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## Session 82PD Credit Derivatives

**Track:** Investment

**Moderator:** JASON SAMUEL STEIGMAN

**Panelists:** JASON SAMUEL STEIGMAN  
MICHAEL R. VASSEGGHI<sup>†</sup>

*Summary: The global market for credit derivatives is growing exponentially and now exceeds \$4 trillion. As the market expands, an ever-growing range of instruments has become available, ranging from "plain vanilla" credit default swap (CDS) to complex basket trades such as synthetic collateral debt obligations (CDOs).*

**MR. JASON SAMUEL STEIGMAN:** Today we're going to give a 30,000-ft. overview of credit derivatives. We're going to drill down on a few topics that I think, and Mike thinks, would be of interest specifically to actuaries.

The views and opinions expressed by Mike and me are ours and not necessarily those of our employers, Merrill Lynch and Mason Street Advisors/Northwestern Mutual, respectively, or those of the Society of Actuaries.

I'd like to introduce the panel. Michael Vasseghi is a managing director at Merrill Lynch. He's been there for 13 years and heads up Merrill's insurance strategy group. He works extensively with credit derivatives. I work at Mason Street Advisors, a wholly owned subsidiary of Northwestern Mutual. I've been there for 18 years. I started out as an actuary and moved over to investments in 1993. In 1995, I became a portfolio manager in the public fixed income area and took responsibility for the over-the-counter (OTC) derivatives that we manage in that area.

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<sup>†</sup>Michael R. Vasseghi., not a member of the sponsoring organizations, is a managing director with Merrill Lynch in New York, N.Y.

**Note:** The chart(s) referred to in the text can be downloaded at:  
[http://handouts.soa.org/conted/cearchive/NewOrleans-May05/082\\_combined.pdf](http://handouts.soa.org/conted/cearchive/NewOrleans-May05/082_combined.pdf).

To begin, we're going to give a little color on the credit derivatives market. The size of the market has grown incredibly in the last few years. The fastest-growing segment of the credit derivatives arena is the credit default swap (CDS) market. So we're going to be focusing on CDS, which are the building blocks of credit derivatives. We're going to go through the basics of CDS. Then we'll discuss the fundamentals of pricing CDS and also how to unwind those transactions. We'll also touch on some considerations specific to insurance companies and elaborate a little more on the risks. So, with that, I'm going to have Michael start our discussion of the markets.

**MR. MICHAEL R. VASSEGGHI:** The first topic is market size growth and importance. The credit derivatives market has obviously been exploding over the last several years. This exponential growth is coming from all of the new leveraged structured products in the marketplace — the CDOs, the tranche synthetics, the index market, the CDO squares, and now even CDO cubed trades are being done both in Europe and the United States. That's obviously causing quite a bit of growth in the marketplace.

I'd like to point out one interesting fact on Slide 5. If you go through time, looking at the upper right-hand box here (credit derivative reference entity by rating from 1999 projecting out to 2006), you can see that the risks that are being taken by the market are substantially similar. There are obviously a lot of single A-type of risk, some AAA and a very small percentage of below-investment-grade or lower ratings, but that's been fairly consistent over time. What we don't see from this information is where the leverage is coming from. Do we see more BBB migration and more single A, which is keeping things constant on a levered basis? If you look at the bottom graph down here, you can also see the maturities are fairly consistent. In the upper left-hand corner you can also see that from 2001, 2003 and 2006, the sector breakout is pretty much the same. So, the market's not necessarily changing too dynamically in terms of its distribution, but it is growing quite significantly.

Slide 6 shows you who the players are. An interesting fact shown in this table in the upper right-hand corner relates to the banks' participation in the market. I think most people would say that banks are obviously the biggest buyers of default protection, trying to hedge out their loan portfolios. You can see on the bottom of the table that insurance companies represent a small percentage of buyers of default protection. More interestingly, I think, is the fact that banks are also the largest sellers of default protection. They sell protection for various reasons, from putting on trades to unwinding existing positions. The other thing that I think banks have done, pretty interestingly, is they've bought protection during years when there was full restructuring, and then a few years later, they've sold protection under modified restructuring or no restructuring, and they've even done that on the same name. So they've locked in some specific credit term arbitrage that we'll talk a little bit about later.

Insurance companies are the second-largest seller of default protection, at around 20 percent. Keep in mind that that insurance company category covers monolines and reinsurers, which are broken out in this next table here. Far and away the largest seller of default protection is the monolines, but they're doing it at an attachment point where your life and property and casualty (P&C) companies are not necessarily involved. The monolines are attaching at that super senior attachment point that we'll talk about.— It's really, really high up the capital structure in terms of tranching credit exposures. You'll also see the reinsurers, the pension funds, and then other insurance companies are about equivalent with mutual funds and pension funds.

Slide 7 talks about the new players in the market. You obviously have corporates coming into the market. They're trying to buy protection on accounts receivable, hedging out other positions. The bank loan books have been in play, and they're really becoming bigger and bigger. Convertible-arb hedge funds --convertible-arb business hasn't really been around much during the last year as volatility has been hammered, and credits have been tightening up. So, these types of hedge funds have been coming into the marketplace, dabbling even more in credit and getting involved in levered credit. That certainly has had a big impact, as well as the macro hedge funds. This just gives you an idea of who some of the basic players are.

Slide 8 is trying to show that every time somebody does an index trade, we're going to hedge either with single names or we're going to hedge with some portion of the index, which is going to create more volatility and have an impact on correlation. If you do a correlation trade, you're going to hedge with an index and vice versa. So everything is now completely interrelated, which is why we're seeing some of the volatility. You've had a few big market participants try to move out of some positions, and we'll get into what type of volatility that has caused for the marketplace.

Here are some key themes through the market. As we talked about earlier, there is a tremendous amount of leverage being used in the credit derivative marketplace right now. I think that's a good thing and a bad thing. There's good use of leverage and there's bad use of leverage. We'll see life and P&C insurance companies doing index trades, and we'll see them doing tranche trades, but they'll focus more in the single-A and above types of attachment points, like 7-to-10 and 10-to-15. You can attach and dial-in specifically what portion of risk you're interested in. So if you want a single-A or an AA-type of credit, you can specifically say what you're looking for. That's one form of leverage.

