, but if for some reason manufacturer XYZ has problems and can't repay the full principal, then bank B would make up that deficiency.

The bottom line is Company A is able to satisfy its customer and still comply with its internal and regulatory investment guidelines. This depends on the type of industry. The banking industry would allow for balance sheet relief. Rules for the insurance industry are still emerging. The credit exposure to XYZ has been transferred to the bank, and now Company A, instead of having exposure to this credit, has exposure to the bank as a counterparty risk. In certain regulatory environments, Company A might get the appropriate balance sheet and RBC treatment. You may note that Company A could have reversed the transaction and then gained access to an investment sector that it might not have had any exposure to before.

Credit default swaps form the building blocks of a lot of securitized transactions, and they have the largest volume among credit derivatives. This involves the protection seller and a protection buyer. The potential loss by the reference asset like a bond, due to specifically defined events, bankruptcy, default, or maybe even a downgrade, will become the responsibility of the protection seller. In return, the protection buyer has to pay a premium. This is not a zero-cost transaction. There's a premium that is paid either up front or periodically. The protection buyer sends this premium over to the protection seller. In return, the protection seller has responsibility for a contingent payment if a credit event occurs.

It's really important that the payoff qualifying event be well defined in the swap agreement. You can think about what kind of problems might occur if it's not well defined. There are different ways that these contracts can be settled. One is the protection buyer can deliver the reference asset to the seller and then receive the full face amount of the reference asset or let's say bond.

Alternatively, there can be a net settlement in which the face amount of the asset, minus the market value of the asset one month after the credit event has occurred. Both of these are used in practice.

Credit default swaps don't have to be based on a single reference entity; they can be based on a pool or basket of reference assets and the payoff can be specifically tailored for OTC transactions. The International Swaps and Derivatives Association has standard definitions and documentation, and this is very important. You can have many lawsuits and disputes over what this means or that means, if they didn't have these definitions.

Finally, the other basic type of credit derivative is the credit spread option. Again, it involves a protection buyer and a protection seller. The protection buyer is protected against the spread widening on a reference asset compared to another asset. For example, let's say you have a ten-year bond issued by ABC Corporation. The credit spread option would pay off if the yield on this asset exceeds the yield on recently issued ten-year Treasuries by 400 basis points, and 400 basis points would be considered to be like the strike price. It is similar, in some ways, to a credit default swap in that there's a protection buyer in it and a protection seller; unlike a credit default swap, there doesn't have to be any specific event that occurs to trigger a payment of the option. All that has to happen is that the spread widens past a certain point.

How is this applicable to insurance companies? Insurance companies, haven't yet been major participants in either total return swaps or credit spread options. They also haven't been major buyers of credit default swaps. Most of the buyers of credit default swaps have been banks, financial institutions, and hedge funds. The regulations and RBC treatment is not yet in place for insurance companies to do this, but I've been told that's changing. Insurers have either directly or indirectly been protection sellers. Much of this has involved what's called collateralized debt obligations (CDOs). We'll get into that later.

Credit default swaps are a very important part of credit derivatives, and they're already often used with insurance companies, either directly or indirectly. I want to get into the pricing. How do you price a credit default swap? Let's assume that there is a five-year corporate bond rated DDD that trades at 200 basis points over Treasuries. Look at Moody's annual corporate bond default study, which is available on its website. It's a really good source of information. Let's say the average annualized cost of defaults for this grade bond is 25 basis points. If the credit default swap costs 25 basis points, then the investor can buy the bond, purchase the credit default swap and really have a net spread of about 175 basis points. Of course, they have exposure to the counterparty, the bank, in which they did the transaction. If that counterparty is rated AA, then the cost of the counterparty risk is fairly minimal. It's not zero, but it's fairly tame. It's like an arbitrage opportunity, except that's not how it works. It's not how credit default swaps are priced.

How are they priced? There are many models out there. There are some really good websites for this information. The math gets a little tricky, especially if you've been out of school for 35 or 40 years or whatever. Hull & White have a good model that describes the process for valuing credit default swaps. At first, we're going to assume there's no counterparty risk. Then we'll generalize that. One of their suppositions is that the difference in value between a Treasury bond and a similar term corporate bond—a referenced corporate bond—is solely due to the possibility of defaults. That's a little controversial, but that model works. The value of the Treasury bond minus the value of the corporate bond is equal to the present value of the cost of defaults.

