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Summary: Panelists will provide guidance and suggestions in modeling certain forms of an insurance company's assets. Among others, these assets include equity and equity-linked notes, nondollar investments, real estate, commercial mortgages, and asset "pools."

Mr. Gregory J. Roemelt: The last four or five years in Tillinghast have been spent mainly on asset modeling related to cash-flow testing, solvency issues, and appraisals and embedded-value analysis. We spend a great deal of time in the Chicago office building asset and liability models; I have had a lot of responsibility for doing the asset portion of that work.

David White, who will be speaking on modeling commercial mortgage-backed securities (CMBS), works in the Dallas office of KPMG, Peat Marwick. David has worked there for two years. Prior to that, he worked in the insurance industry. David has spent most of the last two years building asset models for Peat Marwick.

I'll be talking about asset-backed securities (ABS) and trying to model those types of assets.

The asset-backed security market has developed significantly over the last ten years from about a \$10 billion market in 1985 to well over \$90 billion in 1995. As you can see, the growth has been rather dramatic, especially in the late 1980s and early 1990s. There has been, I think, a couple of reasons for the growth in this market because of both the borrowers, the actual issuers of the security, and the purchasers of these securities. There are significant advantages that accrue to both sides, and I think that's one of the things that has driven the increase in this market.

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The Lehman Brothers Asset-Backed Security Index has outperformed both the Lehman Brothers Government Corporate Bond Index and the Lehman Brothers Regular Government Bond Index over the past five years. Even though the duration on all three indexes is about the same, there is a much better overall return on the asset-backed index than you have on the other bond indexes.

From an investor's standpoint, there are many different reasons why these securities are appealing. First of all, there has been a significantly better return on these securities than many of the other sectors in the security market. Second, the asset-backed securities are usually structured to have a fairly high rating, an AAA-type rating. So from a default standpoint you have a high-quality security, and from a risk-based capital standpoint, it provides value to insurance companies.

Another point that appeals to investors is that there have been no rating downgrades on asset-backed securities. So the investors can be fairly confident when they purchase an AAA security that it will stay that way. Another key issue is there have been no losses. No one has taken any default loss on an asset-backed security. There is a liquid market for these securities. Finally, especially compared to collateralized mortgage obligation (CMO) securities, the cash-flow patterns of asset-backed securities are relatively predictable. Of course, compared to CMO securities, many things are relatively predictable.

From the lender's standpoint—the people who are actually structuring these asset-backed securities—there are also many advantages. First, it gives lenders a way of doing borrowing at a lower cost. Second, it allows companies to remove these assets from the balance sheet. David will talk about commercial mortgage-backed securities, which are similar to asset-backed securities. The reason that many of these have been structured is to remove some of the commercial mortgages from the company's balance sheets so that they can allocate them to a trust and no longer have to worry about the risk-based capital implications of having them on the company's balance sheets.

Another advantage to the lenders is the predictable tax consequences associated with the asset-backed securities. Finally, it gives the lenders another source of funding. They don't have to go to just the bond market or just the capital market. They have another way of getting funding for the corporation. Asset-backed securities are backed by a variety of different types of collateral. Auto loan companies like General Motors Acceptance Corporation, Chrysler Finance, and Ford take their auto loans, securitize them, and create asset-backed securities out of those auto loan receivables.

Another large portion of the market is credit card receivables. I don't know about you, but it seems like every day I receive another application for a credit card. One of the reasons that there's so much credit card debt available is the credit card companies are taking their credit card receivables now and selling them off in the market and then giving themselves the ability to issue more credit card debt. That's one of the reasons why you keep getting all of these Discover card and Visa card applications in the mail.

Another source of collateral for asset-backed securities are home equity loans, loans that people take out on the equity on their houses. These are also being securitized. There's also manufactured housing loans. I used to call these trailer parks but, at some point, the trailer homes got changed to manufactured housing. Finally, they've even secured things like boat loans and recreational vehicle loans.

I just wanted to go through a quick asset-backed example and look at how a corporation that's looking to get some funding can use asset-backed securities as a methodology for generating that funding. Let's say, for example, Chrysler Finance wants to raise \$100 million. It has a couple of choices. Chrysler Finance is a BBB company, so it can issue a BBB paper. Or, if it's looking for a cheaper way of doing it, Chrysler Finance can take some of its existing car loans, securitize them, and issue asset-backed securities off them with a higher rating than it could if it just went out and issued regular paper. And the way Chrysler Finance will do that is that it will take a segment of its loans, \$100 million, and allocate that to a trust. And it's very important that it allocates the assets backing the asset-backed security to a trust so that any event at Chrysler, like a bankruptcy or a foreclosure, will not impact the asset-backed securities. By moving the securities from the company into the trust, the securities can be rated independently of the company, which is a very important part of the asset-backed structure.

But the problem with the securities themselves, if you look at the auto loans that are supporting these asset-backed structures, is that they wouldn't in themselves receive an AAA rating. In order to make the securities that are going to be issued and supported by these auto loans rated AAA, Chrysler will have to provide some credit enhancement. And there are a variety of ways of doing credit enhancement. We'll get into a few of them later on. But the method that Chrysler chose in this particular example was to create a subordinate structure. Instead of allocating just \$100 million of loans over to the trust, it allocated \$109 million of auto receivables to this trust so that it could provide for any default experience. Why was \$109 million allocated? The expected value of defaults on this loan was about 1.5%. In order to receive an AAA rating, Chrysler was required to provide credit enhancement six times in excess of the expected value of defaults, which, in this case, turned out to be \$109 million.

