

RECORD, Volume 26, No. 2*

San Diego Spring Meeting

June 22–23, 2000

Session 11PD

An Introduction to Credit Derivatives

Track: Investment

Moderator: SUNIT R. PATEL

Panelists: DAJING GUO[†]
RAGHU RAMACHANDRAN[‡]

Recorder: SUNIT R. PATEL

Summary: Credit derivatives are transforming the way in which the financial markets price risk. Credit derivatives are bilateral financial contracts that isolate specific aspects of credit risk from an underlying instrument and transfer that risk between two parties. Credit derivatives come in different forms:

- *Credit default swaps*
- *Total return swaps*
- *Credit spread options*
- *Collateralized bond obligations/collateralized loan obligations*
- *Credit linked notes*

Mr. Sunit R. Patel: Our first presenter is Raghu Ramachandran. Prior to joining Brown Brothers Harriman, Mr. Ramachandran was an analyst at Tillinghast–Towers Perrin, the Texas Worker's Compensation Insurance Fund, and FIC Life Insurance Group.

Our second speaker is going to be Dajing Guo, and he has earned his Ph.D. in financial economics from the University of Toronto. His interests include asset derivative pricing, hedging and arbitraging, investment, and portfolio management. His work has been published in many journals, including the *Journal of Business and Economic Statistics* and the *Journal of Fixed Income*. He is currently working at Central Group of Zurich Financial Services Group.

Mr. Raghu Ramachandran: I am going to start off with a little terminology—some basic stuff which most of you would know. Then I'll go into some explanation of what credit is, what problems we have with credit, and why you might need a derivative to manage that. Then I will discuss three introductory concepts in credit derivatives: total return swaps, credit default swaps, and credit

*Copyright © 2000, Society of Actuaries

[†]Mr. Guo, not a member of the sponsoring organizations, is Assistant Vice President at Central Group, a wholly-owned subsidiary of Zurich Financial Services Group, in New York, NY.

[‡]Mr. Ramachandran, not a member of the sponsoring organizations, is Vice President and Senior Portfolio Strategist at Brown Brothers Harriman in New York, NY.

spread options. Finally, I'm going to talk a little bit about the practical and regulatory hurdles that you face if you are going to get into credit derivatives.

Some very basic terminology: A swap is an agreement between two parties to exchange periodic cash flow payments based on some pre-agreed nominal face amount. You probably know what basis point is, as well as LIBOR, which is sort of the risk-free interest rate. Total return is for equities, dividend return, and change in stock price, or for fixed-incomes securities, coupon, plus change in the price of the bond.

Most of you know what an option is. When you do options, especially in an equity sense, the option value is based on the stock price of an underlying stock, and the price of the option varies dollar for dollar as the price of the underlying changes, once you go beyond the strike price. When you are doing these little hockey sticks for your exams, you know that it's dollar for dollar, and how they move. As you'll see a little bit later, that doesn't hold true in credit derivatives.

If you are buying U.S. Treasury securities, they're guaranteed by the full faith and credit of the U.S. government, which essentially means they are risk free. There is no chance of default, so as long as you hold onto the bond, you are guaranteed to get a payment. The nice thing about the U.S. government is if it doesn't have money, it prints some more. So you'll always get the money. The other thing is it's a fairly deep market, so if you ever want to get rid of your U.S. Treasury bond, there is somebody who will be willing to take it off your hands.

The one thing that I sort of wash over is that if you have to get rid of a Treasury issue before the bond comes due and the interest rates have moved against you, you could possibly lose some of your money. So, it's not completely risk free; except for that fact, it is pretty much guaranteed that you will get your money back.

Every other fixed-income derivative out there doesn't have these two guarantees. That is, you don't know if you can get rid of it, and you don't know if you'll get your money back. That's called credit risk, and as you would expect, any form of risk requires that you pay some compensation for it.

What we call *credit spread* is the difference between the yield on a fixed-income debt and a U.S. Treasury security of the same maturity. It can be broken into a credit component and a liquidity component. So, for instance, assume the yield on a spread product is about 7.99. You can decompose that into a portion that is just based on the yield for the Treasury of the equivalent maturity, which would be 6.11, and the credit component of 1.88.

That credit component can be further decomposed into a liquidity portion and a credit portion. The liquidity portion varies as the market moves along. Surprisingly, it doesn't depend on the quality of the issues. It depends more on the age and the size of the issues. Newer issues are more liquid, and hence have lower liquidity

spreads; larger issues are more liquid and have lower liquidity spreads relative to an equivalent issue.

Rating agencies usually guide, although they sometimes lag, in how the bonds are rated. You know the S&P ratings for fixed-income securities. Securities rated down to BBB are investment grade, which most companies are allowed to hold. BB and below are noninvestment grade, which companies can hold, but they have other problems. If you are in the business, they are called high-yield debt. If you are not in the business, they are called junk bonds.

The interesting thing is that the spreads are not static; they move around. Increasing spread is called spread widening, or tightening if they're decreasing. Although it is obvious, I thought I'd point that out—as the spreads increase, your yields are going up, and as these yields go up, the price of the bond goes down.

First, I look at the credit component. There are two things to consider. The first is asymmetry. It is more likely that something will go down than up.