We need to get default probabilities and default densities at every single time interval that the bond is in force. So if the reference issuer has sufficient bonds outstanding and various maturities, and they're widely traded, we can use the data from all of its bonds to construct these probabilities. If that's not the case, then we'll go out and find other issuers that are similarly rated, have the same risk profile as the reference asset issuer, and use that data to construct the appropriate default probabilities and default densities. The key thing is that these default probabilities are risk neutral, and they're not based on historical experience or real-world expected experience.

Determining the cost of default at any point in time is the default probability times one minus the recovery value of the bond or the salvage value. So in order to determine the probabilities, we also need to know something about the recovery amounts on defaults. Moody's study does a pretty good job of analyzing recovery amounts by sector and by investment grade.

The relationship between the default probabilities and the recovery amounts is such that the higher recovery amounts, the higher the default probability, given a specific difference between the value of the reference bond and the value of the Treasury bond. Starting backwards, we can determine the default probabilities and default densities at each time interval. Then we're going to use that and calculate the present value or the cost of defaults. There is the expected value of the payoffs and the credit default option. We're also going to calculate the value of a one-dollar premium per year that the protection buyer is going to send to the protection seller. Then, the credit swap premium is the spread that equates the expected payoff with the swap to the present value of a dollar per year.

Table 1 shows some data. I apologize that it is a couple of years old, but it still works. The left column is the maturity of the bond. This is Ashland Incorporated, which is an energy company, probably not trading at these spreads right now. The second column, the actual bond yield spread to Treasury is in basis points. The third column is the credit default swap premium calculated by the Hull & White model. There's a very close relationship between the actual bond yield spread and the credit default swap. That's intuitively pretty reasonable. The expected cost of default and annual costs of defaults in this bond might have been 30 basis points, and the credit default swap is much higher than that premium.

The credit default swap premium is close to the actual bond yield spread in this example. Let's say the credit default swap premium was much higher than the actual yield spread. What an investor could do would be to short the corporate bond, sell the credit default swap, and buy the Treasury bond. If you work that out you see that there's basically a risk-free profit that would be gained by that. On the other hand, if the credit default swap premium is much lower than the bond-yield spread, then the investor would buy the bond, buy the credit default swap, and short the Treasury again locking in a risk-free profit.

TABLE 1
Example of CDs Pricing
Ashland, Inc.
July 13, 2000

Maturity	Actual Bond Yield Spread to Treasuries in bp	CDS Spread (Premium) From Hull and White Model
1	199	189
5	213	209
10	240	227
20	269	253

There could be situations in which the credit default swap spread in the model would differ somewhat from the bond-yield spread. There are three specific instances. One instance is if you have a very steep Treasury curve. Actually, these would tend to trade off of LIBOR in the swap curve. A second instance is if the bond is trading at a significant premium or discount. A third example would be if recovery rates are very high, like over 50%; then you would get a bigger difference than we saw before between the credit default swap premium and the bond yield spread.

We need to extend credit default swaps to multiple reference entities. In many actual credit default swap applications, this would be the case. The value of the swap actually might depend on the distribution of default on a pool of end-reference assets. We can do that with the model we just looked at. I'm not going to take you through all the math. The key to this extension is constructing a correlation of credit indexes between each pair of reference bonds. What is a credit index? The credit index is simply a variable that describes, at any point in time, the credit worthiness of the reference bond. If that index goes below a certain level, the bond is assumed to have defaulted.

We also need to worry about counterparty risk. What's the counterparty risk? If the investment bank that you're dealing with defaults and the reference asset that you want protection from defaults, you don't get paid. If the counterparty defaults, and there's no default on the part of the

reference asset, then the thing will cost you less because you won't pay the premiums past the point where the counterparty has defaulted. You can see the credit index correlation between the counterparty and the reference asset is zero. I'm going back to one reference asset now, not multiple reference assets. The credit index correlation is zero. There's not much difference between a AAA and a BBB counterparty risk. However, if the credit index correlation is 80%, then there's a marked difference when the counterparty rating slips from AAA to BBB.