What's going to happen is the \$100 million of Class A certificates, the ones that are subordinated by the Class B certificates will receive an AAA rating. The class A certificates can withstand six times the expected value of defaults because any defaults that occur are allocated to the B securities first. Because of this, the A securities are almost guaranteed to receive all their principal and interest, and thus an AAA rating. The B securities will have a lower rating. They could also have some sort of credit enhancement associated with them, or Chrysler could actually keep the securities themselves in a subsidiary. So Chrysler could actually pass on the \$100 million of loans out to the market through these asset-backed securities and keep the default experience for itself.

The various types of credit enhancements that are used with asset-backed securities include subordination, as we just saw, and excess servicing. Excess servicing is the difference between the coupon payment on the collateral and the coupon payment that's actually passed through to the holder of the asset-backed security. So the person out there paying 18% on his or her credit card is actually providing some buffer, because the coupon getting passed through to the holder of the asset-backed security probably has more like a 7% or 8% rate.

Another credit enhancement that was more common in the early years of asset-backed securities was either a letter of credit or a financial guarantee. The creator of the trust purchases a letter of credit from the bank or gets some sort of financial guarantee that makes the trust whole in case of any defaults on the assets backing the trust. A couple of other methods exist as well. One would be over-collateralization. That's when more assets are provided to the trust than issued against it. So you could have more assets in the trust, and they would provide a buffer against default experience. The second is an actual reserve fund where, as part of the creation of the trust, cash would be provided to the trust by the creator to support any defaults.

I want to describe three different asset-backed securities: a home equity loan deal, a manufactured housing deal, and a deal based on credit cards. I want to look at the structure, and look at the cash-flow patterns. As an actuary trying to create an asset model, look at what the key considerations are. Then I create an asset model, trying to model the cash flows on the various classes of these securities.

The first deal that I want to look at is a home equity loan asset-backed security. This home equity loan pool was issued by Advanta Home Equity Loan, which set up a trust in 1992. Two different pools were pulled together: one was a home equity pool that was secured by first mortgages; the second pool was secured by first, second, or third mortgages. In this particular deal, there were two classes: a class A-1 structure that was supported by the first pool, and a class A-2 structure that

was supported by the second pool. It almost turned out there were two separate securities embedded in this structure; two different pools supporting two different sets of securities.

This pool was set up with payments guaranteed by certificate insurance policies. In effect, the people who created the trust went out and got a financial guarantor to guarantee the payments of the principal and interest. The policies that ensure the payments are noncancellable policies issued by an insurer. The amounts payable go to the trust in lieu of any default on the home equity loan. The way the premiums are paid to the insurer is through the excess spread—the difference between the average coupon on the mortgage pool, which is about 12.5%, and the actual coupons on the certificates themselves, the coupons on the asset-backed securities, at 7.5%. That 5% difference was used to pay the premiums to the insurer so that in any default, the insurer would make the trust whole. The trust would pass through that cash to the holders of the certificates, and the certificate holders would not suffer adversely from any default experience on the home equity pools.

If you are an actuary trying to build a cash-flow-testing model or trying to do an appraisal like we do at Tillinghast, and you come across one of these assets on the balance sheet, the key concern is trying to replicate the cash flows that the insurance company as owner of the asset is going to experience. For this specific security, each certificate was backed by the pool. The A-1 certificate was backed by pool one, the A-2 certificate was backed by pool two. And each of those will act as pass-throughs. The principal and interest will be passed directly from that pool to the holder of that certificate.

When we're trying to model these types of securities, it becomes similar to modeling a regular pass-through security, a Ginnie Mae or Fannie Mae pass through. We want to model the scheduled principal payments, any prepayments, and any defaults. In effect, if there's scheduled principal, it will pass through to the holder of the asset-backed security. Any prepayments, which are unscheduled principal payments, also will pass through to the holder of the security. If there are any defaults on the pool, that amount is going to be made whole by the insurer and will also pass through to us.

We need to have a prepayment function that's not driven only by interest rates, which, obviously, is not going to be as sensitive as a normal residential mortgage pool prepayment function. We also need to have the ability to protect defaults, because we will see principal payments equal to that default level. So we're trying to model the security. We'll model the principal payments that come from the pool, we'll model prepayments, and we'll model defaults. And those amounts will actually come through to the asset-backed security holder as principal paid out.

Along with that, we'll receive our regular coupon payment on the outstanding balance until the entire principal is amortized. So, in effect, these behave similarly to pass-through securities with slight differences in how the principal is going to pay through to the holder of the certificate.

Our second example looks at an asset-backed security based on manufactured housing. Merrill Lynch investors had taken \$163 million of manufactured housing loans, loans that are actually mortgages on trailer homes. These mortgages had about a 13% coupon, and Merrill Lynch had broken this down into a three-structured deal a Class A structure with a 7.65% coupon, a Class B structure with an 8.55% coupon, and a residual structure. The residual received the cash flows not allocated either to the Class A or the Class B structures.