The other thing to notice is that some issues that were investment grade at the beginning of the year ended up as non-investment grade at the end of the year, and vice versa.

The cost you pay when you lose a credit rating isn't equivalent to what you gain when you go up an investment grade. In particular, when you fall off the investment grade level there is a heavy penalty paid, because a lot of companies will be forced to sell your bonds, since you are no longer investment grade, and investment policy guidelines require that you hold investment grade securities.

Here is an example of a real one. It is basically a credit problem. This is Consec, 8 $\frac{3}{4}$ bonds, due in 2004. Their basis on the vertical axis is relative to a five-year Treasury. Prior to March 31, it was trading at or near par, that is a \$100 bond was selling for \$100. The yield on that was about 8 $\frac{3}{4}$.

Because of Green Tree Financial problems, Moody's down graded the issue. But, even before the down grade went into effect, the spreads on that started widening. Around May 8, which is at the peak when the spreads were the widest, the price had dropped to around 54, and yield had jumped up to 23% for this debt.

To put that into real terms, looking at year-end filings, life insurance companies held about six hundred million in Consec bonds. If you think about half of that price went away, that \$300,000 million in surplus that disappeared in a period of a couple of weeks.

There is another component that can change, called a liquidity crunch. Usually in crisis situations, investors will go to things that they consider safe—in this case, U.S. Treasury debt, which of course makes the spread product cheaper. Even if you haven't done anything to the outstanding credit, it becomes more expensive,

because people are trying to get out of whatever spread product they have and move into a U.S. Treasury.

Three examples of this are the long-term credit fiasco, the Y2K effect, and currently, the U.S. Treasury paying off its outstanding debt. There are fewer and fewer Treasury issues, and they are becoming more valuable. More valuable means that their yield goes down, and hence the spreads of other debt go up.

Now, consider the first of our credit derivatives. For the basic credit default swap, we have a payer and a receiver. The receiver pays the payer x basis points a year based on the face amount of some reference credit investment, which either party may or may not own. It is not dependent. If the reference credit defaults, the payer pays back to the receiver the amount of the default that he didn't get.

You could think of this as a term life insurance policy for credit. The motivation for the receiver, obviously, is protection, just as if you were buying life insurance, which you buy in case you die. The motivation for the payer is risk-neutral diversification. You're reducing your risk for stuff you own because you are getting more income without reducing your expected returns.

The next example, which is probably the most used for credit derivatives, is a total return swap. You have a total return payer and a total return receiver. The total return payer pays the return on a reference asset. Usually, this is not an individual asset, but an asset class. So you might get the total return on the Lehman Aggregate or the total return on the S&P 500. Then the receiver pays a variable interest rate, which is LIBOR, plus or minus a spread, depending on what the situation is. The motivation for the receiver is it is a convenient way to get into new markets.

If you want to get into mortgage-backed securities, and you don't have the staff to do it, it is awfully complicated to hire the staff and get the resources to get into mortgaged-back securities. You may need to get into mortgage backs for risk diversification purposes. The easiest way to do this is to swap out of what you have and get the total return on a mortgage back index. The same thing would be true if we would be getting into equities, for instance. You could get into a foreign equity market without having to hire a bunch of people who can track Japanese markets or European markets. It is an easy way to get diversification, and it's also a nice, lazy way to do it, because you don't have to go through all the effort of setting up your staff. The motivation for the payer is basically balance sheet management. The easiest way to get rid of the stuff you don't want without having to actually sell it is to swap it out with a total return swap.

As an example, we have a client who has a lot of callable agencies, that is, U.S. agency bonds with call options. As interest rates have moved up over the last six months, most of that has gone under water. That is, they are carrying it with unrealized losses. Now, if they sold it they would have to take those losses, so the easiest way for them to get that off the balance sheet is to do a total return swap into another sector that they wanted to move into.

From the Floor: Do you see a total return swap as an appropriate instrument for a company, like an insurance company, that has asset managers who are compensated on a total return basis, whose products are yield oriented, such as universal life or annuities sold on yield?

Mr. Ramachandran: Yes, exactly; this is the case that I was referring to, where the company needed the yield, and that is why it had gotten into the agency bonds, to get the coupon yield. Both for total return management and just for overall risk diversification it didn't need to be in agencies, or it didn't need to be in agencies as much as it was. Perhaps the company could have gotten into mortgages and gotten the yield, also, but it was too late, or it hadn't done it in a sufficient manner. That is how we used swaps: to get them out of agencies and into some other sectors.

From the Floor: Is there an aging effect that bonds will have a higher risk of default later in their maturity? Normally, you would think that these were events that occurred subsequent to their underwriting, and I think there are studies that indicate that the probability of the downgrade or default will increase with the age of the bond.

Mr. Ramachandran: It's dependent on the quality of the company, so a company could issue debt. For instance, Ford Motor Company, which has several billion dollars of cash lying around, went on credit watch, because it paid down some of its debt, or it did some transaction. The company itself is still very viable, but it went on a credit watch because of some other transaction that had nothing to do with the Ford Motor Company credit debt that was issued six months ago or six years ago. It is possible that the companies get into trouble. The longer they are out, the more chances they have of experiencing trouble. It is not necessarily a function of age. This is different from a mortgage, where prepayment risk is a function of how long it's been around.