If you have a lower-rated counterparty, then you're going to want to pay less of a premium in case the person defaults. If you have a lower-rated counterparty, there's a bigger probability that that counterparty will default, right?

Credit default swaps have proven to be, in some circumstances, leading indicators of problems with companies. There are two companies: Tyko International, where people were stealing from the company cookie jar, and Sprint Corporation. In both instances, the credit default swap premium increased much sooner and much faster than the actual bond yield spread for the cash bonds. There are other examples too.

I want to talk about collateralized debt obligations because this is a very applicable area for insurance companies. These are securities that are issued by a special purpose vehicle, and they're backed by collateral such as bank loans and high-yield debt. So a CDO is really going to appear as a bond on the books, and it's going to have a rating just like the other bonds in an insurance company portfolio. Insurance companies participate as investors and issuers. They're similar to asset-backed securities, but the servicer or the portfolio manager play a much more critical role in the collateralized debt obligations. There are a variety of different structures. First, there are two main differentiators. My terminology might be a few months old because the terms are always changing. So Larry is going to use different terminology. This is a fast moving area and things change all the time. There's two main types of CDO structures. There are funded CDOs and unfunded CDOs. A funded CDO would mean there's a pool of assets and there's cash in the deal that's basically equal to pretty much the value of the assets. For unfunded CDOs, there might be a reference pool of $1 billion of assets, but there's only $100 million or so of cash in the deal that people have funded. We'll show you how that works. Within funded

CDOs, there are balance sheet CDOs and arbitrage CDOs. In our arbitrage CDOs, there are cash-flow deals and market-value deals. Let's look at what these terms mean.

A balance sheet CDO is primarily issued by banks, and high grade bank loans are the collateral. The bank issues it because it wants to get its regulatory balance sheet and capital relief, and it wants to improve its capital ratios. The investor buys this type of deal to get exposure to asset classes that it can't otherwise get exposure to. With an arbitrage CDO, the collateral is usually high-yield corporate bonds or loans, and the issuer, which could be an insurance company or a bank, wants to just get assets under management. The investor can buy this to get into asset classes that it might not otherwise be able to get into. There are some perceived arbitrage opportunities. Issuers are insurance companies, banks, mutual funds, and private equity funds.

I talked about perceived arbitrage opportunities in the arbitrage CDO. What are they? There are high-yield versus investment grade spreads. There's liquidity premium and high-yield investments that might not really mean additional risk. It just means that if you wanted to sell soon, you might not be able to do that. We talked before about risk-neutral default rates. There are the implied default rates (risk neutral such as those that are in CDS pricing) versus the actual historical or expected default rates in the real world. There's also the advantage of diversification. There's the LIBOR curve versus the Treasury curve that sometimes might yield certain opportunities.

There are two kinds of arbitrage CDO: cash flow versus market value. In the cash-flow structure, the object is to select credit that will pay coupons and will redeem the principal fully at maturity. The object is to minimize defaults. I can't really understand when that wouldn't be the object. The deals want sound credit quality, but they're willing to make some compromises on liquidity. Liquidity is not a high priority. These are usually buy-and-hold strategies, and the collateral is usually rated high-yield debt.

The manager is very active in the market value CDO. He has to make decisions, and he's not going to have a buy/hold strategy; however, the objective is to select credits that will hopefully appreciate in value. The portfolio might include not only high-yield bonds, but also bonds that are already distressed. A common deal might have 70–75% high-yield rated debt, but it might have 25–30% in special classes like distress debt, foreign loans or certain equity in other special classes.

Within the cash-flow CDO structure, the portfolio manager is going to manage a high-yield portfolio of say half a billion dollars, and the trustee is then going to take the proceeds that come in and distribute principal proceeds and interest proceeds. There are four classes in this deal. The first three classes, A through C, are debt tranches. They're now arranged so that the total adds up to $500 million.

The way this works is there's a waterfall approach to like interest payments. Class A would get the interest it needs for that period. It's scheduled interest. Then interest would go to class B and class C, and then the equity. However, with principal it would work much differently. Typically, class A gets fully paid off before class B gets any and so on. Class A is rated so high because it is supported by class B and C and the equity. Those others would have to get blown out before anything happened to class A. Similarly, classes C and the equity support class B. Only the equity supports class C.