The credit enhancement on this deal was to subordinate the Class B to the Class A so that any default experience would be hit against the Class B first, preventing Class A from getting hit with default experience, and allowing Class A to have the AAA rating. Class B itself had some additional credit enhancements including the excess servicing, the difference between the 13% and the coupon rates on the Class A and the Class B. And there was also a reserve fund that was established when the trust was established that would help support Class B in the case of any default experience. I think the quality on Class B ended up being BBB, so there was enough credit enhancement on the Class B certificates that they also ended up being investment grade.

From a cash-flow-allocation standpoint, if we happen to own the Class A, what we need to do, first of all, is project our coupon payments based on our standard principal. We also have to project principal payments, regular and prepayments, and then, finally, any foreclosed principal would also be allocated to us from Class B. So, again, similar to the home equity loans we just looked at, we have to project principal payments, principal prepayments, and defaults because that's the amount of principal that we're going to see as our principal pay-down.

Class B, in this deal, worked a little bit differently. Instead of actually receiving principal pay downs, the class B owners were receiving a portion of the excess interests and that was being used to amortize their principal. In this case, the excess interest was 250 basis points of the excess servicing. So 250 basis points of that difference between the 13% and the coupons was being used to amortize the Class B principal. If default that was experienced on the assets supporting this particular ABS reached a certain level, and I think it was 3% in this deal, 100% of the excess servicing was then used to pay down the Class B principal.

In these deals, because you're using interest payments to pay down principal, you end up with, as time goes on, an overcollateralized asset-backed security. Because you're using the principal payments and interest payments to pay off the principal that's supported by the asset-backed security, you end up with a greater level of protection as you go into the future as long as default experience initially is good. In this particular deal, I think the Class B certificates were actually upgraded to A after about three years, because default experience was good enough that the excess servicing on the asset-backed security collateral actually paid down the Class B fast enough that the overcollateralization of the entire deal provided enough credit enhancement to upgrade the rating on the Class B to A. If you will remember, the Class B had the reserve fund. Once the outstanding balance on the Class B certificates reached a level equal to the reserve fund, the entire reserve fund was used to retire the Class B. At a certain point in time, once the reserve fund and the outstanding balances are equal, the reserve fund retires those securities.

If we're trying to model this specific deal, we have to decide how the cash flows will get allocated to the various classes. If we happen to own Class A, we're going to model principal payments and defaults because that's the principal payments we will see. To do that, we will have to look at a different prepayment function than we would normally see on something like residential mortgages. Obviously, people who buy manufactured housing are less sophisticated investors than people who get regular residential mortgages. So the prepayment function is not nearly as sensitive to interest rates as a standard Ginnie Mae or a Fannie Mae would be. The other item that we have to consider is historical default rates because, again, when defaults occur on this business, we will get principal passed through to us as if it were a principal pay down.

If your company happens to own Class B, it could be a little bit more difficult trying to model these cash flows. Initially, the excess servicing of 250 basis points will be fairly simple to model. Trying to determine when that trigger point occurs, when 100% of the excess servicing will get passed through, will be a little bit more difficult. Finally, trying to decide when the reserve fund is equal to the outstanding balance will also be challenging. One nice thing is that insurance companies tend not to own subordinate certificates. They tend to be the ones that are harder to model. But if you do own subordinate securities, modeling these securities gets to be a little bit more of an art and less of a science.

The final deal that I wanted to look at was based on credit card receivables. This was a Discover card deal. Discover card had \$778 million of credit card receivables that it allocated to a trust to create an asset-backed security: \$550 million of Class A certificates, \$50–\$55 million of Class B certificates, and \$173 million of what's called seller interest certificates. I'll explain how those work in

just a minute. The credit enhancement on the deal was very similar to the credit enhancement on the manufactured housing we just looked at. Class A was supported by Class B, so that any default experience was first allocated against Class B. Class B was enhanced through the excess servicing, the difference between the 18% on the credit card and the pass-through rates. Finally, there was also, I think, a \$43 million reserve fund on this specific deal that was used to support Class B.

The cash flow allocations for the credit card deals are a little bit different than anything else we've looked at so far. The interest that's paid to the Class A certificates during what's called the nonamortization period comes from the finance charges, the 18% interest that people pay on credit cards. As long as there's enough interest being generated by the \$550 million of assets in Class A, that interest is used to pay the Class A coupon. If not enough finance charges are being generated by that \$550 million, Class A has the right to hit Class B's finance charges to make them whole for those interest payments. And if there's not enough there from the Class B finance charges, Class A actually is able to hit Class B's principal to make Class A whole for those interest payments.

If, during the nonamortization period, there's actually anyone who pays principal balances on their credit cards, that principal is not allocated to the holders of the Class A certificates. Instead, that principal payment is allocated to the holders of the sellers' interest, and the actual sellers' interest is reduced by the amount of those principal payments, and an amount equal to that is transferred back into the Class A certificates. So during the nonamortization period, the outstanding balance of the Class A principal doesn't change. It's the decrease in the sellers' interest that occurs during that time.

Usually these deals have a caveat in the prospectus that allows the seller to transfer additional receivables into the deal so that as principal payments occur on the credit cards, instead of paying down the Class A or the Class B, the creator of the trust, in this case, Discover Card, will allocate additional receivables into the trust. There are certain caveats, such as the receivables have to be similar in nature to the ones that were originally used to establish the trust. But what's really happening is that Discover Card is actually providing new receivables into the trust as principal pay downs are occurring on the credit card receivables.