Finally, a credit could spread where you pay an option premium, and depending on what happens to the credit spread, you get the payoff.

Here is what I was pointing out; it is not necessarily one to one. What is happening is that you're buying insurance to make sure that if spreads widen and the bonds go down, you get the difference between where you were when you bought the debt and where it is now.

The way it is paid off is based on the notational amount of the issue times the duration times the difference in the index spread and the strike spread. It is equivalent to a dollar-to-dollar payoff, but because now the underlying asset is the credit spread, the change in option value relative to spread is not a one-to-one relationship.

The duration, if you remember interest rate theory, is the first derivative of the price. Duration times change in spread is equivalent to the change in value. You are getting a dollar-for-dollar payment based on what you are losing, but on a

graph it is not a one-to-one relationship, because you are basing it on spread, not on the value of your outstanding debt.

The motivation for the buyer, obviously, is again insurance. You are limiting your downside risk. The motivation for the seller is that you are getting risk-free income, usually in the form of a Treasury. Also, you can take exposure-to-credit risk. Insurance and financial companies are in the business of taking risk, and sometimes this is a way to get into taking risk.

Some of the pitfalls of getting into credit derivatives follow. The first pitfall has to do with the pricing. If you are not familiar with the fixed-income market, it is a little different than equity markets. If you look on your Bloomberg terminal or in *The Wall Street Journal*, and it says that the price of the stock is \$120, it is very likely that you can get the stock for \$120 or fairly close to it.

In fixed-income investments, there isn't an open quoted market, as there is in the equity market. It is done through a series of deals with a dealer. If you want to sell or buy a fixed-income security, you call five security dealers and ask them how much they will give you or ask them for a bond, and they can, depending on their inventory or the counterparties they are dealing with, have more or less supply. You could have, depending on the market, up to an 18% difference in the price that you are quoted. When you are setting up a credit spread option that is dependent on the price, and if you have an 18% difference in the price, then how do you get the payoff?

There is also the issue of correlation if you are buying a lot of these. There is correlation between how they move. If you own Ford and General Motors, they are highly correlated, but how do you figure that out? What is the correlation between General Motors and Exxon? It is not just as simple as figuring out correlations for actively traded issues.

The third point is counterparty debt. When you are instituting any of these swaps, it is done through a counterparty. Now, if that counterparty also has exposure to an underlying security, then you are not really diversifying your risk.

For instance, say you are doing a swap on Ford Motor credit, and you are doing it through a bank that also lends to Ford. Should Ford default, then that bank also has problems making its payment, because it is not getting the money, and you are losing money both on the swap and on the underlying issue.

There is also the issue of moral hazard. This goes back to when I said that it is like a term life insurance policy. You usually can't buy a term life insurance policy unless there is an insurable interest in what you are buying. Obviously, neither party in these swap transactions has to own the underlying asset that you are basing it on. There is a question of what the moral hazard is and why people are getting into these swap transactions.

Finally, there is the issue of trigger and secrecy. There are lots of rules in a swap transaction as to what are actual triggers for one of these issues. For instance, if you have an XYZ bond and it's going into default, or if it misses a payment, did it miss the payment because of some legal problem, or is it an actual default? How do you decide that you indeed have a triggering event?

Also, say that XYZ calls you, or XYZ's custodian calls you, and says XYZ missed its payment. You call your counterparty in the swap transaction and say XYZ missed its bond payment, and you want to exercise your credit swap and get the payment. Say XYZ really hasn't defaulted, but now there is this insider information out there, and now the counterparty has information about what XYZ is doing that it is not necessarily supposed to know—in fact, perhaps shouldn't have known. What happens? Those are some legal issues that you have to deal with.

Finally, a little bit on accounting. As you know, *FAS 133* is coming into effect, so when you set up these transactions, you have to take into account the effects on the income statement. You also have to set up an asset valuation reserve based on the counterparty credit, which, if you are using fairly well known counterparties, is easy to get a hold of, but if you are using parties that haven't been involved in the insurance business, you have to go out and figure out how to get the counterparty SVO rating. Also, you have to set up the new replicated synthetic asset transaction number and file schedule DB, I believe, and get an SVO rating before you get into a swap.

Mr. Dajing Guo: I work for Central Solutions, now called Center Group. My topic will be securitization of loans and bonds. It's now called collateralized bond obligation (CBO) and collateralized loan obligation (CLO). My presentation will have three parts: (1) Everybody has very little knowledge of securitization, so I'll refresh your memory of securitization in general terms; (2) I'll forecast on the CBO and CLO saleable markets; and (3) I'll look at how we can use quantitative models to value this kind of product.

Securitization generally is financial technology developed in the past 30 years which repackages financial assets into new securities. The financial assets can be loans, home mortgages, credit cards, or auto loans, and those are new money, liquid, individual loans, profitable financial assets.

We'll need to use a special purpose vehicle, or trust, to repackage this pool, and then resell it in the capital market. They move in the process like an investment bank. It has to go through the process to originate, and then the investor will buy it from the capital market.

