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**CREDIT RISK OF PRIVATE PLACEMENT BONDS  
AND COMMERCIAL MORTGAGES:  
SOA 1986–1989 INTERCOMPANY STUDY**

Moderator: GERY J. BARRY  
Panelists: EDWARD I. ALTMAN\*  
MARK G. DOHERTY†  
WARREN R. LUCKNER  
KIN ON TAM  
WILLIAM WENDT‡  
Recorder: WARREN R. LUCKNER

- What new information has been developed?
- What are the results for the 1986–1989 period?
- What is the ongoing nature of the study?
- How can a company leverage this study to better understand its own experience?

MR. GERY J. BARRY: I was the chairperson of the Society of Actuaries research group that headed up this study, coordinated its development, and saw it through to the point of producing the study results that will be presented today.

Warren Luckner is a research actuary with the Society of Actuaries. Kin Tam is an actuary in the corporate actuarial area of Met Life. Warren will talk about the methodology of the study. Kin will show the results that we have gathered from this study. After they have completed their session, we will get the perspectives of a couple of other gentlemen.

Professor Ed Altman has done a lot of research on credit risk, primarily on public bonds. He is a professor of finance at the Stern School of Business at New York University (NYU). We have asked Ed to share some of his perspectives on how this study fits in with other credit-risk research.

Bill Wendt is a real estate practitioner with the Travelers; he is the vice president of real estate research at The Travelers, and he will share some of his perspectives on how those in the investment areas of insurance companies can use the results and the methodology of the study.

Mark Doherty, the director of research for the Society, will discuss the efforts to continue producing results as we go into the future.

- \* Mr. Altman, not a member of the Society, is a Professor of Finance at the Stern School of Business at New York University in New York, New York.
- † Mr. Doherty, not a member of the Society, is Director of Research for the Society of Actuaries in Schaumburg, Illinois.
- ‡ Mr. Wendt, not a member of the Society, is the Vice President of Real Estate Research and is a Real Estate Practitioner at The Travelers in New York.

MR. WARREN R. LUCKNER: The primary purpose of my portion of this presentation is to describe the methodology that we used in the 1986-89 study of credit-risk loss experience on private placement bonds and commercial mortgage loans. I hope this will provide some ideas on how to conduct similar internal studies and encourage participation in the ongoing study of credit risk, so that we will have a good source of helpful information on an ongoing basis.

I'll start with a definition of credit risk: the risk that the borrower will not be able to make payments as promised. First, when I shared this with a colleague of mine, he observed that "be able to" may not be necessary. Credit risk is just the risk that the borrower will not make payments as promised, whether the borrower is able to or not. Second, with respect to "as promised," what do we mean? We mean in terms of number, amount, and timing of cash flows. The emphasis in this definition of credit risk is on any credit-related change in cash flows, and that's what we focused on in the 1986-89 study. There were four major types of credit-risk events (CREs) that we identified and wanted to study: restructure, a negotiated change in the number, amount, or timing of cash flows; bankruptcy of the borrower (in this case, we made a bit of an exception in that we wanted to identify all bankruptcies, even if they did not have a change in cash flow, because we wanted to be able to study bankruptcies); distressed sale, a sale intended to minimize losses; and complete default, when the company doesn't expect to receive any additional cash flows (for commercial mortgages, there was a 90-day trigger on default).

We've often referred to this study as a mortality and morbidity study of assets, due to the similarity between people and assets. Because of the combination of sickness, recovery, and death, the model that's suggested for quantifying the risk we're studying is a disability model. Just as disabled people can remain disabled, recover, or die, impaired assets can remain impaired and pay off at a lower rate, they can recover and pay off at the original rate, or they can terminate and not have any further payoff.

A disability model suggests that we look at incidence measures and a "loss-severity" measure. That suggests that we look at four loss statistics. First, "incidence rate by number" is the number of credit-risk events in a data cell divided by the total number of exposure units in the cell. Despite some limitations, especially with respect to the renumbering of private placement asset IDs in 1989 for a number of companies, "the incidence rate by number" is still valuable because it gives an indication of the rate at which such events were happening in the 1986-89 time period.

The "incidence rate by amount" is the amount of credit-risk-event exposure in a cell divided by the total amount of exposure in a cell. It provides some additional information because it accounts for different credit-risk events with different amounts of exposure. It is the possible total amount lost, per dollar of exposure. The "loss severity" indicates how severe the loss is. That is, given that a credit-risk event has occurred, what proportion of the expected amount of payment is lost? Finally, the "economic loss per unit of exposure," which can be considered as the basis-point loss, gives the expected amount of loss, per dollar of exposure.

First, note that multiplying the "incidence rate by amount" by the "loss severity" yields the "economic loss per unit of exposure." Second, the "incidence rate by

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

number," "incidence rate by amount," and "economic loss per unit of exposure," all relate some measure of loss to some overall measure of exposure. Finally, "loss severity" adjusts the possible total "basis-point loss," represented by the "incidence rate by amount," to the expected "basis-point loss," represented by the "economic loss per unit of exposure."

Given those loss statistics, there are two key components to calculate: the economic loss and the exposure. The economic loss calculation is the most complicated formula in this study, but it's not a difficult formula.

### ECONOMIC LOSS CALCULATION

The Economic Loss for Credit Risk Event  $i$ :

$$EL^{CRE_i} = OP_{PYE}^{CRE_i} \left( \frac{PV_{loss\ calc\ date}^{OCF\ CRE_i} - PV_{loss\ calc\ date}^{RCF\ CRE_i}}{PV_{loss\ calc\ date}^{OCF\ CRE_i}} \right)$$

The economic loss is defined to be the outstanding principal for the credit-risk event at the previous year-end, or a more recent time if available, times the ratio of the difference between the present value of the original contractual cash flows and the present value of the revised cash flows, to the present value of the original contractual cash flows. Because of the way the interest rates to be used are defined in those present-value calculations, the numerator, which is the difference of present values, can be considered a market-value economic loss. The ratio of the outstanding principal to the present value of the original cash flows adjusts the market value to the book value, because the exposure is on a book-value basis.

There are at least three practical complications that result from this definition of economic loss. First, there are complications with respect to data submission and data processing. Cash-flow data must be submitted, validated, and processed. Second, there is some complication in selecting the interest rates to use in defining and calculating the present values. Third, there is some complication in estimating future revised cash flows, which is sometimes more an art than a science.

I'll just quickly go over the two different interest rate approaches used. Partly because we had different economic data series available to serve as the base, we ended up with somewhat different approaches for the two asset types. The bottom line for commercial mortgages is that we used rates that vary by month of CRE and by individual payment dates. For private placements, we ended up with rates that varied by month of CRE and by some measure of remaining time to maturity. The area of interest rates is something that we want to investigate further. We've done some sensitivity testing to look at different approaches; for the 1986-89 time period, we determined that it wasn't necessary to do anything more sophisticated than what we did, but we would like to investigate a little farther the impact of the alternative interest rate approaches.

The exposure calculation is very similar to what is done in traditional mortality studies of lives. The exposure calculation is based on the assumption of midyear migration, or equivalently, uniform migration during the year. Thus, for assets that are not CREs, but are in both the "year-end-J-minus-one" and the "year-end-J" files, the exposure for year J in the study period is equal to the average of the outstanding

RECORD, VOLUME 19

principal at the end of each year. For assets that are not CREs and are only in the "year-end-J-minus-one" file – for example, those that are maturities during the year – we use half of the outstanding principal for the previous year-end. For assets that are only in the "year-end-J" file – for example, a new acquisition during the year – we use half of that year-end outstanding principal.

For CREs, the exposure for the year of the CRE is equal to the outstanding principal for the previous year-end; that is, during the year of the event, we give it a full-year exposure, much like mortality studies giving a death a full-year exposure during the year of death. For CREs that occurred during the study period, but before year J, the exposure is zero. If there is a subsequent event on an asset that already had a credit-risk event during the study period, the loss associated with that subsequent event is attributed to the original credit-risk event. That means that on an ongoing basis we have to obtain updated cash flows and estimates of revised cash flows for the credit-risk events. There may be some revisions to the results for previous years that have already been published, similar to a disability study.

The exposure by number of assets is calculated by using the same principles.

COMPANY XYZ IN 1986

	<u>Number</u>	<u>Amount</u>
CRE	1	\$1.5M
Exposure	<u>200</u>	<u>\$200M</u>
Incidence	.005	.0075

If there is one credit-risk event in 1986 with an outstanding principal of \$1.5 million and 200 exposure units with a total of \$200 million in outstanding principal, then the incidence rate by number is simply 1 divided by 200, or .005. Notice that the average size for the credit-risk event is \$1.5 million, and the average size for the exposure is \$1 million. Therefore, the incidence rate by amount, which is 1.5 divided by 200, or .0075, is greater than the incidence rate by number.

For the economic loss calculation, remember that we need to look at present values.

COMPANY XYZ IN 1986

	<u>Amount</u>
$PV_{\text{loss calc date}}^{OCF CRE}$	\$1.8M
$PV_{\text{loss calc date}}^{RCF CRE}$	1.2M
Economic Loss	$1.5M \times \left( \frac{1.8M - 1.2M}{1.8M} \right) = .5M$

Suppose that the present value of original cash flows (OCFs) at the market interest rate that we've selected is \$1.8 million, and the present value of revised cash flows (RCFs) is \$1.2 million. Then the economic loss calculation is: \$1.5 million, the outstanding principal from the previous year-end, times the ratio of .6 (1.8 minus 1.2) to 1.8. The end result is an economic loss of \$.5 million. The astute person will notice that 1.8 minus 1.2 is not equal to .5 and will ask, "Why isn't the economic loss equal to the difference in present values?" The 1.8 minus 1.2 represents a

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

market-value economic loss, and the economic loss must be converted to book value because we're going to be relating to exposure, which is on a book-value basis.

Now we have the components to calculate the loss severity and the expected basis-point (BP) loss, the other two loss statistics.