For Class B, the nonamortization period, the interest is payable from the finance charges. Any allocations that were made from Class B to support Class A are covered, first, by excess servicing to the extent that it's available, and if actual reductions in the principal balance occur, then those reductions are funded through the reserve fund that's established for exactly that purpose. Once we hit the amortization period, the actual pay downs of principal are scheduled out in the

prospectus, and the interest payments themselves are calculated identical to the nonamortization period. But the principal, to the extent that it's available and, again, if there are not enough principal payments coming from the asset-backed securities, is similar to a tax security and a CMO in that if you don't have enough principal to make the scheduled payment, you make as much as you can, and then the principal payments get in arrears.

As I mentioned, the amortization period is defined in the prospectus. So it could be, for example, five years from the issue of the original asset-backed security. Usually the pay-down period is something along the lines of a year with principal allocated, first, to paying off the A class of securities, and then paying off the B class of securities. But one thing that does make these deals a little bit more complicated is that there can be an amortization event. This is an event that actually starts the amortization period early. A couple of things that are built into the agreement—a violation of the agreement, or a bankruptcy, insolvency, or receivership of the people who originally established the trust—can create an amortization event. Obviously, these are less likely events.

A couple of things that could happen is, one, if as those principal pay downs come in and the sellers' interest is reduced, and the person who created the trust does not allocate additional receivables into the trust, the sellers' interest could fall below a predefined level. And once that happens in an amortization event, it begins. In other words, the asset-backed security starts paying out principal based on the amortization schedule. Second, if the aggregate receivables in the entire trust fall below a different predefined level—the same sort of thing can take place.

From a modeling standpoint, as long as we can ignore the likelihood of an amortization event, we know when the amortization is supposed to take place. We know the amortization schedule. So, in effect, we can model them like sinking-fund bonds. We don't have to worry about prepayments because any principal payments that are allocated into the asset-backed securities probably will be supported by the transfer of additional receivables from the creator of the trust. But, again, if that doesn't happen, we could have the amortization event. And then, finally, one of the methodologies for looking at how default experience could affect it is looking at a stochastic process for defaults.

I think the process of modeling these securities is significantly easier than trying to model CMOs, mainly because there's not nearly as many classes associated with the asset-backed securities. Again, though, the key is getting information about the securities. There's a few big deals that I've referenced. I went through the prospectus to see how the cash flows were allocated. Obviously, there's certain structures that are consistent across all the different deals but, at the same time,

every deal has its own unique feature. So it's important to get information about the security.

In an asset-backed security, as opposed to a CMO, we're tranching up the default risk as opposed to just tranching up the prepayments. In a CMO, we allocate principal payments based on a series of tranches. In an asset-backed security, we're allocating default risk. So we're allocating more default risk to the B tranche, supporting the Class A tranche, and getting a Class A security. What it really comes down to is you want to do stochastic analysis. It's not nearly as important to do the stochastic analysis on the interest rates as opposed to the defaults.

Mr. David Lawrence White, Jr.: One of the things that I didn't realize until I was speaking with Greg was how similar our presentations were going to be, even given the vastly different collateral. In thinking about this, a quote from Eugene O'Neil came to mind: There's no present or future, only the past happening again and again. I feel like that's what we're experiencing with these on-going collateralizations.

Generally, if there's a large commercial loan portfolio, investors have a number of different strategies that they can use in managing that. They can hold onto the loan, sell the loan, sell the portfolio, do their workouts and restructures and foreclosures, or they can securitize the block of loans. What I want to talk about is the securitization of these commercial mortgage portfolios. They are securities that are backed by commercial mortgage whole loans collateralized by income producing properties—retail, office, apartment complexes, and so on. We will go over the market overview, look at some differences between commercial mortgage-backed securities and residential mortgage-backed securities, and also differences within commercial mortgages themselves, look at the risk factors that are there, and then try to develop a set of modeling issues, and then go over examples as to how this is being played out.

The market for commercial mortgage-backed securities had started probably ten years ago, but really got its kick in the late 1980s to take care of the savings and loans (S&Ls) in a bail-out situation. They were bringing to market many commercial real estate loans that had been in these failed S&Ls. And so, at that point, with all this effort being pushed, it was the beginning of the market. People who are coming out right now with these are probably the biggest market share in terms of the types of issuers. By the way, the Resolution Trust Corporation (RTC) pulled out last year. It was the end of its existence. Probably 25% of the market is held by conduits, which are organizations that just buy loans, put them together, and then collateralize them. Roughly equal amounts are issued by portfolio investors, insurance companies, investment banks, developers and so on at about half that

level. So there's really a broad base of issuers that are out there. Commercial banks haven't done much recently, but I think they're beginning to pick it up.

A good number of the issues, though, were trouble loans. Companies have bought loans that were in trouble, tried to work them out, and then resold them. The collateral types I mentioned a little earlier include multi-family apartments, office complexes, industrial complexes, retail, and health care. Also, there are some mobile homes that are put into the commercial mortgage-backed portfolios as well. The volume, right now, is roughly the same as Greg was talking about for asset-backed securities. It's probably at \$100 billion or so. They'll be writing this year another \$12 billion. So it's somewhat similar in size to what's there.

The market, though, is becoming more efficient because of increasing competition. During the early 1990s, people were pulling out of the commercial loan lending business and are now beginning to come back in. So that's narrowing spreads. This narrowing of spreads has also given the commercial mortgage-backed securities better performance over the last three or four years compared to regular corporate bonds of the same maturity type.