At the end you will see them process new money from the borrower, like a loan originator. Then all the loans will be put in a special purpose vehicle, and then it will be tranced out.

The rating agency will give the rating for the investment grade and below investment grade equity piece. Normally for the below investment grade, if there is

not enough demand, you need an insurance company to provide credit insurance or wrap. A financial guarantee insurance company can also provide this.

Overall, this investment bank will act as underwriter, then sell it to the capital market. The special purpose vehicle is basically a trust, a legal identity, a passively managed firm that does not incorporate, often located for tax purposes in a place like the Cayman Islands or Bermuda.

This special purpose vehicle is used to purchase all the issue's financial assets. The key thing is this technology. This special purpose vehicle applied in many areas of the securitization industry. The first application of this technology was in the home residential mortgage market. As you all know, that is called CMO or mortgage-backed security. Then it was extended to commercial mortgage or bank loans; it all goes to high-yield bonds, emerging market bonds, and also asset-backed home loans, credit cards, and auto loans.

In the past two years, this technology has also been applied to the insurance industry via the catastrophe bond. The idea is the same: you use a special purpose vehicle but put the insurance policies inside the pool.

It started in the property casualty market, with catastrophe earthquake insurance, and also California hurricanes, so there are about \$10 billion in bonds issued in the past two or three years. The market has not been as popular as expected, because now the property casualty market actually has an overcapacity of capital.

Recently, this market has taken off again. I think Goldman Sachs did 70% of the underwriting in the process, and Central Solutions also issued a catastrophe bond called the Trinity Read.

On the capital structure: On the liability side on this special purpose vehicle, new money will be split into many layers, but basically you can separate it into three classes.

The first priority senior notes new money is investment grade, so it has to be rated BBB or above. That's so you can sell it to most of the asset management firms with investment guidelines requiring investment grade assets.

The Mezzanine class is from BB to CCC, or single B rating. Those are the hard pieces to sell so new money needed, insurance companies to provide a credit wrap.

The bottom tranche is called the Junior Subordinated bond notes, income notes, or equity notes, which share the first and last positions in the pool. Thus, if there is a default credit loss, this is an equity that will get it.

From the first priority senior notes, you can expect to get a higher return on your investment, so you can target in 20–30%.

That's just a summary of capital structure. First you start with a pool that you put in the asset as the collateral and well defined into this special purpose Vehicle.

On the liability side, you split (or tranche) it out into investment grade and noninvestment grade, and then an equity piece.

The key thing is that you also need a rating agency to give a rating for all the layers so that the key player, actually, is the rating agency acting as a regulator here. It's in a regulated market, but the rating agency is the key to whether you can get this product sold or not.

What is the purpose for this approach? Basically, you can conclude that it's converted illiquid, high-cost financial assets into liquid tradable securities.

A key thing is the liquidity; it is tradable and allows the asset manager to mark to market. It is useful for loans or insurance policies for which there generally is no secondary market.

After this, repackaging allows you to sell the pieces into the secondary market, and mark to market for the asset manager. Also, it's bringing a lot of investors, so it will generate a big investment audience for you. The player in this field will need to originate and write the issues, as its manager will act as the trust manager to decide on the passive investment strategy, because nobody like an investment banker will be there.

If the asset pool is mortgages, loans, or whatever, you have to keep track of this asset. The manager must be selective so they really have good, sound records. Then the key player is the rating agency to get every change rated. Another aspect to watch for would be legal or tax problems in the process.

That is the first part of the securitization methodology that is used in this industry. Now I will talk about CBOs and CLOs. There are actually several products, depending on whether the pool is buying bonds or loans. First, start with CLOs. This actually is a credit product just as Raghu introduced the credit product for individual issuers.

If an asset manager wanted to be exposed to an individual type of product, we use total returns, asset management, and credit default. Suppose you want to go buy a credit risk on a portfolio base. Here the CLO or CBO product will allow you to be exposed to a pool of credit.

The first thing that it allows you to have is a diversification benefit. Then you also have the benefit that professional asset managers can help you pick a good bond out of the less favorable, especially if this one is in the high-yield market.

How much value is added by the asset manager is also important. What kind of offer it can bring into this kind of process is important. This actually provides a challenge for the credit risk management industry.

First, I'll give a credit introduction of CLOs. You see all these CLOs in the workplace. Insurance companies can play a lot of roles. Suppose your asset

management side is approached by investment bankers to buy some piece of CLOs. You start to wonder why the bank wants to unload this kind of risk.

There are actually reasons why banks try to unload this kind of loan, because they are traditional commercial banks. Now the industry is very competitive, with very low margins. Banks have to look at credit ratings, satisfy the federal regulations, and on the other hand maintain a decent return on equity to make the shareholders happy. These are the objectives that make this kind of effort very difficult.

If you look at a lot of regional banks, you find their stock hasn't been moving up over the past several years. Even some big banks, like J. P. Morgan stock, hasn't been moving for the past five years, even though they pay a lot of dividends.

A lot of commercial banks try to change their approach: from the traditional bond risk issue to the loans and then to the new process. They are more like an underwriter and servicer. So they go to issue loans and then sell them, hopefully, to the investors. The banks only used themselves as a lender to use their expertise in underwriting their information and understanding, hopefully, the local market.