The next theme coming through is liquidity. With the advent of an agreed-upon index system, which is the CDX Index (it's quoted by 15-20 dealers, generally trades inside of one-quarter basis point, one-half basis point bid offer market), the volatility has certainly caused the bid/ask to widen out to about one-half basis point, or even one basis point at some times, but it is the single-most liquid credit

product in the world right now. You can trade notional values of \$50 million, \$100 million or more inside of a basis point bid/ask fairly easily.

The next thing is innovation. This goes toward what I was talking about regarding other types of leverage we're seeing. People are doing options on CDS, tranches, callables and step-up cancelable, where you'll sell the protection on a single name, and you have the right to get called out of it after two years. Constant maturity credit default swaps (CMCDS) were designed to try to mitigate a lot of the volatility, so it's basically like a credit spread floater. It always resets to the five-year. Other types of structured credit include zero coupon and zero recovery defaults, fixed recovery defaults on credits and lots of different structures to help enhance yield. These are some of the kinds of innovations we're seeing in the marketplace right now, and insurance companies have been involved in all of these types of transactions to date.

**MR. STEIGMAN:** Mike, I was hoping you could cover what specifically insurance companies are doing. Now, we have on Slide 13 real money investors and hedge fund investors. I think you can view most life insurance companies as real money managers. If you have a guaranteed investment contract (GIC) business, and you're looking at CDS on the other side of that, you may argue that you're a levered player. Could you tell us what investors are doing today?

**MR. VASSEGGI:** Sure. I'll talk about some of the types of transactions we'll see insurance companies and money managers do, and I'll try to give you that flavor as it relates specifically to you guys. They've done single-name CDS, and that's tapered off quite a bit simply because the absolute level of spreads is so low, and many insurance companies have volatility charges or other hurdles that they need to get over. The absolute level of spreads doesn't necessarily get them over that hurdle. So what they've become more involved with is structured credit, and a good example of that is an insurance company that sold five-year default protection on Apache last week, and I think they got paid, give or take, 27 basis points for a single name credit, so that's one alternative. Another alternative we've seen is instead of getting long a single credit, selling protection on the 10-to-15 tranche of the CDX index. So you'll have 10 percent cumulative net loss protection below you and you're paid around 24 basis points. So, what are you better off doing? Are you better off with a single name at 27 basis points or are you better off taking an index or a portion of an index with 10 percent subordination for a substantially similar spread?

These are some of the types of trades real money investors are getting into. The other spin on that is the hedge fund investors. We'll see them, in a lot of cases, on the other side of insurance company trades. We've seen it with convertible asset swaps, which involve credit derivatives because they're hedging via CDS. We've seen them with the index trades where they will want a particular slice. So that will force the Street to go out and buy or sell protection on other portions of the credit

index. There are a lot of different types of transactions, including different types of curve transactions. As we've seen the credit curve start to flatten out, you can buy protection on the 10-year, sell protection on the five-year or, i.e., get long five-year CDX, five years forward, if you think that the forward credit spread in five years doesn't look attractive. These are the types of things that will have impacts on the CDX index market, which will then bleed into the single name default swaps since it's hedging out by single names.

**MR. STEIGMAN:** Thanks, Mike. Now, I'm going switch gears and go over the mechanics of CDS.

But before I do that, one thing that didn't make it onto the slides but that's a very important consideration is that a credit default swap is an over-the-counter (OTC) contract. It's a legally enforceable contract between two parties. If you want to participate in this market, there's a lot of expertise that's required in various areas of your companies, not least of which is the legal area. So, that's an important difference between this market and the futures market or the exchange-traded markets. In the exchange-traded markets there is transparency in terms of volume traded, short interest and things like that. You can tell which way the market is positioned in general. In the OTC market, everything is anecdotal. I try to pull valuable information out of Mike every day. Mike tries to pull valuable information out of me every day. Basically, you're relying on word of mouth and whatever the dealer community is willing to publish to get your information.

I also want to briefly mention the International Swaps & Derivatives Association (ISDA). This is a global trade organization that endeavors to promote risk management as it relates to the agreements between parties in the OTC derivatives markets. ISDA publishes standardized documentation such as confirmations and master agreements under which counterparties transact. In a way, ISDA promotes self-regulation of the OTC derivatives markets. As I mentioned before, the one risk you always have in these OTC contracts is the risk that you might not have what you think you have when you enter into the contract, and to the credit of ISDA and everyone involved in the markets, there's been a great effort to try to standardize language and streamline information to minimize this risk.

Now I'll get into the mechanics. In a CDS contract, you have two parties: a seller of protection and a buyer of protection. It's kind of backward from bond trading. Here the seller is actually long credit risk, and the buyer is actually short credit risk, so rearrange your thinking on what's long and what's short. Essentially, it resembles term insurance with a term of five years, typically. The protection seller sells the buyer protection on the default of a specified credit. If that credit experiences a "credit event," which we'll describe in a couple of minutes, there is a "deliverable obligation" that the protection buyer must deliver to the protection seller with a par amount equal to the "notional amount" of the contract. In return, the seller of protection (analogous to an insurance writer) is getting fixed payments (analogous to premiums) every quarter.

The cash flows go like this: If there is no credit event, then the protection seller clips the premium on the contract and delivers nothing, just like in term insurance. If there is a credit event, then the buyer of protection delivers either a physical bond that meets certain criteria with a par value equal to the notional amount, or a cash settlement amount equal to the assumed recovery value of the deliverable obligation and the premiums would stop, just like in term insurance. Of course, most companies selling term life insurance don't accept physical delivery in a claim. That's where my analogy to term insurance ends.