The commercial mortgage-backed securities offer the borrowers a more standardized and economical lending mechanism so that they get access to the capital markets. Insurers are getting into this over the last several years with their own portfolios because of the nature of the markets growing, and how fast they're growing. It's almost a migration for insurance companies trying to move assets from Schedule B to Schedule D, moving it from a commercial loan with its higher capital cost into a security and getting much more favorable capital treatment and liquidity at the same time. Actually, there's also an issue coming about where the rating agencies are punishing the industry for its commercial loan exposure. This is getting that issue addressed as well.

The risk-based capital impact involves going from a commercial mortgage in good standing to an NAIC category one security. There's about a factor of ten difference there, I believe. The market, right now, comes in spurts. There is some lack of appeal at times, I think, on the buyers' part because of the relative lack of liquidity compared to corporate bonds or treasuries—the most liquid markets. You do have more liquidity than you have with the commercial whole loans, but there's much less in other areas of the market. There's also some uncertainty surrounding these assets, and there's not a very big secondary market. The bonds are often priced at a discount, and this all goes together. People don't really have a good understanding of what is behind the commercial mortgage-backed securities. So this lack of understanding has led to spreads seemingly in excess of what's required for a reasonable default piece here.

There's more liquidity in the investment grade classes than there would be in either the single B or double B classes, and I think this will be addressed by taking these poorer classes, and putting them together, recollateralizing them, and selling them again. In the CMO world, the generic name for these are kitchen sinks because you can throw everything into it but the kitchen sink.

The typical deal that you would see right now is roughly a \$200 million deal. Loans are generally \$2.5 million. There's a good bit of credit risk in the collateral but, because of the securitization, that credit risk has moved into some lower classes. When you get a rating on the mortgage-backed securities, the credit risk approximates the corporate rating. So if you have a AAA class, you would expect to see the same kind of defaults as you would for a AAA corporate. Obviously, there has been no long-term studies that would indicate that.

The sophistication that's required for analysis, I think, may be one of the leading factors, and that's probably a big divergent point between the commercial mortgage-backed securities and the asset-backed securities that Greg was talking about. These are, in general, a little more difficult—a little more sophisticated to model because you have many different types of collateral to consider within a certain deal. The spreads, right now, between the various tranches in a deal have tended to be tight, and, I think, this is because of some competition that has been coming in, more players coming in to securitize and buy the securities. Right now, the commercial mortgage-back securities look much like regular CMOs, which is a little bit unfortunate, I think, because the collateral is so much different. You don't necessarily have the same kind of complex structures that a CMO would have. You're putting in different collateral, but having a CMO-type structure.

In comparing commercial mortgage-backed securities and residential mortgage-backed securities, the residential market is a little bit more liquid than the commercial market. That's due to the wide variety and similarity of home loans that have been written. Also, the home loans tend to be much more homogenous in that a great deal of refinancing activity occurs at a certain time. In the mid 1980s, there was a great deal of refinancing; the rates came down. And 1992 and 1993 had much more. Probably 70% of the issues of residential mortgages at that time were refinancing. So you're getting a more homogenous kind of situation there.

The second key area of difference is data availability. On the commercial market, they're not exactly readily accessible. You're almost reduced to having to read a prospectus and trying to understand it. Whereas on the residential market you can get other data sources, third-party providers, and so on, that have substantial databases that help you understand the type that you have there.

The third area I call lumpy collateral. You have a great mish-mash of carved-up credits. The number of loans would be much less than a commercial mortgage-backed security. The risk is more highly concentrated. The collateral is not homogenous. There really isn't any such thing as a standardized loan. In the residential market you have conforming loans and nonconforming loans, and most of them are conforming. There's really not that same concept here. Within the collateral you can have performing and nonperforming loans, balloon or bullet loans, and it all basically comes down to having more risk in the commercial mortgage-backed securities.

The options are a key difference, I think. On the residential mortgage side your biggest risk is the prepayment risk. On the commercial mortgage-backed securities your biggest risk is not prepayments at all. Most of the loans are written as balloon or bullet loans, between a five- and ten-year time frame, with the idea that they would generally be either sold or refinanced. So the risk that you have is that it's going to be extended beyond the original agreement.

The last area of difference would be in the credit risk. As Greg mentioned, it's very similar here. With commercial mortgage-backed securities, rather than tranching the prepayment risk as a residential mortgage-backed security would do, you would tranche the credit risk. There's very little credit risk in the residential market because of the government entities that are involved in providing guarantees. Even the whole loans for the residential market have some kind of subordination of credit enhancement in them. But there is a good bit more credit risk in the commercial mortgage-backed market. Commercial loans are almost always nonrecourse loans whereas when you sign a home loan, they can almost always come after you for other assets if the loan goes into default. That's rarely the case with commercial loans.

When comparing securitized assets versus whole loans or commercial mortgages, there is a liquidity difference. I think you could say that the commercial mortgage-backed securities are arguably more liquid, especially with the senior tranches. You have a higher investment grade. The risk-based capital treatment is much more favorable with the securitized portfolio because it is considered a security in Schedule D rather than a loan in Schedule B.