There are a variety of tests that the rating agencies and the investors will insist on that must be satisfied. First there's overcollateralization tests, primarily on the principal for each asset class. There are also interest coverage tests and diversity ratings tests. That means that the pool of assets have to be diverse enough so that there aren't contagion problems in a particular sector. If these tests are not met, then the manager must take immediate corrective action or start redeeming assets until the tests are met. The rating agencies, Moody's, Standard & Poor's, and Fitch all rate CDOs. What determines the rating is the collateral itself, the experience and expertise of both the manager and the issuer, and the deal structure. The CDO rating, ideally for

a particular class, would be equivalent to a bond, a regular bond callable or noncallable bonds with that same rating. They should have the same risk profile. That's what the rating structure and the rating models are attempting to do.

Moody's has a very rigorous rating process. It uses the binomial modeling method, and it deals with correlation and nonhomogeneous assets by boiling them all down to homogeneous assets using what is called diversity scores. You can go on their website. I think their document is 150-200 pages. It has a tremendous amount of detail. Then they define default probabilities and recovery based on Moody's annual study. These aren't risk-neutral probabilities. They're actual experience and projected experience. They project the cash flows of the deal using their binomial method, which involves a random number generator, just like we would use in stochastic modeling. They develop a loss distribution profile. Then the ratings are set based on the expected internal rate of return (IRR) change due to the cost of default.

In synthetic CDOs the actual amount of funding is very small in relation to the reference portfolio. These are what I call unfounded CDOs. They're partially funded. You might have a deal in which the reference portfolio is $1 billion but the actual cash in the deal is only $100 million. It makes maximum use of credit default swaps. There's a leveraged tranche that may write $900 million of CDS protection in return for something like six to ten basis points on that $900 million.

Larry is going to go into more detail about how these deals work and what the advantages are. I'm just going to leave it at that for the time being. There are issues for insurers with respect to credit derivatives. There are GAAP accounting issues that you're going to have to worry about. There is *FAS 133* and, of course, getting hedge accounting treatment. It's very difficult to get a macro hedge. You're going to have to basically assign the hedge to specific homogeneous assets. Or, if you're trying to do something with liabilities, it has to be a very homogeneous pool of liabilities. What governs these types of securities is International Accounting Standards 39. There's an issue about whether credit default swaps are derivatives. Credit default swaps are, in

some ways, similar to financial guarantees; however, there are some differences. Are those differences big enough to make credit default swaps derivatives in an international accounting context?

Statutory accounting has not come that far along with respect to these transactions. I had a recent discussion with somebody from the ACLI who said that the NAIC is working on developing some C-1 or RBC treatment for credit derivatives to make these efficient uses of capital. There will also be state insurance investment law issues. Larry is going to talk about that.

Recent experience with credit derivatives. The Enron credit default swaps paid off without any problems. WorldCom was expected to pay off with no problems. I have not heard of any problems with that.

There was a controversy with Rail Track. Rail Track is a rail services provider in the UK, and it went into receivership. Nomura delivered convertible bonds, and Credit Swiss First Boston said it didn't want convertible bonds; it wanted regular bonds. I think that was still going on a couple of months ago. The International Swaps and Derivatives Association (ISDA) clarified that prospectively in November of 2001, but this had happened before that time. The last I heard, it was still somewhat in dispute. It's very important to know what's deliverable and what's not so you can get the definitions.

CDO downgrades. As you can imagine, some of the equity tranches have been blown out, and some mezzanine tranches that were rated A or high BBB are no longer rated that way.

To summarize, there's going to be continued focus on credit. CDOs, both funded and synthetic, offer yield enhancement opportunities. We really need to understand the risks better in some of these investment areas. Many companies just bought these saying that this is A rated and satisfied their investment guideline without really understanding what could happen if something like 2001 and 2002 hypothetically occurred again. We, as appointed actuaries, need to upgrade our modeling capability. We can't just do cash-flow testing based on interest rate risk or get

some frozen vector of assets from the investment department that says these are just modeled as fixed cash-flow bonds. We need to start building models that will take into account the different contingencies for these deal structures. I'm going to turn this over to Larry Rubin.