Now I'll address key definitions (these are legal definitions spelled out in the CDS contract and are capitalized here). We've already alluded to a couple of these. The reference entity is basically the issuer of a debt securities or loans to which the contract applies. Next, we'll go through the list of credit events. Originally, there were maybe five credit events back when the CDS market was in its infancy. Now we have maybe two or three. These are events that would trigger a claim against which a deliverable obligation could be delivered (basically bonds or loans could be delivered). The reference obligation associated with the reference entity at the time of the transaction sets the point in the capital structure above which the deliverable obligation needs to be. So, in other words, if I'm writing protection on senior unsecured debt of GM, and then GM defaults, the specific bond that is designated as the reference obligation earmarks the place in the capital structure for the deliverable. That is, whatever is delivered to me must be at least parri passu with where that bond was at the time we entered into the contract. I'd then pay the protection buyer the notional amount in exchange for the equivalent par amount of the deliverable obligation (assuming physical settlement).

The credit events, bankruptcy and failure to pay are the two big ones. Restructuring is the third credit event. It was front and center a few years back in the Conseco situation, which Mike will cover when he discusses restructuring. "Repudiation/moratorium" and "obligation acceleration" are relevant in the emerging markets. For obligations, it's borrowed money. ISDA defined this in the 2003 definitions.

Now I just want to get into the risks. In a CDS transaction, if you're selling protection, you're leveraging credit. If you're buying protection, you're hedging credit. If I have a portfolio and I sell protection, layering risk on top of my existing portfolio, I've invested no more dollars in the process. Taking a simple example, say I'm writing protection on a particular name and overlaying it on a bond of a different issuer. I'm now taking two-name risk in that I have one invested asset, but twice the amount of default risk. That's credit leverage – riding two horses with one behind. You can multiply that transaction over many names and achieve even greater leverage with the equity and mezzanine tranches in some of the correlation products that are gaining popularity.

Next is counterparty risk. If you're buying protection, just like when you're buying insurance, you want that counterparty to be there to deliver the benefit in the event of a claim. That is, if there's a credit event, you want to be able to deliver the defaulted bond, and you want the counterparty to be there to take it off your hands at par, making you whole. Counterparty risk is a big deal. We can mitigate it with something called a credit support annex (CSA) which acts like a margin arrangement where collateral is posted.

Basis risk reflects the risk that your derivative strategy is going to result in performance that is much different from the security you're trying to replicate (or doesn't accurately offset the performance of the security you're hedging). To the extent it's materially different, you may have a lot of basis risk.

Cheapest-to-deliver risk is next. If you're selling protection, you may be delivered something other than what you're trying to replicate. The basic assumption in a CDS trade is that in the event of a default, there's an acceleration of principal (an early amortization event). In this case, a 30-year bond is worth the same as a three-year bond or a 30-day bond -- they all trade at the same cents on the dollar, regardless of their maturity. That's the main assumption. There have been examples where that hasn't been the case, and so you've been delivered something worth a lot less than, say, the five-year bond you're trying to replicate.

The other risks mentioned here include valuation risk and moral hazard. Valuation risk applies if there's a cash settlement instead of a physical settlement. How is that cash settlement being valued? What are the assumptions? Are they unreasonably in the dealer's favor? There is a polling process that's supposed to mitigate this risk and keep the dealers honest. There's also the possibility of moral hazard -- are the holders of the bonds less likely to be helpful to a distressed borrower if they know they'll be taken out at par by the protection sellers in the event of a default? The protection sellers are on the hook, but they don't have a seat at the table until a default has already taken place -- after it's too late. If there's an abundance of protection written on a bond issuer, the incentives of the bondholders (which are the opposite of those of the protection writers) might bear bad results for the borrower and the CDS writers. Mike talked about good leverage versus bad leverage. At the extreme end of the spectrum, there have been parties out there who have used credit derivatives for evil and not good -- the Darth Vaders of the credit derivative world. They can cause disruptions in the market and wreak havoc on your positions if you're on the opposite side of their trade. It's not too common, but there are examples. Switching gears here, Mike is now going to talk a little more about restructuring.

**MR. VASSEGGHI:** Jason and I have alluded to this before. If you take a look at this little continuum here in Slide 23, there's the old "R," (which stands for full restructuring). So, if a company wanted to or did restructure its debt, and I'll give the Consec example because that was one of the things that helped make the market evolve, there were a lot of people who sold protection on Consec. Consec didn't default. It restructured its debt. Now, before somebody misses a payment,

they can call up their bank and say let me restructure my debt, extend it out 10 years. You can have larger lines. Is that the type of credit risk that people were trying to protect themselves against? Many people said yes. Some people said no. But what it caused the market to do was to rewrite the terms where with Conseco, as Jason talked about, maybe all the bonds should have been trading at the same price. Well, obviously, since they didn't technically default, they weren't trading at the same price. People were getting delivered in 30-year securities under the older restructuring definition. So, they were trading at 10 cents on the dollar when the five-year bonds were trading at 45 cents on the dollar. It had caused a little bit of a stir in the marketplace, but it was a good thing because it tightened up the documentation at that point in time, and there have been a number of events that we'll get to in another slide that are continually tightening up the documentation. There are a lot of thoughts and events that people can't contemplate that aren't quite written into the documentation. The documentation is clear. It's just, well, now I have to figure out how it applies to my specific trade.

Right now in the United States all trades are quoted with "MOD-R," or modified restructuring, and what that means is you can't get delivered a security that has a maturity of 30 months longer than the legal final of your contract, i.e., let's call it five years, and that may not even be 30 months depending upon when the default occurs. If a default occurs within the first year, you can't get delivered out something past the five-year final, so you wouldn't even need to go out to seven-and-a-half years. Interestingly enough, in Europe, they have something called MOD-MOD-R, modified-modified restructuring, which is a 10-year limitation window in terms of what can be delivered, and, again, everybody has their own rules.

The index markets trade with no restructuring. That's also the way a lot of insurance companies require their trades to be done. You can ask your dealer to give you a level for MOD-R, and to give you a level for No-R. And there's generally somewhere between a two- and eight-basis-point differential depending upon the credit in terms of what you can get paid for taking that restructuring and non-restructuring risk, but it is something that is very actively quoted.

Slide 24 shows the "successor supplement" concept. This is more for your information. It's just a little decision tree in terms of what happens.