By buying different classes of commercial mortgage-backed securities, you can diversify fairly quickly by borrower, geography, and property type. For residential markets, geographic diversification is considered rather good. You don't want to get concentrations in certain areas because of the economy. I think for the commercial market, you still want to look at an economic diversification, even if it's

not necessarily geographically diversified. You want to get areas that really don't correlate with economic cycles very well.

You can argue that with the commercial mortgage-backed securities you have a lower cost of due diligence and acquisition.

So now we can discuss the risk factors that have to be evaluated when you look at this particular asset class. By far, the biggest risk is the credit risk. Generally, a special unit is set up as part of the trust agreement. A service performs the regular mortgage loan services of the portfolio. In some cases, a special service comes into play, only when it has to do something with either working outs, foreclosures, asset sales, or something. So it's possible that your commercial mortgage-backed securities could end up with a mixture of performing loans, foreclosed real estate, and things that are in between. From a modeling standpoint, this is an optimal situation to have to figure out what to do.

The default rates, as I mentioned earlier, are designed to be roughly equivalent to corporate bond spreads. But if you look at spreads to Treasuries right now, the commercial mortgage-backed securities are probably 60–80 basis points wider in spread than the corporate bond spread. I think that's due to a liquidity premium and probably a market risk premium as well.

Another risk that has to be considered is the extension risk. What happens if the maturity date is reached and you don't have the funds available? In other words, you have a scheduled pay-down for your classes—your different tranches. If the loan is extended for some reason, you don't have the anticipated cash flow to cover that, so you will have maturity dates that can be moving into the future. The liquidity risk and the market risk are somewhat similar in nature. I could think of liquidity risk as a run on the bank scenario from the liability side. Market risk from the asset side is if you are required to sell no matter what current market conditions are. Generally, you would set up your market valuation routines in the software to assume that there is always a willing buyer that's out there so you get decent spreads on the sell side.

Having reviewed this particular asset class and the risks that are involved, let's move on to the issues that have to be considered from a modeling standpoint. The issues that we've talked about would be data availability, the underlying collateral, (what does that look like), credit risk, extension risk, prepayment risk, and liquidity risk. An overriding issue would be materiality. In other words, how much of your portfolio is in this asset class, and how much time do you want to spend modeling it.

From a data availability standpoint, there generally isn't much way around either having a heartfelt conversation with your investment manager or reviewing the prospectus. There's not much good information that you can dig up in a summarized form from that. You may be able to get some information from servicing agents. Many times they're required to provide information on the collateral, as well as the loans that may be beginning to move into a risky situation. The other source is whether the insurer was the one who collateralized it, then, obviously, you have an inside track on the analysis of the data because your company had done that. But you must cover the issues of finding the data before you can really begin to do much analysis of the collateral itself.

Regarding the underlying collateral, you would want to know the type of property, where it's located, and the terms and structure of the mortgage loans that are written against the property. Are they balloon loans? Are they partially amortizing or fully amortizing? Are they adjustable loans or fixed? Generally, in the prospectus you'll find it described fairly well. In the one example that I have here, the prospectus described the top 15 loans in detail, and then gave information on the rest.

From a credit risk standpoint, there's a difference in looking at the law studies between a default risk and a loss risk, and what you really want to look for is the risk of loss. Many times, the studies will show an incidence rate or a default rate. But you have to combine that with the economic loss that occurs to get an idea of the risk of loss on it. This default assumption should include loss of principal, interest on delinquencies and restructures, and foreclosures. The average time from a delinquency to a foreclosure has been approximately a year, so you have years worth of interest to consider there, as well as a write-down if you have a foreclosure.

Compounding the problem of coming up with a default risk for the underlying collateral is that there's generally a long tail that exists between the time that an event begins to occur until it finally has worked itself out and you know its ultimate conclusion. It could take quite a few years to see it begin to work itself out.

The most common way to manage this default risk—Greg mentioned it a little bit earlier for the asset-backed securities—is to do a subordinating structure in the deal so that you have a senior class and then a subordinating class. That is, by far, the most common credit enhancement method for commercial mortgage-backed securities. The senior tranches have less default risk than a subordinated counterpart. If you want to visualize it, it's similar to a waterfall where the first step gets wet and then the second step gets wet, and so on.

The senior collateral gets first dibs on interest, and on principal that's coming in as well. So the typical order would be the cash flow from the collateral. The first thing that comes off of that would be any fees that are paid to the trustee and the service. Then you have the interest payments to the senior bonds. Sometimes reserves might be required. That would be funded next. And then you have principal payments to the senior bonds, interest payments to the junior bonds, and principal to the junior bonds.

For the underlying collateral for commercial loans, studies have shown that the best predictor of the default risk is debt service coverage. For residential loans that's generally the loan-to-value ratio. But here, debt service coverage means comparing the net operating income against the required interest on the loans. There's a big difference in default risk, or loss risk, actually, between performing loans and restructured loans. According to one study, the recovery value for performing loans was approximately 78%. So let's say you had a default. You would be able to, on average, come back with 78% of the original balance.

If a loan has been restructured, however, the recovery value has averaged 58%. So there's a much broader difference in the recovery values between performing loans and restructured loans. The current credit rating is a way of trying to encapsulate this default risk in the commercial mortgage-backed security itself. It's very common to try to get very high investment grade ratings—AA or AAA—on the senior tranches and then go down, but still remain investment grade with some of the others. The noninvestment grade pieces would either be retained by the issuer or sold off at a fairly steep yield premium.