MR. LARRY H. RUBIN: I made the move to a Wall Street firm two years ago, and I found one of the most amazing things about it is probably the way nonactuaries look at the work actuaries do. We may think it's not all that complicated, since we do it every day, but when you look from the outside, you see that it looks like rocket science. I think the same thing happens in some of these structures that Wall Street puts together. When you dig down and go through it, it really is fairly simple. I think it is something that's much simpler than the typical actuary has to wrestle with.

I'm going to take a quick poll of the audience. You all know that 2001 was one of the worst years for corporate default in history, but how many believe that the corporate default rate for BBB bonds in 2002 was less than 0.5%? How many think it was between 0.5% and 1%? How many think it's over 1%? How many think it's over 2%? During the worst year of defaults in corporate bonds in the last 20 years, the actual default rate was 30 basis points. You also have to look at the recovery rate. Enron recovered at 17 cents on the dollar. Based on that, how many think the actual recovery rate was less than 50 cents on the dollar? How many think it was more? The actual recovery rate was 54 cents on the dollar. So the BBB average losses, in one of their worst years, was under 20 basis points.

Imagine being in a business where you get paid $1.40 in premium, your claim cost is 20 basis points, you have no commissions, you have minimal expenses, and no one is going to accuse you of price gouging customers. How many of you would like to be in that business? Welcome to the world of default swaps.

The credit default swap market began in approximately 1996 to 1997. Under the Basil Accords for bank capital, banks are required to hold 8% tier one capital against corporate credits. In an effort to hedge your lending portfolios and achieve regulatory capital relief, banks began buying

protection from counterparties in the event of default on certain assets in their portfolio. Under the Basil Accord, if I have counterparty risk to another bank, I hold significantly lower tier one capital than I would if I have credit risk to a corporate entity. That is true even if that counterparty is rated lower than the corporate entity. The banks would pay the counterparty a premium, and in exchange for the premium, the counterparty would purchase the asset from the bank at par in the event of a credit event. A credit event would be defined as a default or a restructure.

In 1998, credit defaults were first covered under their standard ISDA agreements. Under the 1998 ISDA agreement, in the event of a credit event, the buyer protection could deliver the cheapest asset available to the seller in exchange for its payment. Restructuring was not covered as a credit event in all contracts under 1998 ISDA. In September of 2000, a major bank restructured loans to CONSECO. Given the nature of the restructure, there was some ambiguity as to whether or not they even qualified as a credit event. Consistent with its obligations under the credit default agreement, the bank delivered the cheapest asset—in this case, a long-dated corporate bond—to the counterparty. As a result of the Conseco restructure and the ambiguity it caused in the market, Moody developed a restructuring language that applied to any structured transactions that were rated by Moody's and utilized credit default swaps. Under Moody's definition, a restructure must meet the requirements of a credit default, as defined under Moody's default studies. Additionally, in the event of a restructure, the buyer of protection had to either deliver a bond whose maturity was no greater than 30 months from the date of the default swap or deliver the restructured asset. So, if you had a five-year default swap, you couldn't deliver a bond whose maturity was greater than 7.5 years or had to deliver the restructured asset.

In May 2001, ISDA modified standard language to be consistent with Moody's. The 2001 change in ISDA, as well as the clean payoff that occurred with Enron, is what has resulted in the rapid growth of the credit default swap market in 2002.

Credit default pricing was originally a very complicated theoretical exercise in determining what the credit bond default premium would pay. I think it's one of those areas where, in practice, it is much simpler than theory. The premium that you would receive is simply the bond yield minus LIBOR. If the bond was a fixed bond, then you would swap the bonds floating and then pay whatever rate the bond would swap to minus LIBOR. The main reason is if the default swap premium was less than the credit spread, you would simply buy the bond, buy protection, and receive the difference risk free. If the default premium was greater than the credit spread, you would simply short the bond, sell protection, and receive the difference risk-free. So arbitrage-free pricing requires these things to be close, and typically they're within 10 basis points. The only time to find that they differed is when a company is in the process of going through a credit event where the credit default swap would typically be the leading indicator of where the bond will go. That happens in a matter of days.