### COMPANY XYZ IN 1986

	<u>Loss Severity</u>	<u>Expected "BP" Loss</u>
Economic Loss	.5M	.5M
Exposure	<u>1.5M (CRE)</u>	<u>200M (Total)</u>
	.33	.0025

The loss severity simply equals the economic loss divided by the credit-risk event exposure, which is \$1.5 million. So the loss severity is .33, one-third. The expected basis-point loss then is equal to \$.5 million divided by \$200 million, which is the total exposure. That is, the expected basis-point loss is .0025.

### COMPANY XYZ IN 1986

	<u>Number</u>	<u>Amount</u>
CRE	1	1.5M
Exposure	<u>200</u>	<u>200M</u>
Incidence	.005	.0075

	<u>Loss Severity</u>	<u>Exp. "BP" Loss</u>
Economic Loss	.5M	.5M
Exposure	<u>1.5M (CRE)</u>	<u>200M (Total)</u>
	.33	.0025

In summary, for company XYZ in 1986, there is an incidence rate by number of .005, an incidence rate by amount of .0075, a loss severity of .33, and an expected basis-point loss of .0025. Notice that if you multiply the incidence rate by amount, .0075, by the loss severity, .33, you get the expected basis-point loss, .0025.

MR. KIN ON TAM: Thank you, Warren, for setting the stage for the results of the credit-risk study. I am going to present the 1986-1989 results, first for private placements and then for commercial mortgages. In either case, I will begin by putting the study in historical context. After all, four years is a very short time for a study of this nature. We need to know if the study period is representative of a long-term historical average. Furthermore, the pilot study is no longer very current. We need to know if it is representative of today's conditions.

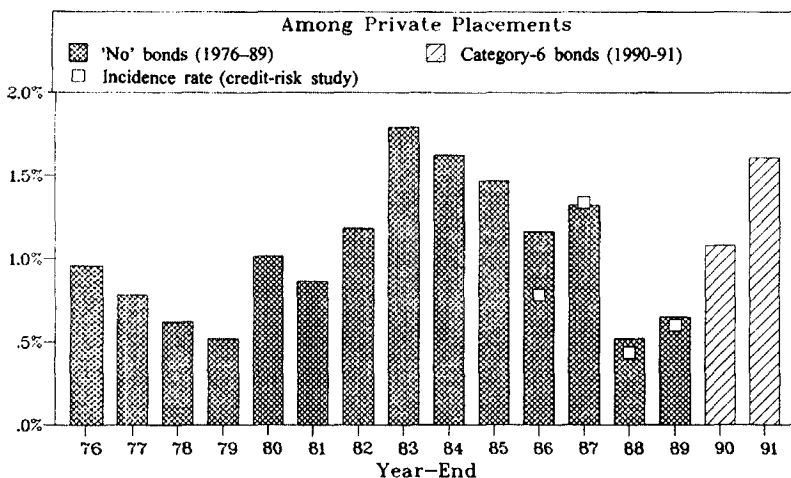
#### Private Placement Results in Historical Context

To this end, we go to the ACLI. Chart 1 gives the percentage of private placements in or near default as tracked by the ACLI from 1976 to 1991. These are, by definition, the NAIC "No" bonds through 1989 and the Category-6 bonds thereafter. The four square markers on the chart represent the incidence rates by experience year from our own credit-risk study.

I have knowingly assembled two series that are, strictly speaking, not comparable with each other: the incidence rate from the credit-risk study (the markers) and the

prevalence rate from the ACLI (the bar graph). The former captures the inception of an event, and the latter tracks the continuation of a status. Be that as it may, the markers seem remarkably consistent with the bar graph.

CHART 1  
 Percentage of NAIC "No" Bonds 1976-89  
 & Category-6 Bonds (in or near default) 1990-91  
 ACLI Data on US Insurance Company General Account  
 Coverage of 60+ % in 1976-89 & 98% 1990-91



Note: This chart is only illustrative; an incidence rate is an inception rate, which is not directly comparable with the percentage in a particular status at a point in time.

What can we say about the four years from 1986 to 1989? In terms of private placements in or near default, there seem to be two above-average years and two below-average years. Taken together, the four-year period does not seem all that atypical.

**Intercompany Private Placement Results**

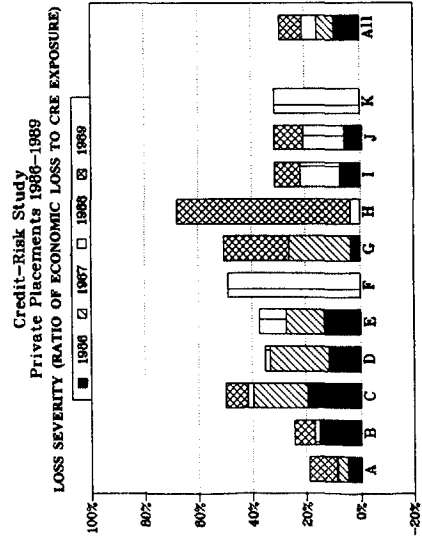
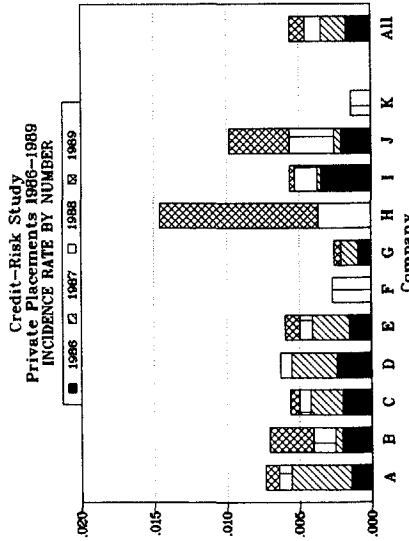
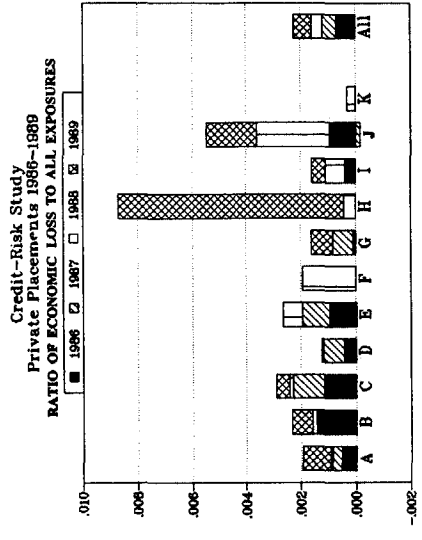
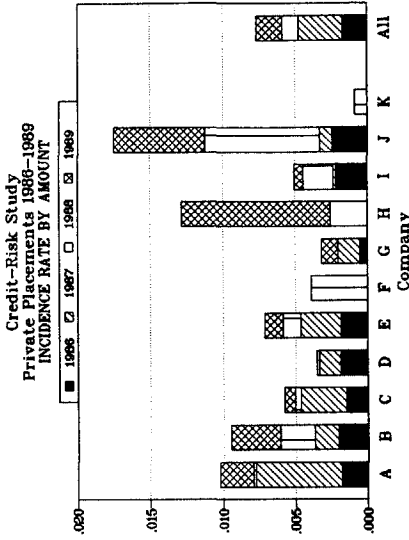
Chart 2 is a graphic summary of the intercompany results on private placements. The set of four related graphs gives these loss statistics respectively:

- the incidence rate by number
- the incidence rate by amount
- the loss severity
- the basis-point loss (or average loss per unit of exposure)

There are 11 companies in the private placement study. In the interest of confidentiality, they are simply known as companies A-K. It may help to know that the companies are more or less comparable with each other in quality distribution.

# CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

## CHART 2



First, let's consider the graph of the incidence rate by number. The full length of each bar represents a one-year, or annualized, incidence rate. But it is an annualized rate based on a four-year average. To show each year's contribution to the four-year average, each bar is partitioned four ways. The graph thus shows at once the variation by company and the variation by year.

You may notice that three of the bars have fewer partitions than others. They are companies F, H, and K. This is because they contributed two years of data instead of four years. In general, the smaller the contribution, the more volatile the results. Isolated at the far right is the incidence rate by number for all contributing companies combined. It stands at 56 basis points.

The next graph gives the incidence rate by amount by company. The intercompany average incidence rate by amount is 76 basis points. It is higher than the inter-company average by number.

Next comes the loss severity by company. At one extreme, Company H is above 60%; at another, Company A is under 20%. On the right is the intercompany average of 29%. We are struck by how low it is compared with public bonds. In fact, it is only about half of what it is for public bonds.

One possible explanation is the covenants protection on private placements. It may be of interest to note that Moody's study of public bond defaults from 1970 to 1992 shows a loss severity of 60% overall, but only 23% when restricted to the senior-secured debt. Perhaps covenants protection has similar effects on private placements as senior security does on public bonds.

Another explanation has to do with the study being too short and too recent for many credit-risk events to have run their course. So our loss severity is based partly on actual recovered cash flows and partly on estimates of future recoveries. Public bond studies, on the other hand, are based on more mature, more verifiable data observed during longer periods.

The last of the intercompany statistics is the multiplicative product of the previous two. This is the basis-point loss, or loss per unit of total exposure. The intercompany average is 22 basis points. Company H stands out because it has both a high incidence rate and a high loss severity.

Looking at each of these intercompany graphs, what can we say about the bar on the right that we cannot readily say about the other bars? It is noticeably more uniform, i.e., more evenly partitioned by year. It shows that you can achieve greater statistical credibility by pooling intercompany data than by restricting to any one company.

#### **Private Placement Results by Characteristic**

Here are the characteristics by which the private placement results have been analyzed:

- The most recent quality rating
- The earliest quality rating
- The NAIC rating



## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

- The original coupon rate
- The type of credit-risk event
- The funding year (or the issue year)
- The number of years since funding (for the seasoning effect)

The analysis of the results by characteristic is perhaps the most important aspect of the study. I have time to go into only two characteristics: the most recent quality rating and seasoning, or the number of years since issue.