My understanding from the major rating agencies, and one negative to the ratings that are going on now, is that there's no assumption of a capital event that occurs. So, for example, there's no assumption of property sales or refinancing. So if you have an extension risk come up, you have some extra default risk that wasn't exactly measured into the agency's rating itself. Also, I wouldn't say it's exactly for tranches to get re-rated. They're generally rated upfront and then they may or may not get reviews regularly. But even if they are re-rated, we still have a problem with ratings drift that occurs on corporate bonds as well where the risk seems to increase over time.

So the whole underlying issue with the credit rating is that you have to be sure that it's current so that any deterioration of the underlying collateral would be reflected there. The other items that would affect default risk would be the quality and types of loans, and the location and type of collateral. They would be affecting default risk on the underlying pool, but generally that's all taken into account in the CMO or the CMBS structure.

There's a good bit of information on the underlying defaults for commercial mortgages, but not nearly enough yet. The SOA has done a study that will be updated fairly soon. There are a couple of published articles that relate to that. But the problem is that there are really no studies that have been done for commercial mortgage-backed securities. In other words, they've been receiving ratings from rating agencies for a while, but there has not been enough time or exposure to see how that would relate. And I would assume it's the same thing for the asset-backed securities—that you can get an AAA rating, but there's probably not been enough experience to come out with the confidence that it's the same that you would be looking for.

Regarding the extension risk, the first area to consider is the disposition at maturity. In other words, most of the commercial mortgages will have a fairly short term maturity. And, in modeling the tranche, you have to know what the underlying collateral will do. Will it pay off, or will it refinance, or what? Probably the best thing to do then is to assume some kind of distribution of payoff. Generally, I think, less than one-third historically have paid off on the first approaching bullet. Two-thirds, roughly, have been refinanced there. But the refinancing would also depend upon availability of the funds and the economic cycle that would be there at the time that it comes up for renewal. The extension risk is also not just at maturity, but if you have delinquencies, restructures, and foreclosures. You have to consider what will happen to the link of the asset pool at that point. The extension risk would be highly tranche dependent as would the credit risk.

I thought I would mention some of the work that I've reviewed of companies doing some asset rejections. It may not be very common knowledge that there really isn't that much in the way of prepayments for commercial mortgages. Generally, the funds are strapped, so the prepayment risk is naturally low because of its dependence upon the economy, the availability of funds, and the high refinancing cost that go on there. In general, there would be a lock-out period, which means that you can't refinance no matter what you want to do.

There also are typically prepayment premiums that would come into play where you have to pay an extra fee to get out. Occasionally you'll find make-whole provisions, so that if you want to refinance you have to pay enough of a premium that the original person—or the company that originated the loan—is made whole on your exit. And then there are prepayment windows where you have an opportunity to prepay every so often. One of the things that's surprising, though, is that different prospectuses say something like we don't know whether these prepayment premiums are legally collectible. So I guess you have to consider that in the model as well.

So now we have to try to integrate all of this and build our asset model for a particular security. The first thing you do, in my opinion, is come to grips with materiality. Let's say you have a \$5 billion portfolio and maybe \$200 million in commercial mortgage-backed securities, I guess you have to wonder how much time you want to spend going through all the details to get hold of the information that you need to do the modeling. One thing to watch out for is that in many investment management systems the commercial mortgage-backed securities are sometimes hidden in with the residential CMOs. So you need to make sure that you can identify the ones that you want to model separately.

You have to develop the model for the underlying collateral. The best thing to do is to come up with a plan of scheduled payments, and then develop contingencies upon the scheduled payments. These contingencies would come about through the risk factors, credit risk and extension risk, and the restructuring that could go on. Evaluate the tranche structure so that you know how the cash flows are allocated. And then, having done that, you can project the tranche cash flows.

Everybody is familiar with the standards of practice relating to cash-flow testing, when it's performed, and so on. But there's another standard that I think you really ought to consider in these types of assets. That would be the standard of Practice 23 on data quality which requires that actuaries be satisfied with the data and analysis that have been provided to you by third parties to be reasonable and consistent. So if you talk to your investment manager and you get a series of bullet loans coming out of your mortgage-backed securities, you may want to question that and see whether that's really the right way to go about modeling.

And then, finally, I think it's very essential that you do sensitivity testing on the assumptions. The interest rate sensitivity generally is slow, but you want to make sure of that. Do default rate sensitivity and then extension rate sensitivity. By way of example, there was a deal that I looked at. It came out about six months ago in late December. It was an Aetna collateralization of some loans. There were 41 loans in this trust with a total value of about \$440 million. So maybe the average size was \$10 million or \$11 million. Aetna split them out into 12 classes. Two were senior classes, seven were subordinate, and there was one interest only (IO) tranche, and two residual interest tranches. The residual, the IO, and the noninvestment grade subordinate tranches were retained by the company. Aetna possibly could do something in the future, but these tranches were not offered with this particular offering. What was offered were the top five classes that received investment grade ratings. As a matter of fact, the offering itself was contingent upon the top five classes getting investment grade ratings.

In the prospectus the one that does the mortgage loan servicing, and the special service were listed. In this case, a different entity would handle the defaults and the real estate owned pieces in your trust. The way that the allocation occurred was that the realized losses went first to the junior tranches before they would even come close to getting into the senior tranches. Not only was there a service and a special service, there was also an extension advisor, which was a different party. If Aetna wanted to extend a loan beyond three years, it had to go to this particular individual and get agreement there. This was a fiduciary type responsibility, I believe.