Post issue, determining what happens to a credit default swap market value is analogous to determining what happens to a cash bond when interest rates change. We all know that if interest rates rise, the value falls, and the reason the value falls is because the coupon received is no longer sufficient to compensate a new investor for the yield they demand for purchasing the asset. As such, they have to also receive back an amortized premium. For default swaps, we get the analogous thing. If credit spreads widen, the value falls. The reason is the change in value would compensate for a risk premium payment and is insufficient to cover the current credit spread.

I'll give an actual example of what actually happens. We can take a look at what happened to the Walt Disney Company earlier in 2002. Here we have a $10 million notional credit default swap with a five-year term. On August 2, Disney released earnings, which were below the consensus forecast. At that point, a provider of protection would receive 210 basis points for writing that credit default swap for five years of protection. On August 3, the default swap tightened by 20 basis points. If I close this position, I'm going to receive $20,000 a year. So the present value of that $20,000 a year means I just had an increase in market value of $100,000. Under *FAS 133*, that increase in my market value went right to earnings. This tells you how volatile these instruments can be.

Knowing a bit about credit default swap is a start for the valuation actuary. What we really need to know is, what is my investment department doing with these things? How can these instruments reflect cash flow? How can they affect my liquidity? How can they affect my income, and what structured transactions depend on these instruments? One of the intuitive uses for credit default swaps is for a company to buy protection against the name in its portfolio that it no longer wishes to be exposed to. Insurance companies very rarely buy protection in this market. If they don't like the name, they just tend to sell the bond. Insurance companies, being insurance providers and being in the business of taking corporate credit risks in order to satisfy their obligations to policyholders, tend to be sellers of protection.

Let's look at return on capital analysis. In Table 2, we're comparing what would happen to a company that went into the spread lending business using credit default swaps versus going into the spread lending business using the typical way it's done which is the GIC market. In this case, we're going to ignore the accounting differences between the two and assume they're all going to use the same accounting mechanism. We're trying to get a real feel for the economic returns as opposed to the accounting returns. In a GIC market, we have charges for C-1, and, in this case, we have 0.3% for NAIC-1 bonds, C-1 at 1% for NAIC-2 bonds, and C-3 at 0.77.

TABLE 2
Return on Capital Analysis

	GICs	Credit Default Swaps
C-1 Capital Charge (NAIC-1)	0.3%	0.3%
C-1 Capital Charge (NAIC-2)	1.0%	1.0%
C-3 Capital Charge	0.77%	—
Total Capital	$1.42 MM	$0.65 MM
x2.5 RBC Multiplier	$3.55 MM	$1.625 MM
Net Annual Income (no defaults)	$0.6 MM	$1.0 MM
RETURN ON CAPITAL (no defaults)	16.9%	62%
Annual Loss assuming one default over 5 years (50% recovery, 100 names)	$ 0.1 MM	$0.1 MM
Net Amount Income (one default)	$ 0.5 MM	$0.9 MM
RETURN ON CAPITAL (one default)	14.1%	55%

FROM THE FLOOR: It says C-1, C-1, C-3 in the left column.

MR. RUBIN: This is a portfolio that is 55%. NAIC-1, 55% single A, 45% BBB NAIC-2. The typical company would try to maintain a 250 times risk-based capital ratio. In this case, we assume our credit default swaps or bonds were yielding LIBOR plus 100. The GICs would credit LIBOR plus 40, giving you a net spread of 60 basis points and a return on capital before tax, if there were no defaults of 16.9%.

There are two big differences in the credit default swap market versus the GIC market. One, no matter how creditworthy you are as a counterparty, your funding is LIBOR flat. The only thing that matters is that you are an acceptable counterparty. The first advantage is you don't pay the 40-basis-point premium that you pay to issue GICs. The second advantage you have is, since there's no funding, there is no C-3 risk, and therefore, no C-3 capital charge. Assuming risk-based capital for credit default swaps, follow the same logic as would follow in the GIC strategy, what would the return on capital be? In this case, you have the same portfolio, the same risk on the credit default side, no risk on C-3, and your return on capital goes from 16.9% to 62%. The key point to make clear is this is not an arbitrage of a regulatory formula. You're getting your higher returns because you have lower costs and because you have lower risk.