### Private Placement Results by the Most Recent Quality Ratings

Before we get to the incidence and loss severity of credit-risk events by quality, let's look at how the exposure breaks down by quality, in this case, the most recent quality rating.

The ratings in Chart 3 are arranged in descending order from left to right. "N/A" on the right stands for "not available." So no less than one quarter of the exposure came without a Moody's or S&P-type rating. Among the rated exposure, the distribution is skewed toward investment grade, i.e., the top four categories (from AAA to BBB). From the highest grade to the lowest grade, the exposure rises steadily. However, as we cross the dividing line from investment grade to below investment grade, the exposure drops precipitously.

CHART 3  
Credit-Risk Study  
Private Placements 1986-1989  
Exposure Amount in Billions by Year

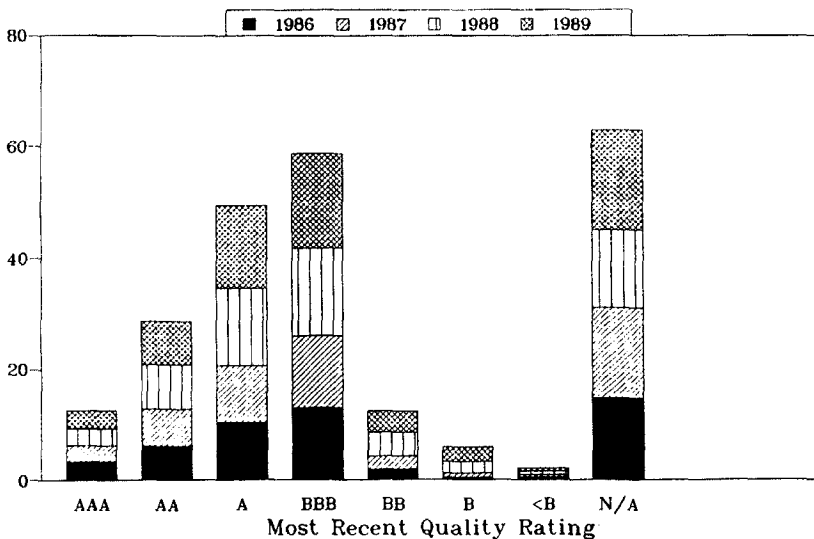
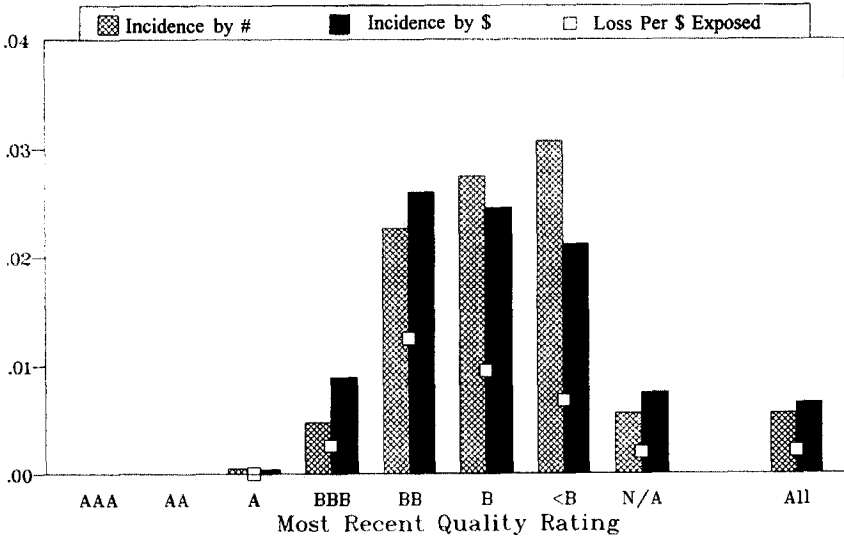


Chart 4 displays three loss statistics at once by the most recent quality rating. They are the incidence rate by number, the incidence rate by amount, and the basis-point

loss. How do the loss statistics vary by quality? As we go down in quality, we expect the loss statistics to go up. Indeed they do, but only as far as the BB rating. Below BB, the results become more or less invariant in a counterintuitive way. Many plausible reasons have been given for this anomaly.

CHART 4  
 Credit-Risk Study  
 Private Placements 1986-1989  
 By Most Recent Quality Rating  
 (Excluding One Big CRE)



First, quality distinction may be sharply drawn where the sensitivity lies, namely between investment grade and noninvestment grade, but it may lose its discriminating power within noninvestment grade. Keep in mind that each company assigns its own quality ratings to private placements.

Second, the lowest below-investment grades may include "fallen angels" that have experienced a credit-risk event already. So what is the likelihood of another credit-risk event occurring?

Third, a credit-risk event with an incurral date before the study may be excluded from the numerator of any incidence rate, but the corresponding exposure has not been removed from the denominator or the exposure base.

Fourth, because the lower-grade cells are significantly smaller, perhaps we should not attach the same credibility to them.

Fifth, perhaps the study period is still too short and the experience not stable enough to establish the proper ranking among cells. It may take a few more experience years

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

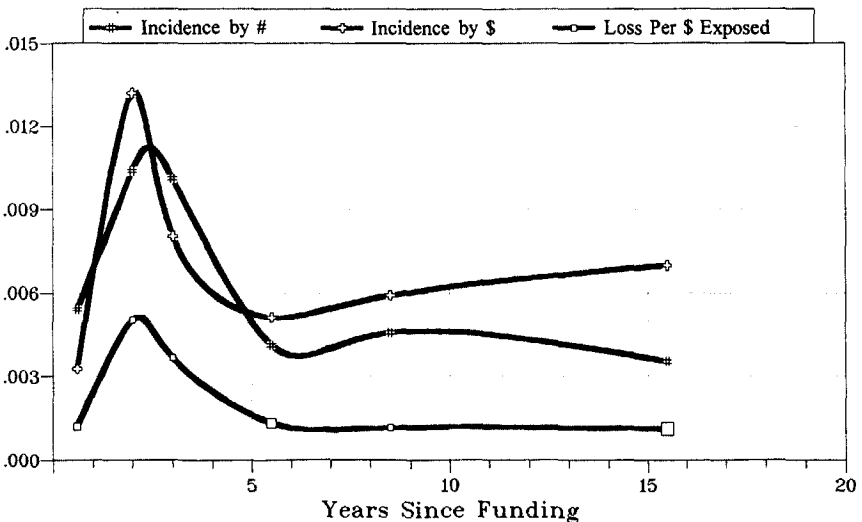
to do so. Finally, we have caught many miscoded quality ratings, but enough may have eluded us to cause anomalies in the smaller, noninvestment-grade cells.

### Private Placement Results by the Number of Years Since Funding

Next, we consider the private placement results as a function of seasoning, or the number of years since issue. We may expect a select-and-ultimate effect, as in the case of a mortality study. After all, a private placement should not go bad shortly after receiving a clean bill of health at issue. As the underwriting effect wears off, we may expect the incidence rate to rise steadily to an ultimate level.

The pattern from the study is actually a little different. Chart 5 shows three loss statistics at once as a function of seasoning. The line marked by the number sign, (#), gives the incidence rate by number. The line marked by the cross sign, (+), gives the incidence rate by amount. The line marked by a square box gives the basis-point loss.

CHART 5  
Credit-Risk Study  
Private Placements 1986-89  
By Years Since Funding  
(Excluding One Big CRE)



Each of the three curves rises initially but hits a high point before settling down to a lower ultimate level. Instead of two periods, select and ultimate, we actually have three: a select period, a weeding-out period, and a survival-of-the-fittest period. The underwriting effect wears off in just one year, giving way to a ferocious elimination of the weaker assets during the next two years. The survivors may be the harder assets in the first place. Furthermore, after weathering the weeding-out period, they may come to enjoy a growing equity base to support a fixed debt.

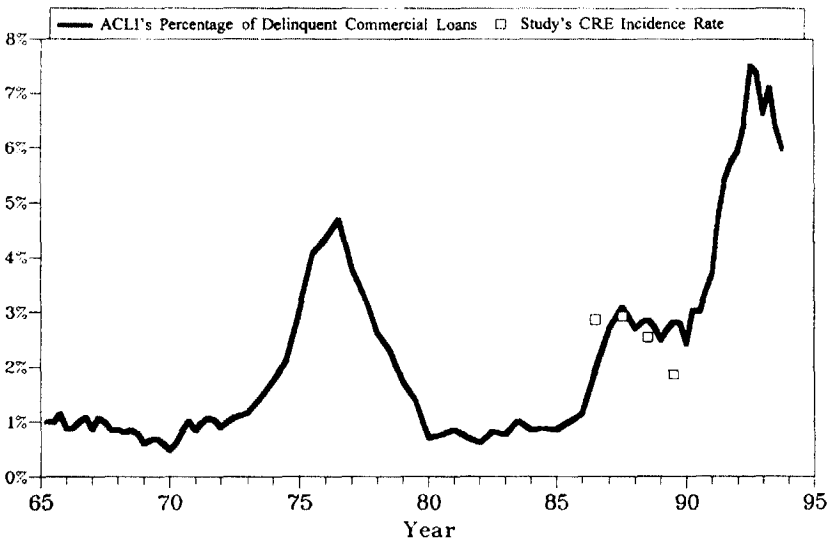
**Commercial Mortgage Results in Historical Context**

Now we turn to commercial mortgages, where it is even more important to put the study in historical context because of recent experience. To this end, we resort to yet another ACLI time series.

It is a tribute to the ACLI that it has been tracking the percentage of delinquent mortgages since 1965, as Chart 6 shows. This graph is rather compelling.

First I will comment on the two extended flat parts of the graph. During the best of times, 1965-73 and 1980-86, the delinquency rate of 1% is remarkably low and stable.

CHART 6  
1986-89 Credit-Risk Study on Commercial Mortgages  
In the Context of the 1965-93 ACLI Survey



Note: An incidence rate is not directly comparable with the percentage in a status at a point in time.