Next I'll discuss timing issues. Protection contracts start in T+1. That wasn't always the way. If you go back two or three years ago, it used to be T+3 to match bonds. There was a question as to what happens if the default occurs before the third day. Are you long or are you short protection? So, the market came together and said, "We'll make it T+1, and if it occurs on the day you actually sold the protection, you're fine. If it occurs the following day, you're not." Potential failure to pay is any missed payment or likely-to-be-missed payment. For the delivery of the credit notice, you need to give 14 days' notice. So, the market is continually evolving, continually tightening up the documentation. It's not perfect yet. I'd like to call it

still somewhat of a new market. It's been around for almost 10 years now, but it's really become active in the last five or six years.

We talked a little bit about credit differences and considerations. There are a number of trades that were written on Armstrong Holdings. Did they pick up Armstrong World Industries or not as they moved around in the capital structure? That was something that, again, has caused people to tighten up the documentation. National Power is another one. We talked about Conseco. Xerox had some Samurai bonds that were outstanding that were trading at a very, very different dollar price. There were some questions in terms of what denomination securities could be delivered in, and that again caused a restructuring supplement to be issued in 2001 to tighten up that language. Documentation is still evolving.

**MR. STEIGMAN:** Now we're going to focus on some of the themes that pertain specifically to insurance companies as CDS market participants. There are many considerations relating to the regulatory and accounting areas. Having expertise in these areas is mission critical if you're going to be active in the CDS market. There's always so much going on in the regulatory front. Any insurance company that uses CDS to synthetically replicate a cash security must file a Replicated Synthetic Asset Transaction (RSAT) with the Standard Valuation Office (SVO) of the NAIC.

Before we discuss RSATs in more detail, let me back up and just say that before 2000 you could only do two things as a life insurance company with respect to derivatives. You could either hedge or generate income by writing covered calls. Not many were familiar with this concept of replication. The regulators finally agreed on the definition of "replication" and unveiled the definition by requiring insurance companies engaging in replications to file, report and maintain them as RSATs. You need to have experts at your institutions who shepherd that process. The accounting area needs to be involved because this is going to show up in a special schedule on blue blanks. There are also risk-management issues, so the risk-management areas need to be involved. The legal issues need to be addressed by the law department and so on. So, there are a lot of people involved at most companies doing this stuff.

So what is an RSAT? An RSAT is basically a construct where you have a host bond and a derivative, and together they replicate something else; an approved asset that the company could otherwise invest in. Given that, there are all kinds of rules and criteria that I'm not going to go into here. There are rules that we follow to select that host bond, in terms of its maturity, its rating, etc. It effectively limits you to the amount of credit leverage you can take. So, depending on the style of your company, you may pick more or less conservative host bonds than other companies. What you need to do once the RSAT is in place is demonstrate effectiveness, and that isn't only an SVO requirement. That's a Statutory Accounting Practice (SAP) 86 requirement.

What I'm trying to emphasize here is that you need a lot of expertise in the accounting area and in your legal area and in risk management. You need buy-in from upper management. You need to educate upper management. And, last but not least, you need the proper systems in place, the right infrastructure and the right attitude in terms of flexibility because as these derivatives become more complex, and there are different pieces and leverage applied in different ways (like with the CDX product), you need a way to quantify that in a risk-management framework.

I'd be happy to answer any specific questions on the considerations for a life insurance company, because that's really an important aspect here. We're going to jump ahead and talk about some of those examples where protection has been put to the test. There have been a couple of items in the newspapers lately, three in the last couple of months. One was an issue with Kerr-McGee where the reference obligation went from being senior unsecured to secured because of a covenant breach. So, those who had written protection with that reference obligation thought that they had replicated that specific bond. In fact, what turned out to be the case was that as this covenant was triggered and that bond went from senior unsecured to senior secured, the CDS stayed at the senior unsecured level because that was the reference obligation's place in the capital structure at the time of the trade. So, if you thought you truly replicated the five-year Kerr-McGee bond, you were disappointed to see that the bonds that you otherwise would have purchased or that you sold against this trade went to secured, and you're still sitting at unsecured. That sent some concern through the market, even though when you look back at the legal documents, it's clearly the case. It was an example of where most market participants thought they had something different than what they ultimately had.

Just the other day in the *Wall Street Journal* there was coverage of this whole GM domino effect where the hedge funds basically had a cash market trade on, and it filtered its way through the various credit derivative products and markets and sent a lot of other hedge funds scrambling, and then finally cash investors. That was a big deal – the CDS market was front and center. Another example: Collins & Aikman (C & A), an auto parts manufacturer or distributor, filed for Chapter 11. They're a high-yield name. They were in the CDX Index, and because of their Chapter 11 filing, they became, believe it or not, the first credit to default in the CDX high-yield index in its two-year history. With each example, the market has taken away valuable lessons. In the C & A example, we've learned more about the cash settlement process and why it's important.

**MR. VASSEGHI:** We talked about Consec, Enron, Xerox and Armstrong already. Again, this is more for your information to see what some of the events were during the last four or five years that have caused the documentation to change, supplements to be put into place and things to certainly tighten up.

**MR. STEIGMAN:** Pricing a default swap is a lot like an actuarial exercise, theoretically. Ultimately, the markets end up dictating the price based on supply and demand, of course. But let's try viewing this actuarially. I'm not going to use commutation functions here, but I'll use the big A ( $A_x$ ) and the little a ( $a_x$ ) from the actuarial text. Consider the corporate bond yield expressed as a spread over the Treasury yield. Say for example, a corporate bond is trading at T+55. Let's say the swap spread is 40. That leaves you with 15 basis points accounting for the pure default risk of that bond (assuming the swap spread approximates the ongoing cost of borrowing the bond). So what do the 15 basis points represent? This should be approximately where the CDS should trade. It represents the "actuarial present value" of the net loss (the  $A_x$ , which would take into account the probability-of-default-weighted present value of the benefit to the protection buyer) divided by the present value of a dollar (the  $a_x$ , which would take into account the probability-of-survivorship-weighted present value of an ongoing premium payment of a dollar that's going to be paid as long as the reference entity doesn't default). If you divide  $A_x$  by  $a_x$ , that should roughly be your annualized premium of 15 basis points.