Consider a Midwest bank; we all know the Midwest consumer market better than the other investors. They want to change these kinds of roles. Another motivation is that by unloading the loan pools from the balance sheet, they get a lot of benefit from the decrease in regulatory capital requirements.

This business has very strict capital requirements for the commercial banks, so they want to use this kind of special purpose vehicle to unload those loans, especially lower-rated loans, and then release capital. A lot of balance sheet considerations dominate the motivation behind creating CLOs.

The motivation for commercial banks is actually to get the regulatory capital advantage. If you want to know their motivation, that's a big one. There is a kind of regulatory arbitrage to be played between the industries—for example, between the commercial banking industry and the insurance industry. Here is actually an arbitrage game that can be played.

As we know, commercial banks have this kind of balance sheet motivation. Most investors are very careful to invest in this kind of piece. Now, in the market there are also more investor treatments; it is called the arbitrage CLO and CBO. That is mostly from the liability side, so the investor wants to participate in the credit market.

They don't want to buy only one bank's credit pool, such as J. P. Morgan's or Bank America's. They want to have a pool of bank loans from several banks and then try, hopefully, get the credit exposures with a good return. These are the so-called risk arbitrage CLOs and CBOs. These are the most popular now in the marketplace.

Again, there are also synthetic CBOs and CLO, which is for the one that I present and need to use a special purpose vehicle. You need to sell the asset, actually, into the pool, but sometimes that is difficult. This is why an investment banker wants to use the total returns and credited to default information, to apply to individual credit products to transfer the credit risk into this pool, without selling the asset.

That is the key; the credit derivatives actually facilitate this kind of securitization of business in that regard. This market has a lot of synthetic CBO and CLO. So this is a new generation.

There are two flow types. You also can have a cash flow CBO and a market value CBO. A cash flow CBO and CLO are the most popular. That basically says that the interest, the cash flow, and the principal cash flow are divided into the asset tranches.

The asset managers do not need to evaluate the market to the asset pool. There is a liquidity crunch, so high-yield bonds are now investment bank loans, for example. You have this kind of long-term capital collapse or a national crisis, you'll find liquidity spread skyrocketed.

Part of it, probably, is just the increase of the credit risk, but a larger part is because liquidity premiums increase dramatically. At that time, if you want to go to market and put a strict investment guideline to tell them to sell, you will sell at a very high spread with a big loss.

The market value of CBO sale is less than popular in the market. Most of this kind of business forecasting originates with the top ten investment firms on Wall Street.

Suppose you already are interested in getting this business asset manager. Suppose you have a big asset management business. You want the asset manager to manage the pool, or if you want to be investor to buy the current investment grade, the Mezzanine piece, or the equity piece, you also need to value this product. There are many ways to evaluate this in a systematic way. I present this kind of modeling as three pieces.

First, you must have a credit portfolio simulator, since you are valuing a passive investment pool. You have a pool of credit and you want to value this, simulate this credit pool, first.

The second way is to model the cash flow interest on the principal. You have to be able to properly model all the legal requirements. You also want to do trigger testings. With all this, you can calculate what kind of risk-and-return profile and what kind of curve are comfortable to you. Then you decide what kind of piece you want to invest.

For the first part you need to have a portfolio model. On the credit side, this is a long traditional credit investment.

You have to analyze the fundamentals of a firm and then look at the balance sheet, project these earnings, and then give some credit scoring. Those are the traditional ways.

Now, the Wall Street models developed the stage, and they can actually allow you to value a credit portfolio. Your model is very similar to a stock portfolio, but it is more difficult to tell if a distribution-of-credit portfolio is much longer than a standard stock portfolio that you'll see for S&P or NASDAQ.

Also, it is much harder to diversify a credit portfolio. If you look at any investment studies, you will find that if you normally take your 20–30 stocks, then you are diversified. You are very close to the S&P Index. But it takes you 40–50 bonds, at least, to get the kind of diversification you get from the stock portfolio.

That's the key. You want to model those diversifications and the correlations. Most of the credit products have a high default correlation, and you want to model that. There are some economic studies and also industry models that can give you a first jump-start.

So, at least try to borrow some option-pricing models first started by Bob Martin. These are the models that you can first use to get some idea.

First is credit default risk; that's basically the key thing, the default probability. What kind of default probability do you see for different types of rating of the bonds? Consider the migrations so the bond won't migrate after one year with different ratings.

If a bond defaults, what kind of recovery you will get? That's a recovery risk. There is some spread risk; you use derivatives, credit spread risk, and interest rate risk.

Finally, an important aspect is the correlation risk. You find that in the U.S., for a high-yield market, all of the different industries actually have very high correlation. The asset correlation will convert into default correlation.

You think you have diversified. You invested in bonds highly concentrated in one industry, like real estate or shipping bonds. Then if that sector is in a recession, you get a lot of default in the same sector. The correlations across industries, across asset class, and across countries are very important in this kind of modeling.

On the capital structure side of this, the models are very complicated. The legal structure to define this so-called waterfall is difficult to understand. It is derived from the idea that if you have this pool, the money will be distributed every period.