In between is the period from 1973 to 1980. During this seven-year period, the delinquency rate shot up to five times the baseline. It marks the depth of a distinct real estate cycle. What can we say about the spikes in the late 1980s and the 1990s? Beginning in 1986, the curve rose sharply, reflecting the real estate downturn in the oil patch in the Southwest. By the 1990s, the rest of the country followed the footsteps of the Southwest, giving rise to an unprecedented level of mortgage delinquency.

What can we say about the four-year period covered by the credit-risk study so far? The period 1986-89 is decidedly worse than the good old days but is still better than

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

today. We would do well to keep this perspective in mind in using the results of the study for any short-range or long-range projection. It is for this reason that we dwell on the historical context so much.

### **Intercompany Commercial Mortgage Results**

Chart 7 is a graphic summary of the results on commercial mortgages. The four intercompany graphs give the incidence rate by number, the incidence rate by amount, the loss severity, and the basis-point loss (the average loss per unit of exposure), respectively.

Thirteen companies contributed data to the 1986-89 study on commercial mortgages. They are coded as companies A-M. The coding for commercial mortgages does not necessarily correspond to that used for private placements.

Compared with private placements during the same period, commercial mortgages showed a much higher incidence rate. This is true by number (1.88% versus 56 basis points) and by amount (2.45% versus 76 basis points). Once again, some companies contributed only two years of data. They are companies B, F, H, and K. Their results are all outliers; in fact, all are on the low side of the intercompany average. This may suggest a right-censoring problem.

Next, consider the loss severity by company. The average is only 25%, which is lower than the 32% in an unrelated study by Snyderman. Once again, as in private placements, the full story may not have unfolded in the case of those credit-risk events with a long "tail." Nevertheless, four companies are in the 40-50% range.

The final statistic, the basis-point loss, is the product of the previous two statistics. The average basis-point loss for commercial mortgages is 61 basis points, as opposed to 22 basis points for private placements.

It is important to look at all four of these statistics. A high incidence rate can be offset by a low loss severity and vice versa. But a high incidence rate can also be coupled with a high loss severity. Such seems to be the case with Company J.

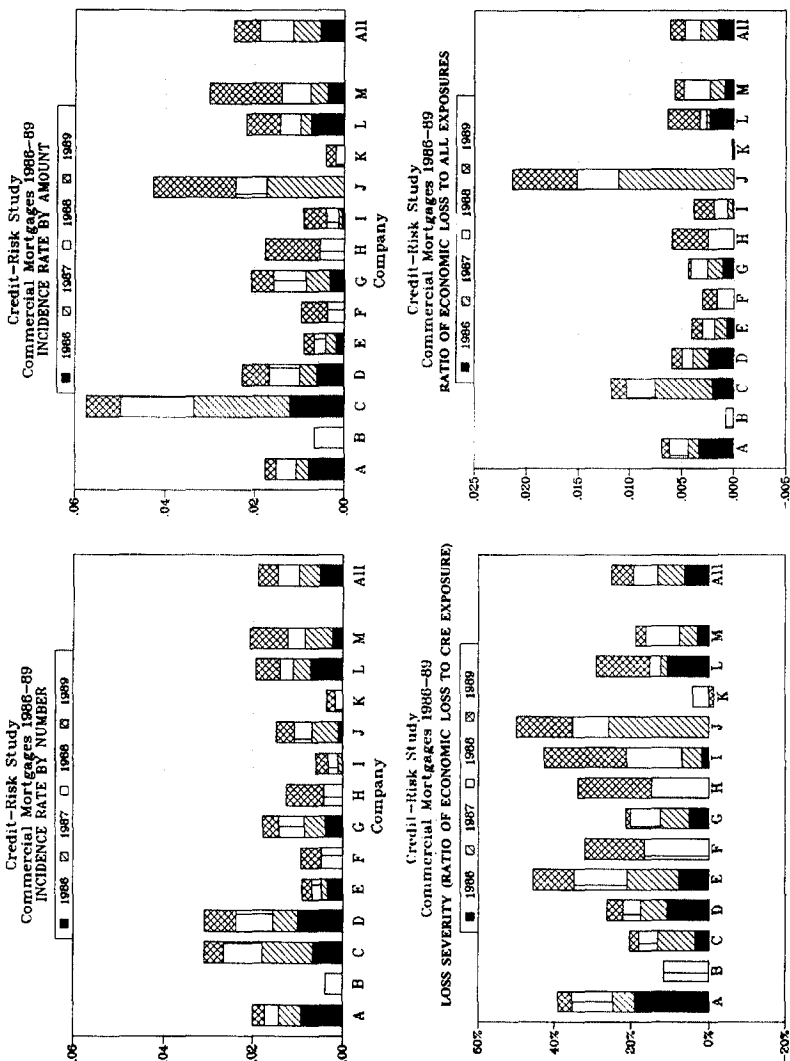
### **Commercial Mortgage Results by Characteristic**

Here are some characteristics by which the commercial mortgage results have been analyzed. They are:

- The coupon rate
- The loan-to-value ratio
- The property type
- The ACLI region
- The funding year (or the issue year)
- The number of years since issue (for the seasoning effect)
- The cross-tabulation between funding year and experience year

We have looked at all these characteristics, but not equally conclusively. I have time to discuss only one characteristic, the mortgage interest rate.

CHART 7



## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

### Commercial Mortgage Results by the Original Coupon

Chart 8 gives the distribution of the exposure by the mortgage rate. The histogram is in 1% intervals, except for the open intervals at the extreme. The bar graph peaks sharply in the 9-10% range. Overall, it is somewhat skewed to the right.

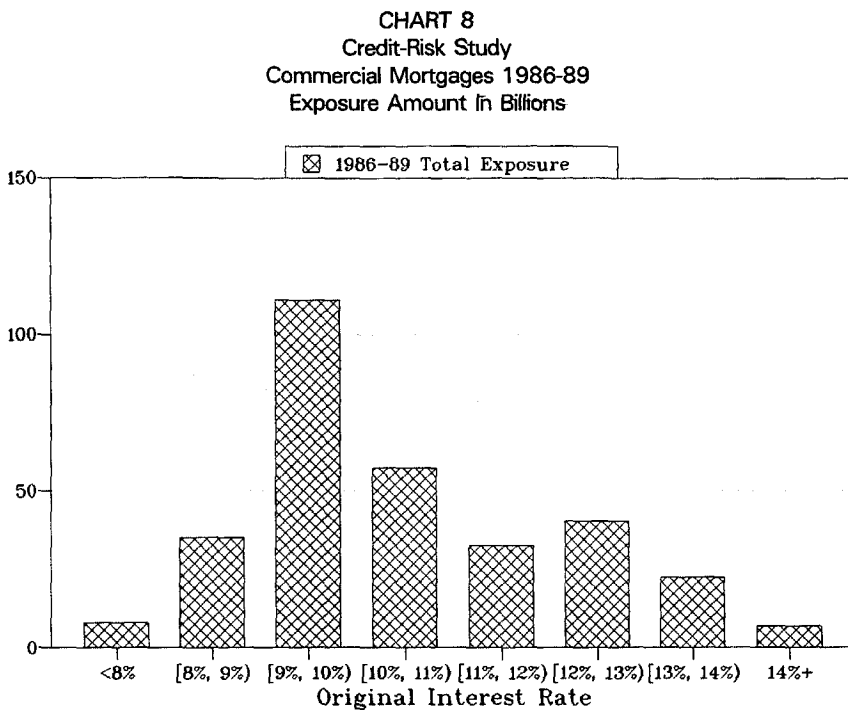
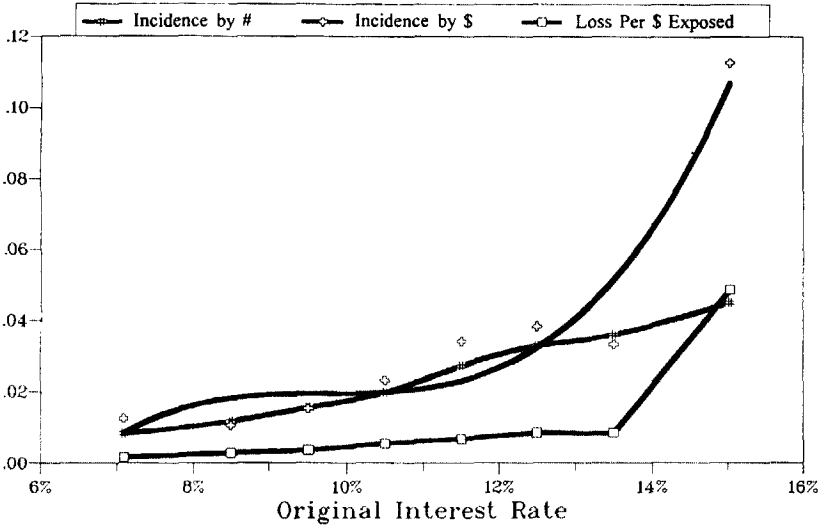


Chart 9 shows the incidence rates and the basis-point loss as a function of the mortgage rate. The line marked by the number sign, (#), gives the incidence rate by number. The line marked by the cross sign gives the incidence rate by amount. The line marked by a square box gives the basis-point loss. Not surprisingly, the graph shows that higher coupons are more prone to credit risk. This is because, all things being equal, a higher coupon rate is generally associated with a lower quality. Furthermore, servicing a debt at 15% is more onerous than servicing a debt at 7%.

But what about the quantitative disparity in the credit-risk experience between high-rate and low-rate mortgages? Let's compare the top-cell mortgage rates above 14% (on the far right), with the bottom-cell mortgage rates below 8% (on the far left). The incidence rate by number is 6 times as high, the incidence rate by amount is 9 times as high, and the basis-point loss is more than 20 times as high. These ratios are striking, but we have to discount them somewhat (especially the last one) because of the instability inherent in these small cells at the extreme. But if I compare the second cell from the top with the second cell from the bottom, i.e., the 13-14% range with the 8-9% range, the corresponding ratios are still 3-to-1, 3-to-1, and 3-to-1, respectively.