Now, there are other ways to get to the same result. You can discount at what's called the "risky rate," which implicitly incorporates the contingencies, but the bottom line is that at its roots, the same principles come into play here, and that's the neat thing about having an actuarial background and moving over to this side. It's the same stuff, just on a different platform. From that perspective, you then see that once a trade is on, that other factors take effect, namely supply and demand or "technical" factors. The price and valuation of your default swap will likely move somewhat differently than theory would dictate, and that's what we're getting into here. Some of the factors include the credit quality of the reference entity. Obviously, the lower the quality, the wider the spread, the higher the discount rate and the more likely it is to default, which gets into the next point. CDS is typically an on-the-run, five-year market. Now, 10-year markets have developed. Mike, are we going to have a 30-year market?

**MR. VASSEGHI:** Not any time soon.

**MR. STEIGMAN:** So, I guess we're stuck with the fives and the 10s right now. My point is that as a trade ages and the tenor rolls down from its starting point of five or 10 years, the demand decreases somewhat, which causes a difference between where the CDS should theoretically trade and where it will actually trade.

**MR. VASSEGHI:** But the one caveat here is that the curve is starting to develop. The five-year is the most liquid point. Ten-year is second-most liquid, as the market's been in place for several years. We set out regular runs — two, three, four, five, seven and 10. So there is close to a full continuum of default curve for many, many credits.

**MR. STEIGMAN:** In terms of pricing a trade you already have on, if I wrote protection at 60, and now, if I wanted to buy that protection back, it's at 80,

basically you would pretend you're getting into the opposite side. It's just an annuity of 20 that you're discounting at the current risky rate. That, in a nutshell, is how you would price an existing trade.

This arbitrage relationship is shown on Slide 34. Slide 35 shows a sample trade. This is a trade that a lot of hedge funds will do and used to do. They still do it, but this was a trade I guess that CDS responded to that attracted the levered investor to the CDS market. Essentially, the levered investor would borrow at London Interbank Offered Rate (LIBOR) in the repo market, invest in a bond at 5.75 percent coupon and then asset swap that to floating. You could see a lot of the arrows cancel themselves out in the diagram.

So, I'm earning LIBOR plus 300 on an asset-swap basis. That is, I'm taking that 5.75 percent coupon and swapping it to floating in the interest rate swap market, the LIBOR leg of that interest rate swap immunizes my liability to the repo, the LIBORs canceled out, and what I'm left with is 300 basis points running. (This example obviously assumes a high-yield bond.) I do have default risk in the reference entity. I also have interest rate risk on the interest rate swap. If there's a default on the reference entity and rates go against me, that interest rate swap could be under water. So I have a lot of boxes and arrows, basis risk, contingent interest rate risk and so forth if I'm doing this trade. My friendly CDS dealer comes along and says, hey, I can do this trade for you with two boxes and one arrow (and a dashed arrow). Those are the boxes and arrows we discussed earlier. So if I get paid, in this example, fair value, I'd get paid 300 basis points running for protection, and it would be for a five-year term. So, instead of having the roll risk in my repo for borrowing the bond, I would have a term borrowing at an implied LIBOR cost of funds.

Now, if I'm a LIBOR plus 10 borrower, and I can work that down to a LIBOR plus five, say, through the implied leg in this CDS, then if a highly rated counterparty was getting paid X basis points, I might get paid X-5 for the same protection. I'm still better off than I'd be if I did the repo/asset-swap trade. In the CDS market, you could find all kinds of opportunities where not only do you consolidate all these boxes and arrows, get rid of the contingent interest rate risk, get term financing, get a LIBOR-implied cost of funds, all of that great stuff, not only that, but you could also pick up basis points in the trade. So, instead of 300 in the cash market, maybe I'm getting 350 in CDS. This would be a "positive basis" trade.

**MR. VASSEGHI:** A lot of times an investment professional or an insurance company will ask whether this bond is rich or cheap or where the default trade is to the asset swap. Is that rich or cheap? And they don't necessarily think about the financing or the embedded financing in a default swap in terms of their pricing. They're like, OK, I'm getting my money. I'm investing it against my benchmark or against my bogie or yield that I need to earn on this, as my actuarial department has told me. But I think the group of actuaries is going to understand both the asset and the liability side where they can say, "Is my net funding, by issuing

policies or maybe a GIC or a fixed annuity, LIBOR plus 15 or 20?" I'm buying this security. Implicitly by getting LIBOR flat financing I've improved my returns by 15 to 20 basis points, and I think all too often on the investment side they disregard that potential funding spread to LIBOR that many insurance companies issue at, be it explicitly in the GIC market or implicitly embedded in policies. They're looking at it on just a rich or cheap basis. When I'm pricing my policies, how much income can I earn to support those policies?

**MR. STEIGMAN:** I'll give you the other side of that. I would turn it around and say that's great if you, indeed, are a LIBOR floating-rate investor, and you are, indeed, levered through GICs or whatever, and you look at things that way. But if you are an investor in a long duration portfolio, and you're typically investing in fixed rate bonds, basically that consolidation of boxes and arrows that I just showed you is the mirror opposite. So, my base trade is simply this: I have cash to invest – I buy a bond. I pay Michael's corporate desk \$100 million, and I take in some bonds, and I'm getting a premium or a coupon, that's as simple as it gets – two boxes and one arrow.

But if I use CDS, I'd take, say, an asset-back or some very high-quality LIBOR instrument, and I have to swap that to fixed because I'm a fixed-rate investor. Then I layer on a CDS, and now instead of two boxes and one arrow, I have an interest-rate swap. I have an asset-back. Now I have a CDS. I've just created the mirror opposite. As a real money manager, I don't necessarily look at the cost of generating that \$100 million to invest when doing my relative value analysis. The client says, here's \$100 million — go invest it. Mike has a good point, but that's just not the way we view it. That paradigm would lead you to have lots of different risks embedded in that structure — contingent interest rate risk, basis risk, etc. So, it just depends on the perspective of the investor and what type of investor you are, but if you are a levered LIBOR financing type of investor, Mike's absolutely right, and that is basically the paradigm under which you would establish a rich/cheap analysis.