The one thing that most actuaries would find today is the scenario of no defaults. Let's take a look at a one default over five years, which is probably a little better than Moody's corporate average. You can see that the GIC return falls to 14.1%, and the credit defaults still stay over 55%. It is these economics that are driving a lot of insurance companies into looking at this market, particularly a lot of those that are in the GIC market today. A credit default swap has a number of advantages, such as LIBOR-based funding, and no C-3 risk. It's also easier to diversify a credit default swap than a cash funded market. If I wanted a $200 million position, I can very easily go out and buy $2 million credit default swaps and get $200 in my portfolio. It is a lot harder to buy 100 $2 million corporate bonds. There are a number of reasons why companies don't generally go out and sell credit protection broadly. One is the concern about volatility. Even though these are economically the same transactions, the accounting treatment is

different. One day, if we ever have a consistent accounting treatment, I think a lot of decisions that companies make would change, but the volatility of these instruments, as you saw in this example, can be extreme.

The second is the concern over fallen angels. There are a lot of companies that believe there are other upcoming Enron or WorldCom accounting scandals out there; they just don't know who they are. If they put a whole portfolio together, they're going to get stuck with one or two of them. A third reason is that a number of states do not allow insurance companies to enter into derivative transactions for income generation purposes. They can only do derivative transactions for bonafide hedging purposes, typically as defined by the company in a derivatives use plan. There are some companies that are looking to use credit default swaps to hedge some of their rates embedded in some of their longer term guaranteed products to create some of the income they need, typically for their level term, disability income or long-term care, where they might have an implied rate of 7%. Generally, it's very difficult to go into that market under today's regulatory environment. The fourth is there are a lot of benefits of structuring transactions which can get rid of a lot of these concerns.

Let's go over some of the most common structures. One strategy is called leveraged corporate credit. The second one, which is probably the most popular, is insured corporate credit. The third strategy is a combination of the two called the insured leveraged corporate credit. We'll go through what these are and why companies use them.

Let's take a look at our typical structure transaction involving credit default swaps (Chart 1). We have 100 credit default swaps of $10 million, each paying 100 basis points. The total income received is $10 million. We're going to break this up into what I call the leveraged layer (another name is referred to as the super senior), the risk layer (which may be called the mezzanine layer), and the insurance layer (which would typically be called the equity tranche). The total amount in these layers—A plus B plus C—has to equal $1 billion because that's the total amount of protection that the structure is writing, and the total income received. X plus X plus Z has to equal $10 million. The insurance layer pays the first A losses in this portfolio, and that would

typically be in the neighborhood of the first 3.5% so it's assuming losses at a 50% recovery rate. It would pay the first seven credit defaults that occur in the structure, which is more than four times Moody's average default rate and is probably the highest it has ever been. The risk layer or the mezzanine layer pays any losses over A up to A plus B. That layer would typically be in the neighborhood of $65-70 million, so between A plus B, the structure is protected to 20 defaults. The leveraged layer would pay any losses above A plus B. Since losses above A plus B are very remote, rating agencies would typically rate the leveraged layer or the super senior as a AAAA less risky than a AAA. As a result of these high ratings, B tends to be very small, while C tends to be very large, leaving a lot of that excess to be divided between the writers of B and A.

So under our leveraged corporate credit strategy, the company would take the risk layer and the insurance layer and sell off the leveraged layer. That leveraged layer would go anywhere from 8 to 13 basis points. Since we had $10 million, we'll sell that leveraged layer anywhere from $800,000 to $1.3 million. That leaves the $8.7 million and $100 million of notional credit exposure.

Under the insured corporate credit strategy, the insurance company does the opposite. It sells off the insurance layer and keeps the risk layer and leveraged layer. It believes that C is risk free and that there's no reason to sell it off, to even give up that $800,000 to $1.3 million. The most common strategy, mainly because of insurance regulation, is to actually sell off A plus C and keep B. That's done simply because B could be cheaply funded and to be created as a replication transaction, away from the restrictions against using derivatives for income generation purposes.

There are a number of issues that we need to be concerned about in these types of transactions. Before I go on, this compares the GIC strategy itself to the insured corporate credit strategy, which is probably the more common of the three strategies. As you would expect, since you're paying for insurance, if there are no defaults, you actually lose money on the strategy, but as defaults widen, the insured corporate credit strategy gives you a much better economic return than the straight GIC strategy, again with no C-3 risk.