CHART 9  
 Credit-Risk Study  
 Commercial Mortgages 1986-89  
 By Original Interest Rate



**ACLI 'Underperforming' Rates by Region and by Property Type**

My presentation was going to end right here. But I cannot resist going back to the ACLI survey to illustrate the significance of two factors: geographical region and property type. One reason for going to the ACLI survey rather than our own study is to use data as recent as the second quarter of this year.

In 1988, the ACLI generalized its mortgage survey to track the experience geographically by subdividing the country into ten regions. These regions can be grouped roughly by the relative degree to which they have plunged in the commercial real-estate downturn during the last five years:

Relative degree in real estate downturn	ACLI Region
Most Advanced	Mountain West South Central
Next Advanced	West North Central Middle Atlantic New England
Less Advanced	East North Central East South Central South Atlantic
Least Advanced	Pacific Other (Alaska & Hawaii)



## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

In 1988, the ACLI started to track a second category of underperforming mortgages, namely, loans restructured at below-market rates. Combining delinquent loans with restructured loans under the nonstandard term of underperforming mortgages, Charts 10 and 11 track the recent experience of all ten regions (in groups of five).

Five years ago, West South Central was already underperforming at the 20% level. It has not improved since. In the meantime, West North Central has approached the 20% level. In so doing, it has surpassed Mountain, one of only two regions above the 10% mark five years ago. East South Central has gone up slowly enough to stay under 10%. Finally, the other region is rather erratic because of its relative small size.

Now for the history of the other five regions. Five years ago, none of them had an underperforming rate above 5%. Today, all of them are above 10%. Leading the pack are New England and Middle Atlantic. Both are approaching the 20% mark. South Atlantic and East North Central are neck-and-neck at about 13%. Pacific, the most resilient region for the longest time, is catching up fast at almost 12%. Is 20% the ultimate underperforming level? If it were so, some regions would still have further to go.

But even if it were so by region, it is not so by property type. Chart 12 shows the underperforming percentage by property type. At present, hotels and motels are 32% underperforming, followed by offices at almost 19% and apartments at 13%, followed by industrial at 10% and retail at 9%.

If I dwell on these graphs, it is because some striking trends in the ACLI survey deserve to be better known. They highlight the importance of geographical region and property type. They also provide an excellent backdrop to the credit-risk study. Finally, they underscore how things have evolved since the 1986-89 pilot study, and they point to the importance of updating the study to include the last three years.

### **Correlating the ACLI Delinquency History with Other Time Series**

The credit-risk study is ushering in a new time series. How promising is this new time series? How well can we correlate one historical series with another? Can we find good leading indicators with which to build macroeconomic models? By way of an answer, let me conclude my remarks by juxtaposing three time series against each other. I think these graphs speak for themselves.

First, let me put the ACLI delinquency history on the same graph as the national average vacancy rate in office space as tracked by Coldwell-Banker (Chart 13). The vacancy rate seems to be a rather good leading indicator, in fact, with quite a lead.

Next, let me put the ACLI delinquency history on the same graph as the total return on the Frank Russell and Company (FRC) index adjusted for the growth rate on the CPI. In this case, we should be looking for an inverse relationship because the better the real estate performance, the less likely the mortgage delinquency. Sure enough, Chart 14 shows a striking inverse relationship.

CHART 10  
 ACLI Percentage of Delinquent and Restructured Commercial Mortgages 9/88-6/93  
 By Region (1)

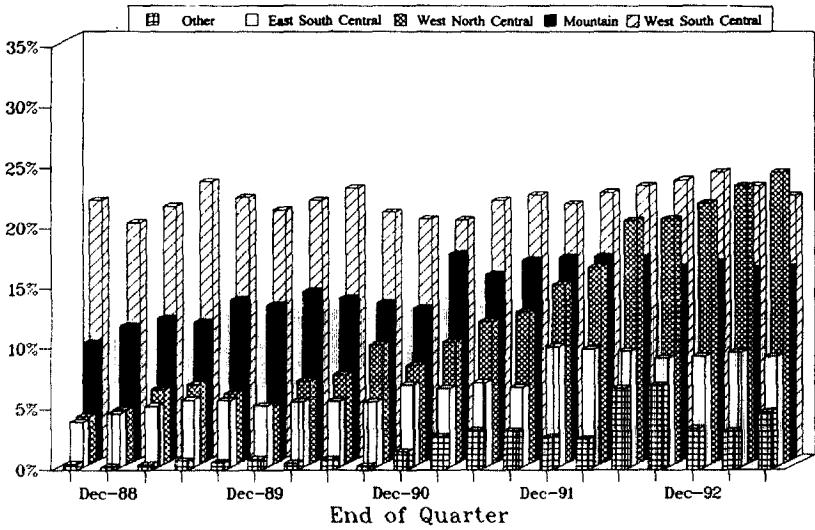
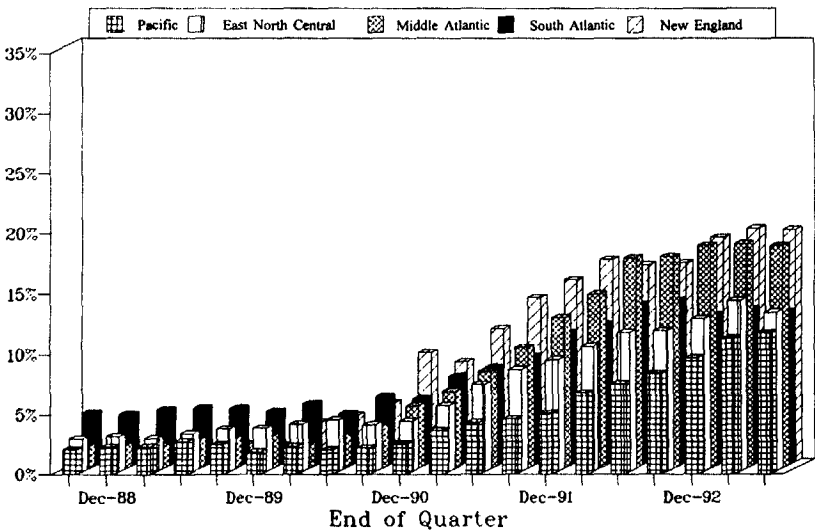


CHART 11  
 ACLI Percentage of Delinquent and Restructured Commercial Mortgages 9/88-6/93  
 By Region (2)



CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

CHART 12  
 ACLI Percentage of Delinquent and Restructured Commercial Mortgages 9/88-6/93  
 By Property Type

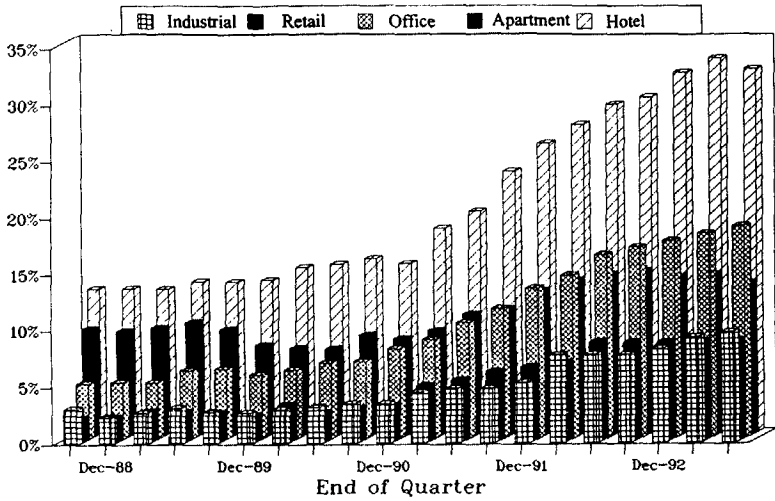
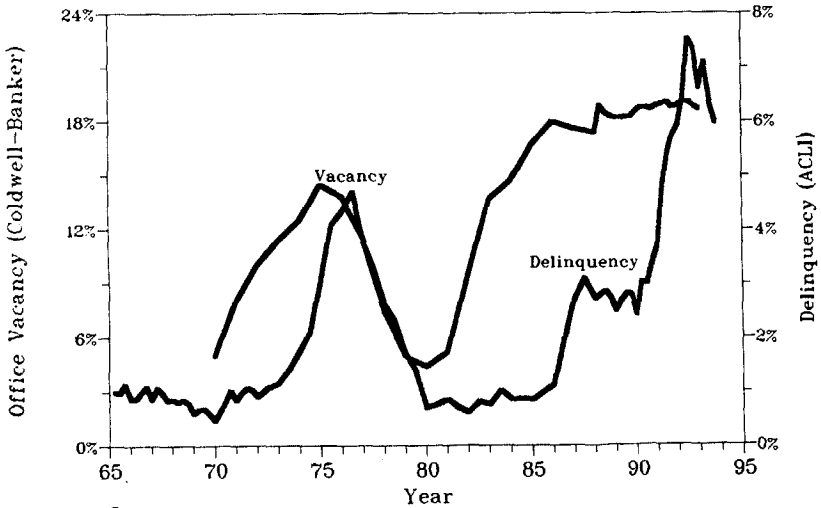
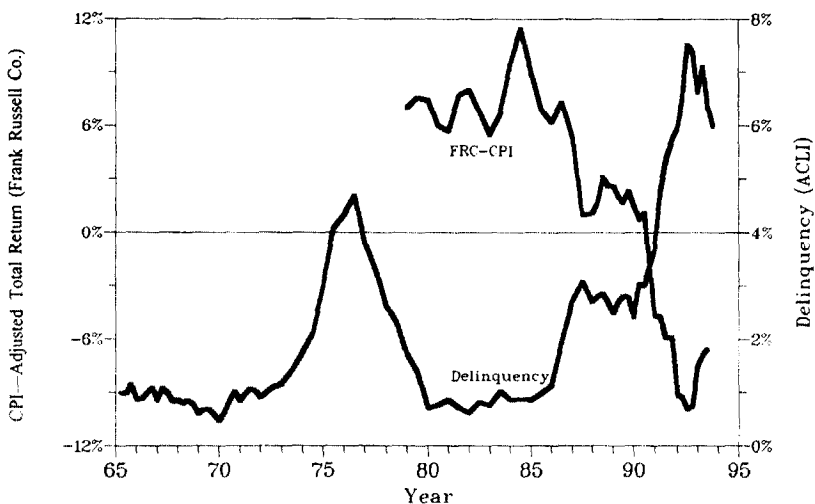


CHART 13  
 Office Vacancy Rate versus Delinquency Rate  
 1965-1993



Source: Coldwell-Banker vacancy rate is for office market in metropolitan areas. ACLI delinquency rate is for all commercial property types.