Now, one thing I should mention, and why, as professionals at your various insurance companies or other institutions, you need to be clued into this market is there is a convergence taking place very rapidly in the credit markets. I've been sitting on the public bond desk since 1993, and I used to have all the information on the derivative markets. I used to get different information than the corporate bond traders. I'd bring opportunities to them. I'd say, "Hey, I see that you're able to get T+75. I could do this trade in CDS, replicate it and pick up 50-60 basis points, even after charging for all the different risks." Those days are gone pretty much because now the corporate traders get that same information that I do and are marketed CDS alongside bonds. Also, the opportunities to pick up significant spread in a trade are few and far between. But the point I'm trying to make is you're no longer either a derivatives trader or a corporate bond trader. You are a credit trader. But still, understanding the differences between the two markets (the bond market and CDS market) and understanding the implications based on the

type of investor you are in doing your relative value analysis is extremely important. So, what drives the basis, Mike?

**MR. VASSEGHI:** I think any good FSA in this room worth his weight in salt knows its implicit cost of funding. So, keep that in mind whether you issue GICs or not.

What causes the basis to move around? As Jason was talking about, a year or two ago there were a lot of cheap default swaps in the marketplace where there was a good pick to the cash, i.e., default traded cheaper to the asset swap level. A lot of that has actually gone away due to synthetic CDOs, repo market in terms of funding out cash securities, securities lending. Some of the other things we're seeing from a structural standpoint are doing unfunded transactions. We talked about some of the monolines where they're not doing things in funded form. They're doing it in unfunded form. Counterparty exposure in terms of if you have a particular amount of risk to certain market participants without CSAs, you're going to be very reluctant to put on more exposure to them. So that kind of takes out one of your main outlets of both buying and/or selling risk, and that causes some of those spreads to compress again. Some of the cheapest-to-deliver options are embedded in these things. We talked a little bit about what's happened with GM and GMAC. There the basis has widened out significantly. It was 70 basis points a few months ago, and now it's close to 300 basis points.

**MR. STEIGMAN:** In response to your first comment, if an insurance company views its cost of funds based on the rates at which it issues products as you imply in your relative value analysis, then that company had better be prepared to do the CDS trade rather than issue that product and invest the proceeds. The monolines have done precisely that, but I don't think we have that option typically. Back to your basis discussion: I'm not sure we defined what the word "basis" means. Is everyone comfortable with what that means? Basically it's where the CDS is trading implicitly versus cash bonds. So, it's the amount of richness or cheapness. If it's rich, it's a negative basis. If it's cheap, there's a positive basis.

**MR. VASSEGHI:** That is also backward from how you'd think of it in bond terms, but, again, the point being here if you look at the GM security, right now GM cash versus default is close to 300 basis points. That has widened out so much because the market is afraid of the potential cheapest-to-deliver option. With default swaps, if there is some way that GMAC can get ring-fenced or separated from GM in terms of your deliverable obligation risk, you have this one massive entity that in bond form I know couldn't survive without the GMAC arm. They both have more than 20 billion in cash. If I separate that risk, I have a substantially different risk in default than I do in cash, and those are some of the kinds of dynamics that move around that basis risk. It's very, very tight right now until we see events start creeping up and credit starts deteriorating where some of those cheapest-to-deliver options and some of the embedded, let's call it, optionality in default, starts to come about, and people start taking advantage of it, but those are some of the key things that drive the basis.

**MR. STEIGMAN:** Now I'd just like to explain how I look at things, and regardless of our cost of funds or implied cost of funds, if you're a fixed-rate investor and you're not a LIBOR investor, you still need to make that adjustment. This is where Mike and I view things a little differently. So, the basis, as we defined it, is the CDS level less the asset swap level of the cash bond. So that's where we're starting, and that's what I think the Street would like you to think of as the level of cheapness or richness, as it were. But, again, if you're a fixed-rate investor and you're constructing your trades the way I do, you would have this contingent interest rate risk, which is basically this: If I have a fixed-rate investment and let's say we could find (hypothetically) a risk-free security that's paying me interest-rate swap levels. So, it's AAA asset-back, virtually risk free, but it's a fixed rate. In an environment where rates are higher, let's say I did a 10-year CDS with a duration of eight on the asset-back. Rates subsequently rise 100 basis points. My asset-back is now worth 92. And now let's say there's a default. Figuratively, I need to sell that asset-back to fund the payment of par to my counterparty in return for the defaulted bond. I no longer have par. If I'm going to sell it at 92, I'm probably eight basis points worse off than I would have been had I owned the bond outright. Now, that's offset by the fact that I've earned more carry along the way from the positive basis, but when push comes to shove you have what we call "contingent interest rate risk," and there are ways you can try to mitigate it, but the longer the credit derivative, the longer the maturity, the weaker the credit, the more prevalent this is. If you're doing a trade on a junk credit, it's very prevalent. If you're doing a trade on a single A or an AA, it's probably not worth much.

So, I make a charge for that. I make a charge for the fact that I have to engage many people that I've talked to you about before — lawyers, systems, etc. Whenever we put a trade on, it kicks off all kinds of legal documentation, confirms, etc. The trade tickets have to be sent to at least 20 people because of our control processes for derivatives. Also, if a CSA is in place, there's one more trade to value on a daily basis. So, it's taking a lot of people a lot of time. You need to adjust for the expiration, the issuer, any unique terms to make it a less liquid contract if we're not conforming to the mainstream. Of course, there's the fact that we have two-name risk, even though I'm investing in an asset-back. I'm getting paid a spread for the asset-back approximately equal to the swap spread. If I back that out, the remaining spread that I'm getting paid on the CDS is typically not going to be as high as the comparable cash security. Whereas a levered investor mitigates basis risk by using CDS, I, as a non-levered real money investor, introduce basis risk in packaging together a replication using CDS relative to investing the cash in a bond. I need to charge for this basis risk. So, the bottom line is that I need to adjust that level of "cheapness" that I'm seeing from the street, and the adjustment will depend on the quality of the underlying credit and the tenor of the CDS.