First, to the senior note holder with the investment rate, once the interest requirement is satisfied and some interest rate task and overcommercialization task is satisfied, it allows you to pay to the Mezzanine note holder. When another set of tasks is done, then you can distribute the dividend to every holder.

So, the food chain of this capital structure is very complicated, and it is deal by deal driven. Here your manager banker and the rating agency pull a lot of triggers in order to protect the senior investor's note.

If you are investing the Mezzanine equity piece, you want to see what kind of triggers they put in the place to protect the senior trigger, and you want to model it properly. These are very complicated legal structures.

The same thing holds true for the principal waterfalls. Most of this kind of special purpose vehicle involves paid-out principals, so the senior note will be paid down very fast, as with collateralized mortgage obligations (CMOs).

So the seniors' trust will be paid down fast, followed by the Mezzanines' and then the juniors'. Also, the same sort of test will be set up to protect the senior investors. You also want to model that right. These sets of models are called the test, interest and coverage test, and the principal coverage test.

For example, at the beginning of the pool the senior interest ratio will say that for the cash flow that you have, the required payment deal for the senior interest has to be 120%. At the beginning of the pool, it actually can be higher, 150–200%.

But then, once this pool has started, you will want to check it periodically to see whether this ratio is above 120%. If the ratio is below 120%, you'll say okay, let's stop. All the layers behind this senior trust, interest of cash flow, will be cut off.

It is not considered as default for the Mezzanine and the Junior pieces; it is just temporarily cut-off cash flow. The money will stay in the trust as protection. Either you pay down the senior trust or use it to reinvest to get new bond, to get this trust back to the normal ratio.

There's this kind of a test to protect different layers. Once you have this model set up, you can evaluate this kind of note on the yield, or the internal rate of return based, or you can run stochastic models to calculate your internal rate of return on what kind of standard deviation you can have.

You can do a stress test of different default probability to concur correlation. Then you look at what kind of risk-return relationship different notes have. Decide as an investor what kind of risk return you can accept, and then make a decision.

As you can see, there are a lot of roles that an insurance company can play as a credit rater, as an investor, or as an asset manager in the process. So, there is a lot of quality quantitative work to be done in this kind of new product area.

From the Floor: How do you price credit derivatives?

Mr. Ramachandran: Essentially, equivalent to a Black-Scholes model, except you are now taking into account the chances that your spreads are going to move out. The theory is the same; it's just that the formulas no longer like a normal

distribution of the price. Were you asking for the explicit formula, or were you looking for the methodology?

It's not as simple as that, and unfortunately, I don't have the details of that. I haven't dealt with the actual pricing of the model.

Mr. Guo: I'd like to add something. This kind of methodology will try to start from Black-Scholes, a risk-neutral world. Recently, the study tried to borrow this methodology, and the credit world.

There is some work done by Duffie and Singleton, by Jarrow and Turnbull, and also recently by the original organizer, David Lee. Since it is a credit market, there are a lot of credit instruments that are very liquid already.

You can have a very liquid curve using those liquid bonds to build several credit-spread curves. You build a model that tries to simulate the spread, like you simulate a risk and mutual interest rate. You want to build this kind of spread to try to fit each of the curves. If you establish a distribution that allows you to fit the curve, then for your first step, you call it a risk-neutral distribution disregard. Actually, it's not risk neutral by definition; it's a risk-adjusted distribution that allows you to fit the current credit spread curve.

This is the same idea as an interest rate derivative methodology by Fitzgerald Martin, or Hull and White. They try to take the current interest rate curve, like the U.S. Treasury curve, as given, but they don't ask where this curve came from. They just say okay, suppose your fundamental market produced this curve. I take it as given, as rational, and I try to build a spot rate to fit your curve, so that is my model.

Then I price derivatives on top of that, and certainly a lot of the derivatives are redundant products. When you price a derivative, you want to find your derivative is not arbitrated by the underlying market. Here is the same idea; you build a model that replicates the current credit risk. That's the first step.

Second, you can put your data in the model set. There is a mathematical mean which is my value of the credit option. Certainly, I can replicate this product in the cash market, but it's easier said than done. This market is still actually not easy to hedge; neither are a lot of firms, actually.

From the Floor: What form do these products take? Do they take the form of something like a notional amount? Are the credit spreads locked in at a certain time and reset every quarter to some spread?

Mr. Ramachandran: Usually there are sort of customized contracts, so there is no standard form that you can have. You negotiate the agreement between the counterparties. I think the question you are asking is that usually you would start with, for instance, on a spread option, a current spread. Then you have a strike spread. You would set a time period for the expiration of the option, and within that

time period, if the spread moved outside the range of the option, then you would trigger that.

The same thing is true with a default. Once you define what that triggering event for a default is, should that happen, then the counterparty is responsible for making whole the payment.

From the Floor: I was wondering if the credit market has gotten to the point yet where it's kind of generic?

Mr. Ramachandran: It's not generic.

From the Floor: You said one of the motivations for total return swaps is balance sheet management, so if my equity exposure is too high, I enter a total return swap where equity total return; does that really change my balance sheet characteristics?

I can understand, from a risk management point of view, that you can think of yourself as reducing your equity exposure, but from a statutory balance sheet, risk-based capital (RBC), all of those kind of perspectives, have you really changed anything?