CHART 14  
CPI-Adjusted Real Estate Return (FRC-CPI) versus Delinquency Rate  
1965-1993



Note: Both indexes (Frank Russell Co. and ACLI) are for all commercial property types. The series FRC - CPI is on a rolling four-quarter basis.

MR. BARRY: One thing that you might be wondering about is just how much exposure data we have and how many credit-risk events are in this sample. I know that Kin and Warren had at least implied that it's difficult for a company with its own data to come up with enough data to be able to give it a good sense as to where it really is or how reliable it is. You can see from the company-to-company variation and the year-to-year variation within a given company that to do one of these studies requires a high volume of exposure, a fairly significant number of loss events, and a fairly extended period of time to obtain a more complete picture.

We had on the private placement side, I believe, about 8,000 assets that were included in each of the years of exposure, on average, from 11 companies. The number of events was 179. So, from these 11 companies, during that four-year period, a fairly small number of credit-risk events generate these statistics. So when you try to cut the statistics by some of the risk characteristics - investment year, credit rating, and so on - you see that you are probably beating some of these data to death by just going one cut down in some cases. On the commercial mortgage side, approximately 15,000 assets were included in the study. Unfortunately, from the industry's point of view, but fortunately from a researcher's point of view, we had a larger number of credit-risk events. I believe the number is 1,256. So we had double the number of assets exposed, but we had maybe seven times the number of credit-risk events in the commercial mortgage study compared with the private

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

placement study. So the commercial mortgage data can be cut in a number of different ways, and still have a fairly significant number of credit-risk events. We had 13 contributing companies on the commercial mortgage side. With respect to the total invested by the insurance industry, we're pushing close to 50% on the commercial mortgage side. I think we had something like 35% on the private placement side in terms of the exposure, at least by the time we got into the 1989 year.

Ed Altman is the vice director of the Solomon Center at New York University (NYU), which is known for a lot of its research, particularly on the investment side. Every two years NYU sponsors a forum on the insurance industry and the risks of the insurance industry, focusing on investments as well. The last forum was held in May 1992 and included a presentation on this study.

PROFESSOR EDWARD I. ALTMAN: My role is to talk to you a little bit about two aspects of this study: the relationship to the public bond market and a perspective on the importance of these data. This is an enormously important research endeavor. The area of default rates, mortality rates, and loss rates with respect to different asset classes goes right to the heart of the loss reserve, the expected profitability, and the pricing of assets. I can tell you that the mortality and default statistics in the public market are used on a daily basis by practitioners.

As an example, two weeks ago I acted as an advisor to a major investment bank. It was going to Standard and Poor's (S&P) with respect to a new product that it was trying to float: essentially, a collateralized bond obligation, a structured finance instrument that has junk bonds (low-rated corporate bonds) as the asset pool with a certain expected cash flow from that asset pool. And, from that asset pool, it was going to issue securities to the public.

The investment manager, who is really an investment management arm of the investment bank, wanted to get an A rating on that security from S&P. S&P said it first. I wanted to take a look at the assets and give it a stress test. Stress test means under what scenarios will you not be able to meet the interest and principal cash flows commitments? What did it use for the stress test? It used its own mortality study with respect to public bonds in the junk bond (double-B, single-B, triple-C) area. My role was to critique what was being done and to present some of my results as to why I thought, in this case, the stress test was too stressful. The point is, data were being used to determine a bond rating on a product that didn't exist yet, and that, indeed, is what was going to happen. I think we were successful in getting S&P to consider moderating the stress test, but we're not sure yet.

I know that investment practitioners use these type of data all the time. So I applaud the Society's work. Indeed, in 1987 a troop of investment actuaries came to see me. They were looking at my mortality work, which I'll mention in a moment, with respect to the public bond market, and asked if the same thing could be done for private placements. The answer is yes, if the data are present. The data, of course, are the key. The methodology that Kin, Warren, and the rest of the study group used is not exactly the same as in the public bond market, but it's very similar in many respects. We now have the first iteration of the study. The study is clearly a start. However, as Kin cautioned, making decisions in 1993 based on these results would

be fool-hardy, because it does not include the most recent four years' experience, which in the public bond markets was different from the 1986-89 period. And there were only four years of observation. Still you have to start somewhere. In another iteration there will probably be another three years of observations. Those data will become even more meaningful, because they will cover good times as well as bad.

I'll give you an idea of the difference that the last few years makes. The public junk bond default rate in 1989 was about 4%. In 1990 and 1991, more than 10% of the market defaulted in each of those two years. In 1992, it was 3.4%, and this year (1993) it's under 1% so far and probably will be under 2% for the full year. So you see the dramatic swing in that last four-year period. I can absolutely guarantee you that your analysis will be flooded with observations when you look at the 1990-91 period. You won't have to worry about only 179 observations. My forecast is that you will have triple that at a minimum, although I haven't seen the actual data.

Now let's look at a few charts comparing the results in the public market with the credit-risk study.

Table 1 is the summary of 1986-89 for private placement credit-risk event experience by number and by dollar amount. The first column is the amount outstanding, from \$50 billion to as high as \$67 billion, about \$233 billion in total. The number of exposure units is approximately 31,700. The number of credit-risk events is 179. So 179 compared with 31,700 gives you a ratio, in terms of number of credit-risk events, of about 0.5%. One-half of one percent of the study data ended up in a credit-risk event. In terms of dollar amounts, it was 76 basis points, or .76, of 1%. So it was a little bit higher in dollar amount than in numbers, but overall, it was a very low rate. But keep in mind that the vast majority of these data points were investment-grade securities, and you wouldn't expect them to default in that short of a period of time. If you take a look only at the public bonds that are investment grade that defaulted in the period that we have data on, the difference in incidence might not be as significant. However, most of the default data in the public markets are on the high-yield junk bond market, because that's where the probabilities are much greater.

Again, Table 2 shows that the number of credit-risk-events defaults, bankruptcies, etc. for private placements is 179. The third column lists how much was involved in the outstanding principal of those securities. Now we compare the expected recovery in the public markets with the expected recovery in the private placement market. What percentage of a credit-risk event can you expect to recover? One minus the recovery rate is the loss rate. If you look at the last two columns, the numbers without parentheses are the results from the Society of Actuaries study. So, for example, overall, given a credit-risk event, 70.9% of the value is recovered. In other words, the loss severity is about 29%.

The public market numbers are coming from my own studies. I estimate that around 58.6 % is recovered at the time of default. Therefore, the loss is around 41%. Keep in mind, and this is a very important part of my critique, the one thing that is not in this study that is critical, I believe, to an investment manager and to studying reserves is the seniority of the debt. You can certainly expect to recover a lot more on senior

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

secured bonds than on junior unsecured debt. We have many studies that document what you can expect to get in the public market, given a default, by seniority.

**TABLE 1**  
**Private Placement (PP) Bond Credit Risk Event (CRE) Loss Experience<sup>a</sup>**  
**(Life Insurance Company Sample: 1986-1989)<sup>b</sup>**

Year	PP Amount Outstanding Exposure (\$ Billions)	No. of Exposure Units	No. of Credit Risk Events (Defaults)	Ratio of CRE To Number Outstanding	\$ Amount of CRE Exposure (\$ Billions)	Ratio of Exposure to Amount Outstanding
1986	\$50.6	7,700	53	0.0039	\$0.40	0.0079
1987	52.9	7,200	57	0.0079	0.71	0.0134
1988	61.7	8,400	35	0.0042	0.27	0.0044
1989	67.8	8,400	34	0.0040	0.41	0.0060
1986-1989	233.1	31,700	179	0.0056	1.78	0.0076

This table shows the amount (in number and dollars) of private placement bonds held by the sampled life insurance companies and the incidence of credit-risk events for the period 1986-1989. For example, during the entire period, approximately 1/2 of 1% of the number of exposures resulted in a credit-risk loss event and .76 of 1% was the total possible amount that *could* be lost per dollar of exposure; i.e., 76 basis points was the total possible basis-point loss.

<sup>a</sup>Source: Society of Actuaries, *Credit-Risk Event Loss Experience 1986-1989: Commercial Mortgage Loans, Private-Placement Bonds*, Society of Actuaries, June 1993, Schaumburg, Illinois.

<sup>b</sup>From a sample of eight large life insurance companies for the entire four-year period and eleven (11) firms for the two years 1988-89.

I asked my colleagues beforehand about the percentage of the private placement market of insurance companies that are senior secured, senior unsecured, junior unsecured. The answer was, "We're not sure, but we think most of them are senior unsecured." I have seen one study that describes the private placement market. One-third of the bonds are senior secured, 54% are senior unsecured, and 13% are junior unsecured. These data are critical if you're going to assess expected losses, because the recovery rates are dramatically different, depending on which class you're talking about. My recovery number of 58.6, which is a recovery rate in the public market, is a blend of senior secured and senior unsecured bonds, which I think are the most relevant to the SOA study. The Society's study notes say that 70.9% was recovered, but I don't know the breakdown as to whether they were senior secured or senior unsecured. If they are in the same ratio as the public market that I used, then these two numbers are comparable, but they may not be. I think that's an important thing to consider in the future.