Within this tranche, there was, I think, a very common element—a clean-up call provision. In other words, there was a 10% clean-up call, which means that once the collateral had 90% of it paid down, the issuer could call the rest and get rid of everything. There were detail requirements for reports to be provided by the service in terms of how the collateral was acting annually and quarterly. And there was a big discussion in the prospectus of the risk factors, such as prepayment premiums not being collected at limited maturity, or limited liquidity, and so on. But it really developed in a way that if you read the prospectus you could determine the tranche structures and how you'd have to go about setting up a model for that.

From the Floor: I have a question for Greg about asset-backed securities. You said you're really tranching up the default risk. Even if you're holding a Class A security, is it important to understand that it's supporting the Class B tranche? What is your source of data for the default risk through various types of asset-backed securities?

Mr. Roemelt: To answer the first question, yes, it is important to understand the credit enhancement that's embedded in the asset-backed structure because the performance of your security is dependent on how much credit enhancement you have. Even though you might have received a rating of AAA, *how* that AAA rating is arrived at is important.

Second, the prospectus is usually the best source of data. We're talking about some very thick documents, and we're not talking about good bedtime reading. This is not interesting reading. It's definitely written by a lot of lawyers. So it can be a difficult process to sort through the prospectus and find the key information that you need. Usually, there's certain key sections that you can identify, but reading them can really strain your eyes.

I know of one commercial software system. The Global Advanced Technology system is going to begin to include projection capabilities for asset-backed

securities, I think, in the software's next release. So that certainly will help the whole process of trying to model asset-backed securities.

Did you have a question about the source of defaults, too? I don't have a really good handle on the source of information for those data. I'm sure there's some historical material out there somewhere. But it's probably something that the Wall Street firms could identify more easily.

Mr. White: I think you'll find that they really haven't been around long enough to get a good study on it. And I think most people rely on the rating agency itself and the rating that's given there as a first stab at default risk. But I would agree with Greg that you have to know the security that you get with that, because the ratings can drift over time. You don't want to watch your rating vanish.

Ms. Sarah L. M. Christiansen: When you've been analyzing these, have you been analyzing them under different rate scenarios? And would you say that, perhaps, defaults might be correlated to the level of interest rates?

Mr. Roemelt: I've never tried to develop a correlation between interest rates and defaults. It seems like there are situations when interest rates are high and defaults are high, or interest rates are low and defaults are low. So it doesn't seem like there's necessarily a strong correlation between those two. Again, the amount of data available to do a really in-depth study of that is just probably not there. I wish I had a better answer for you.

From the Floor: If you were analyzing, say, the New York Seven, and this was part of your portfolio that you needed to include, would you vary your cash flows by the scenario? Or would you just say, OK, this is my best guess, and that's what it's going to be, especially if it's terrible material?

Mr. Roemelt: In that situation, I'd probably do the New York Seven and look for my worst result. I'd pick that interest rate scenario and then sensitivity test for defaults within that interest rate scenario. In that way, I'd be doing a testing of the tails and looking for the worst case that I could end up with, and then see how badly my results come out under there.

If I were going even beyond the New York Seven, doing stochastic testing, I might pick the ten worst stochastic scenarios on interest rates and then sensitivity test defaults on those.

From the Floor: How do you generate default patterns?

Mr. Roemelt: First of all, you have to develop some sort of prepayment function, based on interest rates. Trying to develop a good one is as difficult as trying to develop a good excess lapse function.

From the Floor: Where would you start?

Mr. Roemelt: I would start by basing my function on as much historical data as I could get a hold of. By trying to just apply logic to, say, the mobile home market. I know that prepayments on mobile homes are probably going to be sensitive to interest rates, but I also know that they're going to be less sensitive than residential mortgages. How much less sensitive? It's time to get the dart board out. That's the reasonability and logic that I would try to apply to developing a prepayment function. I don't know how many good prepayment functions there are out there for these securities. That's why it will be nice once some of the Wall Street firms develop prepayment models for these types of securities and make it a little bit easier on us.

Mr. White: Would the prepayment vary based on the type of structure that you had in the prospectus? In other words, if you have the caveat that lets you put more receivables in it, it would seem that would be a different prepayment structure than if you had no additional amounts being added to it.

Mr. Roemelt: Right. On the credit cards, it seems as if prepayments aren't nearly the issue they would be on something like a mortgage-backed security, a mobile home security, or a home equity security where the principal balance stays much the same through the life of the security until one reaches that amortization period.

Mr. White: Most of the work that I've done has been pretty much one on one discussions with investment managers to get their feeling as to how things look. There really is not much that's going on there. What you have to worry about is not really the prepayment side but the extension. How much is going to happen there. As a rough rule of thumb that we've used, about two-thirds or more of the initially written commercial mortgages will somehow refinance, or something will happen to them at the end of the period.

I looked this Aetna deal up on Bloomberg. And the cash flows that were projected assumed a three-year extension and that was it. And so you almost have to come up with your own cash flows through discussions and best expectations on them. Fortunately, for most of the work that we've done, it has not been as material an issue. In other words, I can change the percentage refinancing dramatically and not really affect my overall cash-flow testing results. I would develop an argument at

that point that it wasn't material enough for me to really care as long as I received something that appeared reasonable.