Mr. Ramachandran: You have not changed it from an RBC viewpoint, because that's still on your book. But it does change from a pure asset management perspective, because you no longer have that exposure. You might still have to carry an RBC value or an AVR/IMR value on your statutory statements.

From actual management of the assets, it's not on your balance sheet. It also allows you to do something else. As in an example I'd given, where you are locked in because the agencies were under water and they couldn't sell it without realizing the losses, it allowed you to move out of that and into other sectors that they couldn't get into.

From the Floor: I wanted to touch on insurable interest. It seems to me that every company has potentially so much credit ability. For single companies, will this somehow affect their credit rating or their ability to get credit?

Mr. Ramachandran: The question was, Can you buy a lot of swaps in a single security, or in a single company, and affect the credit rating of that entity or the underlying assets? I don't believe you can do that.

What it would affect is the financial health of the party that is buying, or the financial health of the counterparties that are involved. This is because the swap itself is only referencing the underlying asset.

What the moral hazard is, assuming neither the payer nor the receiver owns the underlying asset, is that there is no effect on the underlying asset. The issue becomes whether you place your company at risk, because you are getting into

transactions to boost your returns, for instance, without taking into account the risk to which you are exposing it. The moral hazard is on parties involved in the swap transaction, not necessarily that on the underlying asset.

From the Floor: To answer the previous question, it is a balancing issue. I cannot speak with certainty on a U.S. basis, because I don't have that much background in that. But on a Canadian basis, when your asset returns change, because you're using current valuation, same thing as cash present values, your yield has changed; therefore, your liabilities have changed; therefore, your balance sheet has changed. At least in a Canadian environment, I believe you have changed it.

Mr. Ramachandran: I think the original question related to what is actually listed on your balance sheet.

From the Floor: The liability is on your balance sheet. You are going to show that current value, future cash flow is on a different yield; therefore, you're changing your liability.

Mr. Ramachandran: You're talking about valuation of liabilities based on the return on the asset. I couldn't comment on that, since I don't deal with liabilities.

From the Floor: I think that is a great point. My question was kind of narrow in a sense: What is really on your balance sheet?

From the Floor: Don't do anything if it doesn't affect your balance sheet or income statement. What is the difference if the company takes credit risks, whereas another company does not? There are investors looking at it. What are they looking at? You have to change at some point or it will affect the balance sheet. At least, again in a Canadian environment, it definitely affects the balance sheet.

Mr. Guo: You might be in a bad market, or in a market of your absence, if you have reduced your credit, your assets become more valuable. I just cannot see that you do all this work and your balance sheet has not had any change. It just doesn't make sense to me.

From the Floor: It is possible to have dialogue with credit agencies about some of these matters so that you can modify your approach and compare numbers on the balance sheet. You can analyze what you simply see as the results in some different experiences. How deep is the market for high-yield total return swaps?

Mr. Ramachandran: The question was, What's the depth of the market for high-yield total return swaps?

From the Floor: To what degree can a company really enter into a high-yield total return swap? How much yield can it expect in a relatively short period of time?

Mr. Ramachandran: I don't have those numbers.

Mr. Guo: This market is not larger than \$100 billion, with about 50% of the issues being done by J. P. Morgan. J. P Morgan is a big trading house. It tries to promote this on its Web site, called Creditex.com. It tries to place this trade on the Web. I don't think this is very liquid. Wall Street can do that.

From the Floor: Suppose I have a bond portfolio that's said to yield 6%, whose secured size, if you would break it up into sections, maybe picking up some additional yield because of the shape of the yield curve. I know there is no such thing as a typical transaction, but in general, do I have to pay in terms of yield? Do I come up ahead or behind within a normal range? How much would it cost me to secure? Do I come out ahead?

Mr. Guo: His question is, How much will it cost to securitize? Normally, investment banks will charge a fee of underwriting on the structures, and also in this process the rating agency and the legal firm will charge fees. An investment bank will normally charge a different equity piece. It will charge about 5%, Mezzanine 2%, investment grade probably 50 basis points, overall 1–2%.

The transaction cost of this kind of CBO sale to start with may cause you to lose 1–2% of the note from day 1, when you start the business. Hopefully, the yield will pick up. On average, this pool gives you a yield on a high-yield bond of about 12–13%. It gives you a spread, over U.S. Treasury, about 5–6%. Hopefully, with that kind of cash flow, you would lock in about 6–12 years. During that period, hopefully, the default is not enough to wipe out your equity, so you actually build up your principal in the later stages.

The key thing is a passive investment so you get two economic benefits, diversification and overall default of the credit market you are looking at with 10–15 years at X%.

Moody would say single B rated over 10 years. On average, you lose about 2%. Now you will be paid about 6%. There is a 4% credit spread buffer to help you each year. Suppose the credit expect loss goes to 4%; you are still covered.

If you get above 6% now you will have very bad economics. It isn't bad on the credit spread, and the real world expects loss in the future.

From the Floor: With a narrow market, these transactions can be dealt with either by individual security or an index. What is typical? Is this typically somebody trying to weigh the risk of a small number of securities, or is it more against an index?