Finally, Table 3 shows the private placement loss incidence rate for low-rated issues only.

RECORD, VOLUME 19

TABLE 2  
Private Placement (PP) Bond Recovery and Loss Experience from  
Credit-Risk Events (CREs) versus Public Market Experience<sup>a</sup>  
(1986-1989)

Year	No. of PP CREs	Amount of PP CREs (\$mm)	Recovery on PP CREs (\$mm)	Percentage of Recovery: (PP) & Public Markets	Percentage of Loss PP and Public
1986	53	\$ 397.4	\$ 233.1	58.6% (42.3) <sup>b</sup>	41.1% (57.3)
1987	57	707.2	592.7	83.8 (68.6)	16.2 (31.4)
1988	35	269.1	178.8	66.4 (52.5)	33.6 (47.5)
1989	34	407.3	257.8	63.3 (64.1)	36.7 (35.9)
1986-89	179	1,787.1	1,262.4	70.9 (58.6)	29.1 (41.4)

- <sup>a</sup>Source: (1) Society of Actuaries, *Credit-Risk-Event Loss Experience 1986-1989; Commercial Mortgage Loans, Private Placement Bonds*, Society of Actuaries, June 1993.  
(2) Edward I. Altman, *Corporate Financial Distress & Bankruptcy, Second Edition*, John Wiley & Sons, New York, 1993.

<sup>b</sup>Represents percentage of recovery just after default in publicly held bond markets of senior secured (30 issues) and senior unsecured (72 issues) bonds in the 1986-1989 period. Each year's results are a blended rate of the secured and unsecured senior bonds.

Note: Ratio of senior secured to senior unsecured bond CREs in the public market may be substantially different from that same ratio in the private placement market; PP CRE may include some subordinated issues.

TABLE 3  
Comparing Low-Rated Private Placement (PP) Loss Incidence Rates  
With High-Yield Bond Default Rates in the Public Market  
(Most Recent Rating Categories: 1986-1989)

Year	PP Loss Incidence Rate: Low-Rated Issues <sup>a</sup> (\$ Weighted)	Public High-Yield Bond Default Rate <sup>b</sup> (\$ Weighted)
1986	.051	.035
1987	.039	.058 (.014) <sup>c</sup>
1988	.022	.026
1989	.010	.043

<sup>a</sup>Source: Society of Actuaries, *Credit Risk Event Loss Experience, 1986-1989*: June 1993.

<sup>b</sup>Source: E. Altman, *Corporate Financial Distress & Bankruptcy, Second Edition*, John Wiley & Sons, NY 1993.

<sup>c</sup>Without Texaco, default rate in 1987 was 0.14.



## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

I have good data on junk bond default rates in the public market. Most of the data that were presented were dealing with the total population of the Society's study, which included investment grade and noninvestment grade. However, there are a great deal of rich data in that study, and if you go carefully through it, you can pull out the exposures and the incidence and the loss rate by bond rating; double B, single B, and less than B, as they call it. The number in the second column is the credit-risk event probability based on actual results for the Society's study, and in the third column is the public high-yield bond default rate in those same years.

So what do we see? We actually see a higher incidence rate in 1986 and a lower one in the next three years for the private placements. I don't understand the 1989 data in the Society's study. It looks much too low. And 1989 was the beginning of Armageddon in the fixed-income industry. After June 1989, defaults soared, so I don't understand how the 1989 rate was so low for private placements unless they were excellent loans. I know that 1989 was a worse year than these other years in the public market. I would like to suggest that I and they go back and look at the 1989 data again, because something's strange about the data; they are much lower than the public markets, which could be, but they are also a lot lower than the other years, and 1989 was not a terrific year.

The point is that, in general, private placements probably do have a lower incidence rate than the public junk bonds. They almost certainly do have a higher recovery rate than the public markets. That's why it is important to document the difference between these two data sets. Up to now, I would guess that some private placement investors are using the public market's data to assess and set their loss reserves. Now, for the first time, they begin to have data to look at in their own industry. But until you get the most recent three or four years, I would still use the public markets, because the 1986-89 period is just too short, covering too narrow a database. In a couple years, it's going to be a very important data source.

I referred earlier to the mortality rate studies in the public bond market. This I see as one of the aspects that could be added to the Society's study – documenting the aging effect with respect to private placement corporate bonds. Kin did mention that the SOA study at least showed that in the first year the incidence rate was low, but it jumped dramatically in the second and third years and then dropped. What we find in the public market is that the first, second, and third years have big marginal increases in the mortality rate each year and then they begin leveling, not dropping. So the expected mortality after the third year is about equal to what it is in just about every other year after.

The formula we used is a standard actuarial formula for calculating the mortality rate of public bonds. The cumulative mortality rate is one minus the product of the annual survival rates. Therefore, it's very important when you structure the mortality study that the cohort population gets adjusted for all the types of events that could cause a death in a bond. And unlike people, there are good deaths with the bonds – calls, sinking funds, and maturities, as well as defaults. Our study then adjusts the population each year, not only for defaults, but for the subsequent redemptions in the market.

We now have cumulative mortality rates by year after issuance, by cohort group, and by original bond rating. Moody's and S&P have now done this by what's called a "static-pool" approach. For example, for single-B-rated securities, approximately 25% of the population can be expected to default by the fifth year. Now that sounds like a lot, but that doesn't mean it's a bad asset class to invest in, because we have said nothing about the risk-reward ratio. If you can get 4, 5, or 6% yield spreads, you're going to more than make up (on a compound interest basis) for the expected loss from a 25% incidence rate. Incidentally, this becomes about an 18% loss rate. So you can expect a loss of 18% of the portfolio by the fifth year in a single-B-type category. But if your compound yield spread more than compensates for the 18% over five years, which I'm sure it has, then this is an asset to consider in terms of an acceptable risk-return trade-off.

These mortality loss and net return spread data are available. They are not available yet in the Society's studies because the aging effect is very difficult to do with just four years of data. But again, seniority, mortality, plus all the good data that you now have available to you from the four years make up, in my opinion, the optimum type of database that we can hope for.

MR. WILLIAM WENDT: Of course, with real estate you don't have all those wonderful databases. That's been the problem all along. So there hasn't been any, or there has been very little, research conducted to bring real estate as an asset class to a level with other asset classes. That, of course, is partly what this effort by the Society of Actuaries has been all about, and there's growing interest because real estate people are being forced to pay attention to this, in not only this area, but in terms of quality rates and in terms of pricing.

Now with respect to real estate, here are my concerns as these studies go forward. One of them is once burnt, never again to touch or taste. Second, I sat in some sessions earlier on risk-based capital (RBC) factors. If the RBC factors were correct, then there would not be so much arbitrage activity taking place right now. Some of you may have heard Jim Townsend's talk on that. Then I sat in a session on bond prepayments and, of course, I asked the question, "What have you done in commercial mortgages?" The answer was, the market's not big enough yet, we haven't done anything. What that really says is, "We don't have a database."

Finally, my greatest concern is the so-called Model Investment Law that's coming up, which essentially is saying to forget about asset/liability matching. You should go back to making 30-year mortgages so that you can still use a 70% loan to value, because the Model Investment Law now says if it's not fully amortizing over the life and term then, of course, you can only do a 60% loan to value. That will have significant impacts in terms of how much mortgage lending the industry will do and the way in which it is going to be structured. I guess I conclude that with these situations lying out there, what is a prudent man to do? It's crazy. It's absolutely crazy. You know it's the kind of overreaction that we get, but it can be understandable.

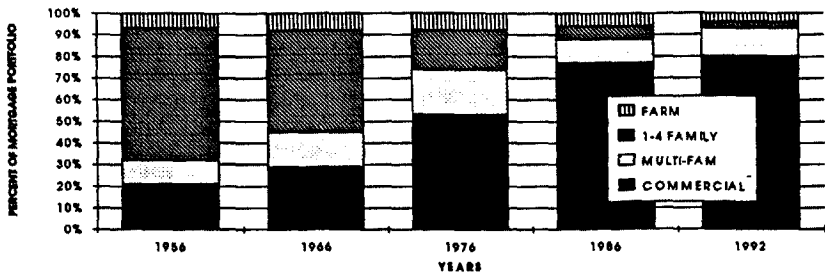
Now my original purpose here was to comment on and put into perspective the mortgage experience, because many of you have never paid any attention to real estate until the last year or two when it became a problem for you in terms of your

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

cash-flow matching. So just very briefly here, I want to talk about two things: (1) the changing composition of mortgage investments, both as a percentage of total assets, and (2) its property-type distribution.

Some of this Kin got into earlier. But you can see on Chart 15 that despite the dollar growth in mortgage investment as a percentage of total assets, it has fallen since 1956.

CHART 15  
The Changing Composition 1956-1992



Source: ACLI Industry statistics

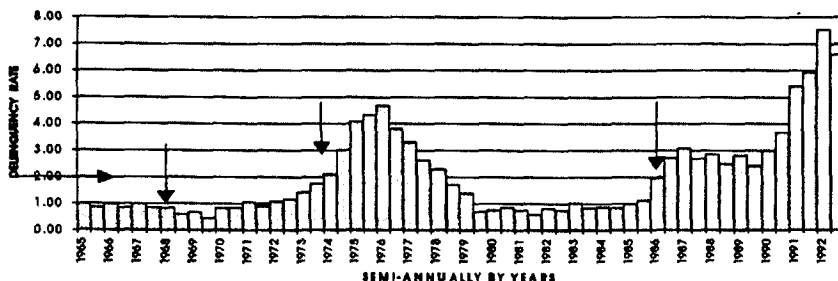
Perhaps more interesting is to see how the composition has changed. In the late 1950s and early 1960s, 60% of what the insurance industry did was in single-family mortgages held individually. The chart shows how that has declined. Now where did that all go? We all know it became securitized. Then look what has happened to multifamily and commercial and see how that has grown to about 93% of the portfolios during that same period of time. That is a very dramatic change.