Here's an example (Slide 41). It's a Raytheon bond, five-year CDS versus the 4.85% coupon of January 2011. This is a little dated here because I had to put these slides together a long time ago, but let's say it trades at 36/41. That means I

could get paid for writing protection 36, or if I want to buy protection for Merrill Lynch, I have to pay 41. So that's the bid ask, 36 to 41. Let's say the cash bond was trading at 80/75 to the Treasury for an asset swap of LIBOR + 35/30. That is, when I swap that bond to floating it's 35/30. Let's say that's the asset swap level. The CDS to the bond maturity is 43 basis points (for protection out to 2011). Now subtract the 30 basis points on the asset swap. That leaves me with a basis of 13 basis points. So that's what I could figuratively pick up by doing this trade. But let's say, given all those considerations, I've decided that I need to charge 25 basis points in order to get into this trade. That's my threshold. I would say that even though the basis is positive, it's not enough, and I'm going to pass on this one. Mike may bring up some points that I haven't thought of and work that 25 down, which is his job, but in fairness to Mike, there were lots of opportunities that were shown where the basis is positive, and even after applying these charges they make sense.

**MR. VASSEGGHI:** There are a few ways to unwind transactions. One of the ways to do it is to enter in an offsetting transaction. So, let's say you sold protection at 100 basis points so effectively it was like the bond was trading at LIBOR plus 100, and now it's at LIBOR plus 50, and you could buy back protection at 50 basis points. Effectively, you've locked in this 50-basis-point annuity because you're receiving 100 and you're paying 50, but they're both risky cash flows in that, as Jason talked about, the term life example, these cash flows can go away if there is some credit event. So you haven't necessarily earned 50 basis points times the remaining duration. That's one way.

The cleanest way to do it is to simply terminate the transaction completely. You'd call the dealer and say, "What's my unwind level for the transaction?" Effectively, that's 50 basis points; present valued to today, here's a check for the difference. There is sometimes reluctance for some insurance companies to necessarily unwind transactions from a book yield perspective, a tax or accounting perspective. Sometimes offsetting transactions might work a little bit better internally.

The third alternative is simply to assign it to another counterparty. What we talked about is streamlining all the documentation such that everybody has basically the same fungible document where you can call up Merrill Lynch or Morgan Stanley or Deutsche Bank or UBS and say: What's your level for this trade? And the assumption is it's under standard docs unless you say something otherwise. That being the case, you can very easily assign it to anybody else.

I talked a little bit about this already, in the example of locking in those 50 basis points. Again, keep in mind that if a default occurs, that 50-basis-point annuity also goes away. So, it needs to be discounted by the risky rate of those cash flows. You are not necessarily earning those 50 basis points. It is not risk-free. It's still subject to the underlying credit.

Another good thing is that Bloomberg, which I'm sure everybody's familiar with and proficient with, has an asset-swap calculator built in and a default-swap calculator built in. And you can very quickly price up a default swap, get its pricing, get its cash market value, and this is the standard across the Street. There are standard assumptions of a 40-cent recovery for senior unsecured, 25-cent recovery for subordinate paper in terms of recovery values. The pricing is straightforward, and it certainly helped things out quite substantially in terms of the evolution of this marketplace, that there is a pricing model that is a standard across the Street.

**MR. STEIGMAN:** Just so you know, the model shown here is the discounted spreads model. You can see it in that calculator screen (Slide 45). There are actually a few choices there, and I think, without any disrespect to Merrill, the J.P. Morgan model is the standard.

**MR. VASSEGGHI:** That is the standard that people use. You would flip that to Model J, which is the J.P. Morgan model.

Next, I'll discuss recovery rate averages. Slide 46 shows an interesting graph, and this goes to what we were talking about: those standard assumptions of 40 cents for senior unsecured and 25 for subordinate. You can take a look across all of these industries and see where recoveries are, and that line represents that mean of 37 or close to 40 cents. Obviously some industries are significantly higher, and many are significantly lower. I think one of the most interesting things is this next graph (Slide 47) where you talk about where recoveries occur. People are like, oh, 30-40 cents. Well, this is, I believe, over the last five years' worth of history. There hasn't been a recovery between 30 and 40 cents on any security. That's not where things default. They either default 20 cents in or they recover at 75 cents and above. So it's interesting that the Street still uses these assumptions, and it's interesting that I think insurance companies and a lot of the market assume that these are where the recoveries are. That is actually not the fact.

**MR. STEIGMAN:** I'm just going to make a few quick comments about the CDX Index. Essentially, a need developed for trading CDS on more of a portfolio basis, on an index basis. Why? I can think of a couple of good reasons. Let's say I'm a corporate bond trader, and I need exposure to the "corporate bond market" in a hurry, and I want diversification, I want size, and I want it now because I think something's going to happen in the next couple of days, and then maybe I'll be able to work into cash securities over time. One thing I've done and that my counterparts at other companies have done is to sell protection on the market, and we facilitate that through the Dow Jones Index called CDX.

Slide 51 shows that the North American Index is broken down first by high grade versus high yield. The high grade is broken down into five-year and 10-year products, but also high volatility, which are the BBB companies and their products. Any one of these boxes you could actually trade in pretty decent size, pretty liquid, and, as Mike talked about, pretty tight bid/ask spreads. The high-yield product has

a BB and a single-B tranche. The thing about the high yield that isn't on here, which is good to know, is that there's a funded product that goes on your Schedule D. It's a bond. I believe it needs to be bifurcated for GAAP. One nice feature is this: With high yield bonds, you often have callable securities. You can have this convexity problem in times of credit deterioration where your assets lengthen. The funded CDX product is a five-year bullet structure. So, you get rid of that convexity risk. The other thing that happens is that contingent interest-rate risk I talked about goes away due to some structuring inside the product whereby if there's a default, the trust that issues the product delivers par, no matter where rates are. So, I'm a big fan of the high-yield, CDX-funded product out there ... so far. On the other side of this structure is a consortium of 10 dealers who are active in this product. Is it 10 or is it more by now?