One of the biggest problems companies have to deal with is the problem of market value versus fair value. GAAP requires that derivative instruments, which these are, be marked to fair value. If you went to a bank on one of these structured transactions, and asked them for a mark, they would give you a mark based on the fact that these things are illiquid and tell you what it would take to sell them. This can be looked at as the fire sale on one of these instruments, which is almost analogous to attempting to sell a real estate portfolio in one day. Is that fair value? GAAP requires fair value, not market value, so what is the value we'd put on this? If we treat it like real estate, and discount the cash flow, this would tend to leave you to believe that these insured layers, with this layer of protection, should have a significant layer of stability derivatives for income generation purposes, although, with replication, many companies are able to still get the advantages of this market. These structures are very highly illiquid. With that, I'll open up to any questions.

FROM THE FLOOR: You're saying that companies very rarely do total return swaps. I have run across and argued that funds withheld modco reinsurance constitutes a total return swap because of your pool of assets. You're passing that off to somebody else in return for them paying the liabilities. Just be aware that people might have more total return swaps than they think.

MR. RUBIN: There is one interesting area in total return swaps that a lot of mutual funds have done. What some insurance companies are starting to look at is swapping the growth of their variable account value for some LIBOR-based growth to give them a very stable income stream. I know a couple of insurance companies have looked at doing that for their variable annuities, but I don't know whether anybody has actually executed one yet.

MR. KERRY A. KRANTZ: If companies were to use these credit derivatives, right now what typically happens in an asset adequacy opinion in a company that isn't doing cash-flow testing is they'll do something like gross premium valuation, so they're not even testing the interest risk. So, if they want to move on to the more advanced type of asset adequacy testing, cash-flow testing, and credit testing, they would then look at the assets that are backing the reserves and

include perhaps these types of assets. The companies that do cash-flow testing that I've looked at to date try to avoid including these in the mix of assets. Therefore, they use some published default rates to keep their projections simple. Is there something that the actuary should be studying? There are the ones who are doing actuarial opinions and memoranda so is there something available when they are peer reviewed? Then they can say, "This is what I did." The reviewing actuary, like me, can read what you did and decide whether it looks like it's a reasonable method.

MR. RUBIN: The one key thing the actuary needs to be concerned about in the credit default swap market is the fact that they are leading indicators. They tend to react faster than the rating agencies. Just looking at the ratings of the company to determine its expected default will probably not give an appropriate answer. You probably need to not only look at the ratings, but also determine whether the spread is within the spread of similarly rated instruments in order to determine what your expected default rate would be under that instrument.

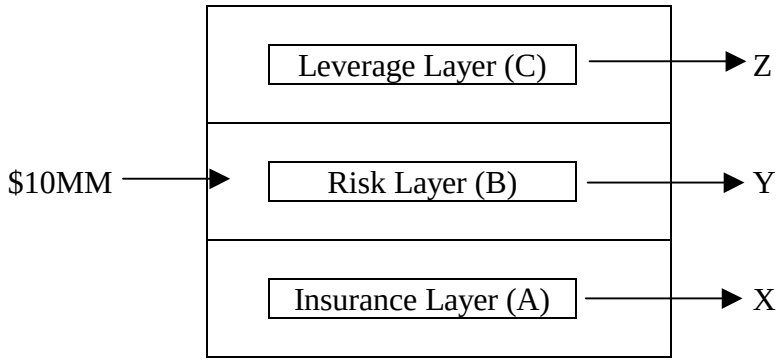
MR. HAMBRO: Larry, if I were to buy a credit default swap from a counterparty and then sell the same credit default swap to the same counterparty, what would be the difference in price? What's the bid/ask difference in these?

MR. RUBIN: It's about 10 to 15 basis points, which is not quite as efficient as the interest rate swap market.

FROM THE FLOOR: So you're saying the bid/ask spreads are in the order of 10 to maybe 20 basis points, but you also said that it can be quite illiquid.

MR. RUBIN: Credit default swaps are liquid and structured transactions are illiquid.

CHART 1
Credit Default Swap Structure
100 Credit Default Swaps of $10MM Pay
100 Basis Points Each



A+B+C = 1.0 BN
X+Y+Z = 10.0 MM