The one question that this had led me to speculate is whether the same thing is going to happen to commercial mortgages (i.e. securitization) that happened to the single-family mortgages. That's just the next step in the future, and I think there is definitely a move in that direction.

Now Chart 16 is similar to the chart that Kin Tam showed you, but I want to make two comments on it. Even though the ACLI's statistics on delinquencies only started in 1965, if you have talked to professionals who were around since the end of World War II, there were only a few minor blips before 1965.

Basically, mortgages were thought of as being safe, and because we didn't have quality ratings, we used to say that all mortgages were BAA quality. The investors accepted that statement. So, of course, they then started to invest in mortgages. Why? Because there was a yield differential.

CHART 16  
 ACLI Commercial Mortgage Delinquencies 1965-1992



Source: ACLI Industry statistics

But let me talk about two delinquency periods that were pointed out earlier, because you did have a period in the 1974-78 time frame when delinquencies were as high as 4.6%, so it was serious. Delinquency rates of more than 2% represent a serious problem.

In this 1974-78 period, we were coming off of relatively low interest rates in the economy. We did not have the kind of overbuilding that you have currently. But we were coming off low interest rates and went into hyperinflation in 1980 and 1981 when interest rates rose up to 17, 18, 19%.

Now what do the above facts mean? Well, two things. I did an unpublished study, that indicated that mortgages that were foreclosed, that sold from 1980 to 83, yielded a 200-basis-point pickup over the original mortgage rate. So you actually came out better. You didn't receive your cash-flow stream as you expected, but in terms of total internal rate of return (IRR), you came out better.

Now, the 1986-93 period, which we're still in, was just the opposite. We came off of the 1981-82 high interest rate period. You saw the 14% interest rates on mortgages. I remember when we were making those. We said real estate could never carry the debt service and, subsequently, that turned out to be true.

We went into a low interest rate period and a low inflation period, so we did not have the appreciation in the owned real estate values. So foreclosing in this current 1986-93 period produced large losses, both of interest and of principal. What do you do? We did restructures. Coming from high interest rates alone, that made a lot of sense.

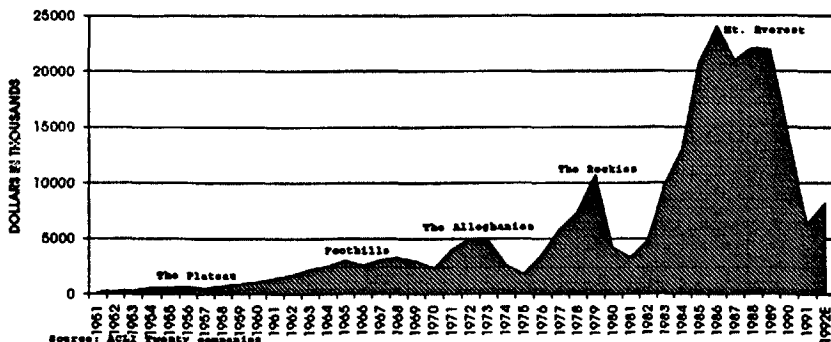
## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

You avoided some of the losses and the real estate could carry, in many cases, the lower coupon rate.

In fact, in the RBC studies we talk about restructure. Well, nobody outside the real estate world knew that such a thing existed until we began to identify it in the ACLI studies. I was involved with that ACLI committee, and we decided to call them "Restructured Loans in Good Standing." We did so because in real estate, all you've given up are some opportunity costs and that's it. Real estate professionals didn't consider that a credit event. So they were wondering what everyone was getting all excited about. Well, your definitions are very different.

Now this leads me to Chart 17, and then I want to make a point. Look what happened. I didn't label the 1983 period of foreclosure as Mt. Everest just for the fun of it. What was going on then? Well, I can certainly tell you what was going on at many insurance companies. They were chasing yields. In the case of some companies, we were chasing the GIC market. It only took a little bit of an interest rate differential to make a difference. Some companies did it in junk bonds, and one insurance company or more went down the drain on that one. Others did it in mortgages, because you had anywhere from a 40-100-basis-point yield advantage over bonds for what was called a BAA quality. There was no differentiation on quality. There still isn't in real estate, but there should be. Okay, you can see how much money was put out – huge amounts. These mortgages did not have time to season before the oversupply of real estate hit due to investment by foreign investors, plus S&Ls and all the rest – you know the story. As a result, there was a huge oversupply. Then you're in this low inflation economic market. This is why you're seeing the levels of losses. But that has not been true historically.

CHART 17  
ACLI Commercial Mortgage Commitments 1951-1992



Source: ACLI Industry statistics

Now I'd like to make the point, and I think it's pretty obvious. Mortgages are not bonds. In addition to the difference in the interest rate payment, monthly versus semiannual, the underwriting standards are not homogeneous. There are no pricing models. Real estate professionals don't even know what a pricing model is. The type of pricing model used in real estate until recently said, if it's a hotel, you raise it a quarter to a half a point; if it's a shopping center, you lower it; otherwise, it was the market rate, whatever it was, that was generally the rate that all your competitors were quoting. There was no other differentiation. It didn't make any difference whether it was 60% loan to value or 90% loan to value. You didn't price it differently. So underwriting standards are not homogenous. Third, and very importantly, mortgages are nonrecourse to the property only. And a property is location specific. It is subject to the vagaries of that local economy, and it is also subject to the vagaries of the real estate cycle, which don't necessarily follow the economic cycle. Finally, prepayment clauses are not sacrosanct! There is no honor among thieves. That is a strong statement, but the whole thing is driven only by economic decisions, not perceived moral commitments.

So what happened with all the interest rate fluctuations? We came up with yield maintenance clauses. They're so complicated that the lawyers can't write them. In fact, I finally made a suggestion last week that the lawyers should put in the formula. You know that's more specific. Put the formula in. Don't try to translate the formula into words, because they never get it right. But yield maintenance in many of the mortgage contracts essentially gave you total yield maintenance. So you, as actuaries, sit back and say, well, let's relax, guys, we're protected. I say, yield maintenance means very little. It is nothing more than a pawn in renegotiation. I haven't done a study, but if we have gotten as an industry 10-15% of the total amount of yield maintenance that we should have gotten, I would be very surprised. In almost every case it's being traded away for something else; i.e., a pay down on the mortgage or some other kind of workout. So this is no sacrosanct binding agreement. And, just to stress that point once more, there's a little thing called deed-in-lieu. That's where the owner hands the keys to the mortgage lender. There's hardly a major insurance company, and I mean Prudential, Travelers, and so forth, that has not done that on at least several specific properties and is not now contemplating it. So don't talk to me about the creditworthiness of the borrower, which was the big thing. If it does not make economic sense, the owner's not going to keep it. The owner is going to give it back to you. No agreements.

So where does it lead? As we've said, this study is a half-finished dissertation. It must be completed. The industry must develop a statistically based quality rating. We can no longer move forward without creating these kinds of databases. We must use pricing models, and that means we also have to have the statistics to develop them. I hope that's going to move forward.

MR. MARK G. DOHERTY: Where is this study going to? For private placements, the data submission instructions have been released for the updated study. This will cover a period through 1992. With mortgages, we're going to be a little behind, but we will move as rapidly as possible. We're going to extend our period through 1993, because we think it is an important time period to capture.

## CREDIT RISK OF PLACEMENT BONDS AND COMMERCIAL MORTGAGES

It's important to realize that what we're dealing with here is an iterative process, much like our mortality studies. Sometimes you pick up a few lives that you've left out in the past studies, or you may see the aggregate mortality change a little bit from year to year. That could also be because of new additional information from the previous time period, or the addition of new companies into the study, or changing the company mix. For this study, we want to take a look at the 1986-89 credit-risk events and review them to see if the cash flows or revised cash flows have changed at all; for example, if the projections on the foreclosed property have changed. Then, you add the credit-risk events from 1990 to 1992 (1993 for the commercial mortgages). The period extends outward, adding new data and new credit-risk events and updating previous or existing credit-risk events. We also wish to add data contributors.

There are a couple things that we're in the process of doing right now that weren't quite explicit in this presentation, but have already been released to the data contributors, at least on the commercial mortgage side. We've looked at starting a cohort study, taking a group of loans made in a specific year and tracking them forward in time from time zero on out as long as we can track them. Kin identified quite a few characteristics we're looking at, and those can be done not only on an aggregate 1986-89 basis but on a year-to-year basis. Some of that's very fascinating -- taking a look at it, breaking it up by experience year. It's really interesting to watch the patterns develop and flow through. Also, some companies say they treat foreclosures in a certain way. Another group says they handle all foreclosures in a different way. We can study those two groups of companies separately. Interestingly enough, we did that for two different ways of dealing with foreclosures, and it turned out that, in the aggregate, they were very similar in terms of loss and the loss severities.

I think there's a lot of additional research we can do, either in private placement or in commercial mortgages. You can take a look at a transition matrix, if you think about it in terms of the Markov process. We could take a look at private placements, starting with a certain quality rating, and study how private placements move to different quality ratings over time. For commercial mortgages, you can take a look at it from the perspective of once you have a credit-risk event, what happens to that asset? If it's delinquent, does it go into the process of foreclosure, does it become rehabilitated, or does it become restructured? Then we can do things such as look at other parameters, or exogenous variables. The Coldwell Banker vacancy rates in commercial mortgages can be overlaid, and we can take a look at regions of the country. There are many different aspects that we haven't gotten into yet, but the database is there.

Finally, credit-risk experience is of obvious use in terms of risk-based capital or in developing asset reserves. I think in time we will have to be able to stand up and say what appears to be reasonable levels and have the regulators understand that the statements are based on data. So right now we have many additional pieces. We can begin to do work on adding new data and, as Bill said, 1990-93 is a critical period. As Ed mentioned, we have to get this new information in private placements. Not always the good years, but in some cases we may be concerned more with what can happen in terms of the values.