**MR. VASSEGHI:** It's more. It's probably close to 20 dealers.

**MR. STEIGMAN:** There's a new series every six months, representing the on-the-run structure. So, if you're looking for five-year or 10-year cover, every six months you have a new index that's developed. Right now we're on the fourth series. The number of credits in the high-grade, North American investment-grade tranche is 125. So that's 0.8 percent per credit. You have diversification. There's a fixed rate that is part and parcel of this. For the 10-year product, it's 65 basis points; 40 basis points for the five-year. So that's what you get if you enter into this. There's a present value up front. We talked about how to price default swaps. You would price the difference between where the implied spread is today and what the actual deal spread is and that is what you would either get paid or have to pay to get into the deal. As Mike mentioned, there's no restructuring. It's just "bankruptcy" and "failure to pay," which is another positive if you're writing protection.

**MR. VASSEGHI:** It is technically 125 separate names that trade as one security, one package. It just trades as a block transaction.

**MR. STEIGMAN:** This is the main product, the indexed product, and, as Mike said, it's a collection of 125 individual CDS, each paying its own individual premium to the writer of protection in one package. The important thing to understand is that when there's a credit event, that name will fall out of the index, and then there'll be a recalibration of the notional amount and so forth, and everything will be adjusted accordingly. What you're referring to is something called the tranching products that represent a synthetic CDO. So there's a waterfall of attachment points.

There's an equity piece, 0 to 3 percent, where if the cumulative net losses are 3 percent or less, then the next tranche, which is the mezzanine tranche, is safe. The equity tranche is subordinate to the mezzanine tranche. Then we go from three to seven, which is subordinate to the senior tranche (i.e. the senior tranche is safe up to 7 percent net losses), etc. So that's just the basic CDO mechanics. That's applied here to this indexed product, and that actually is a good segue. If anybody at the Q&A wants to hear about the recent GM experience, it involved this tranching

product where the first loss piece was a tool used by the hedge funds to get some extra yield.

Like I said, every six months there's a new roll. A new index comes out. If you're writing protection on an index, and you don't roll, it still exists, and you still have either the protection that you bought or you're still short the protection you wrote, you don't have to roll, but there's an opportunity to roll.

**MR. VASSEGGHI:** The best way to find any kind of CDX Index is just type CDSI in Bloomberg, and you can get a complete listing of them. CDSW is the default swap calculator, and with CDS, you can actually take a look at the CDS spread curve.

**MR. STEIGMAN:** And if you want to see a historical graph of the North American investment grade four tranche, the five-year, type in "DJCDXNI <INDEX> <GO>," and then type "GP," and you'll see a recent history.

**MR. STEIGMAN:** If anyone wants to hear about what happened with GM as it relates to the CDS market, I could explain a plausible scenario really quickly. So here's one theory on what happened in the GM trade. There were two groups of hedge funds. Call them Group A and Group B. Group A had this trade on where they were long the bonds in the cash market, long GM bonds, and short the stock. So that was their trade. Within a day of each other, Kerkorian came in and said "I'm going to buy 90 million shares," and the price of the stock went through the roof. So that ruined one side of the trade for the hedge funds. Around the same time, Standard & Poor's (S&P) came in and downgraded GM to junk, and so the bonds got hit pretty hard. That took care of the other side of that trade. In a mad scramble to stop the bleeding, this group of hedge funds bought protection in the CDS market on GM, which created a very high technical basis in GM completely driven by the demand for protection by these hedge funds. It got so expensive that some clever hedge funds in that trade thought, well, let's trade the equity tranche of the CDX tranching product (which we call a correlation trade). They're betting on the idiosyncratic risk, meaning that because the zero-to-three tranche is the "first-loss" tranche, it will be driven by the first credit that goes bad. Therefore, the worst credit in the pool is going to drive the cost of protection for the zero-to-three. So, they were saying, well, we know GM is going to be that credit. Let's buy protection on the zero-to-three because it's cheaper than buying protection on GM outright. So that's what they did. That's domino number one.

Domino number two: There's another group, Hedge Fund Group B, which had this carry trade on where they wrote protection on the zero-to-three tranche, got paid a handsome premium and bought protection on the three-to-seven tranche (the mezzanine tranche). So, the amount that it cost them to buy protection on the mezzanine tranche was a lot less than the amount they were being paid to write protection on the equity tranche. It's called a positive-carry trade. Well, when this other group of hedge funds came in and started buying protection in the zero-to-three, it drove up the cost of protection, and basically that trade that the second

group of hedge funds had on went under water in a hurry. So they got on the same side of that trade and started unwinding their positions, buying protection on the zero-to-three, adding fuel to the fire. Now the zero-to-three tranche is way out of whack, and they started to sell protection on the three-to-seven to unwind that side of the trade. So that's domino number two.

Domino number three: The other side of the three-to-seven tranche, the original protection writers (perhaps the Street), were doing something called "delta hedging" (using the entire CDX index to hedge themselves against that tranche based on a hedge ratio or "delta" that, itself, moves as the price of the protection moves – this is called "gamma"). As hedge fund group B sold protection furiously on the three-to-seven to unwind their trade, it drove the cost of protection on that tranche down and the deltas shrank precipitously for the original protection writers, forcing them to buy protection on the CDX index to maintain their hedge ratios. The cost of protection on every one of those 125 names started rising in unison, as did their basis. It was an ironic thing that when you trade on the CDX index, you're using it basically as a diversification tool, and here everything ended up being correlated to GM. But to those who weren't in the trade, it spelled potential opportunity in the aftermath as it caused the basis on CDX to widen out (perhaps only temporarily). That is, the thought was that the basis in all of these names was driven to artificially high levels, and the view of many investors was that the relationship wouldn't last forever. So, you can go in and write protection on the CDX Index, and when the basis comes back to normal, you've basically pocketed that temporary cheapness. Mike, any last words?

**MR. VASSEGHI:** One point is there's a tremendous amount of research from Merrill Lynch or any other dealer on the Street for all of these products for these entire markets. It's fairly evolved. So, call me, call anybody you want. There's a tremendous amount of information. We have it available all online. Take a look at it. It's a way for you to really dig in and see because, as Jason mentioned, you can't separate these markets now. A few years ago we combined our cash and CDS traders. Everything's combined. All these markets are intertwined, and now you're even seeing the evolution of the debt and equity markets. It's just total capital structure. Arbitrage is starting to occur. The point is you cannot afford to not pay attention to these particular markets anymore because they are affecting everything else that you guys do day to day.