Mr. Ramachandran: What we've seen is that it's usually somewhere between an individual security and an index. When you are trying to hedge away, you end up having a company that has an overexposure in a certain area, and it wants to reduce that exposure. It's not completely an index, but it's more than a single

security the company is trying to hedge away. Usually, when you're assuming that you're hedging away from agencies into a mortgage, you're going into an index.

From the Floor: Either party has to own the security, is that typical? Is it typical for a company to say it has overexposure and certain below-investment grade bonds, and it wants to hedge away that risk, or does the company want to hedge away the whole investment market risk?

Mr. Ramachandran: An excellent example that I've used is that it is not usually companies with exposures into high-yield debt, but rather companies that have an overexposure in a certain sector within the investment grade, and they want to diversify that out. Or if a company wants to get into a sector without necessarily having to invest in getting into that sector, you can do a total return swap into foreign equity, for instance. Then the company does not have to worry about actually buying Japanese stocks or European stocks and then having to follow that.

In the cases I've seen, it's been at an investment grade level which was receiving overexposure, not in a high yield. Usually, when companies decide they want to break down and actually get into high yield, they get into high-yield debt.

From the Floor: In the case of credit default swap, I think the buyer pays the fees to the seller for protection in case the bond defaults. Now if the swap tries to correct, it seems to me that the fee paid should be the credit buyer. Why go through trouble to find the bond protection, and you could probably save some transaction costs?

Mr. Ramachandran: It's a present value of the spread, right? I mean you are assuming you get into a spread product because you want the spread. That is, you want the extra return. You are buying the insurance to cover in case it defaults. Obviously, you are not going to pay \$100 for a \$100 insurance policy. The cost will be less. It is a question of where that trade-off is and how much risk you want to assume.

From the Floor: It seems to me that the cost should be exactly the credit spread.

Mr. Ramachandran: If you look at not just one single default, but if you look at it in terms of a diversified, you can diversify that out a little bit and get less than just a pure default. Think of it just like insurance; if you are insuring one person, obviously, the cost would not make sense. However, if you are insuring a million people, the costs are justified.

From the Floor: We talked about some of these hedges being put on for fairly lengthy time periods; these are not just one or two hedges, I assume. If that's true, what kind of markets are there to take these hedges off? Do you have to pay a high price to unwind it?

Mr. Guo: The question is how to unwind the hedges. While there are actually some cancelable features, the product can be very structure oriented, so if you are the first to start, you want to have some options to cancel it. You can cancel it,

but with a price. There are flexibilities that allow you to cancel it, or options that kick in at a certain point, options to get an interest rate probably like a swap, or whatever. You have the option to carry a total return swap or default swap.

From the Floor: In the market, can somebody buy out your position?

Mr. Guo: This is very difficult. I think you have to do this with an investment banker, and this market is not very liquid. It is just as if I buy an insurance company from you; how much do I have to do to sell it back to you? For that question, a lot of people have not tried to sell the spread, but they actually try to buy it. You'll find a lot of investors buy a total return swap with the idea that you can go buy the individual bond, for sure, but if you buy the bond, you buy the interest rate and credit risks, which are also put on your books.

To bypass this, you can buy a total return swap or credit spread swap that has two impacts. One impact is a derivative product, so you may not need to put on your book. The second impact is you are betting on a credit risk.

Suppose you don't want to take interest rate risk. If you buy an individual bond, you are taking interest rate risk and a credit risk together. Here it helps you to separate; if you have a wheel of credit risk, you go to bet on your credit risk.

If you don't want to bet on interest rate risk, then this credit default swap will actually help you. I think that is another reason that targeting risk is important to consider.

From the Floor: If spread has widened because of demand for Treasuries, which are narrowing in supply, doesn't the money that institutional investors were putting into Treasuries, at that point in the yield, have to go somewhere, maybe create demand for some of these credit spread instruments, and narrow the spread on those instruments?

Mr. Ramachandran: Could they create other products? At the moment this is a transitional phase; people certainly haven't figured out what to do once Treasuries go away. It is still adjusting.

There could be new stuff that comes in, and you could see that going away. At the moment, companies and institutions are just figuring out what to do with it, and this is going to stick around for a couple of years. Of course, there is always the chance that the federal government will manage to get us back into debt.

From the Floor: Have you guys speculated at all about where the money is going to go that was going into those Treasuries?

Mr. Ramachandran: No, not at the moment.

From the Floor: Can this be used to help a company maintain its current credit rating? Is there some way you can apply a credit derivative on your company?

Mr. Ramachandran: The question is, Can you use these to maintain a credit rating? The answer is yes. The example going around, where the company was overweighted in callable agencies, so it had negative convexity, and it was taking hits both when rates went down and the values went down, when the rates went up. The reason it had gotten into callable agencies was for yield purposes; but if rates went up, then the company got called against it both ways. One of its big concerns was that if either case happened, they were going to get exposure, and their credit rating was in crisis.

Going back to a comment earlier, even before we got into these transactions, we were able to talk to a couple of rating agencies and point out to them, in fact, that putting the swap on is beneficial to the company, as opposed to staying where they are. Even though that doesn't show up explicitly on the balance sheet, we were able to show that it is a better deal to put on a credit swap than it is to maintain the position that they were at.