Default Risk and Required Return in the Commercial Mortgage Market

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Abstract. **This study uses published mortgage commitment and delinquency data to compare historical and prospective results of investing in well-diversified commercial mortgage portfolios with corresponding investments in long-term Treasury and corporate bonds. The conclusions are that commercial mortgages have been and continue to be efficiency priced, and that mortgages are similar in risk and expected return to lower rated investment-grade corporate bonds.**

Introduction

The explosive growth of the institutional debt market and expanded corporate use of leverage in the 1980s has stimulated research interest in the risk/reward characteristics of various diversified fixed-income portfolios. Initial investigations focused on the comparison of historical junk bond returns with returns on government bond portfolios of similar maturities over various investment horizons.[1] Recent studies have expanded the area to include corporate bond portfolios of all credit grades.[2] The results of these studies are of interest to both academics and fixed-income portfolio managers because they address two related questions:

(1) Was each class of risky debt efficiently priced with respect to default-free debt in light of subsequent loss experience?
(2) Is risky debt efficiently priced based on future loss expectations, or are other market considerations generating extra yield premia on one or more classes of risky debt that could be captured by a well-diversified fixed-income investor interested solely in long-term total return?

In this article we extend these questions to commercial mortgage portfolios. This is a natural extension, since the return/risk characteristics of large-capitalization commercial mortgages are almost identical to those of corporate bonds, and resemble the investment characteristics of corporate bonds much more closely than they do the investment characteristics of residential mortgages.[3] However, the extension entails difficulties not encountered by earlier researchers, due to the lack of publicly available historical data required to emulate the earlier methodologies.

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The lack of a liquid secondary market for commercial mortgages implies that no return measurements on diversified portfolios of commercial mortgages are available. Similarly, without secondary market pricing data it is not possible to measure directly the losses incurred by mortgage investors on loan delinquencies, foreclosures, and restructurings to forestall anticipated default. Researchers cite the lack of adequate data as the reason for the absence of rigorous economic studies on the historical investment characteristics of commercial mortgages.[4]

While the data needed to emulate the methodology of studies on the investment characteristics of corporate bond portfolios is not available, a substantial quantity of historical data on commercial mortgage originations, delinquencies and defaults has been published on a quarterly or semiannual basis by the American Council of Life Insurance (ACLI). This data is widely recognized as the most authoritative well-diversified commercial mortgage data available. The present study began as an effort to see whether simple robust intuitive models could compensate sufficiently for inadequacies in the ACLI data to answer the above questions. This is the approach used throughout the article.

Mortgages as Private Placement Loans

Commercial mortgages comprise one component of the private placement debt market. The main differences between commercial mortgages and general obligation corporate debt are threefold: mortgage default covenants are simpler and less varied than covenants for general obligation debt, mortgages do not share primary claims on default security with other debt instruments, and most commercial mortgages do not expose the lender to risk of loan income loss due to principal prepayment.[5] Prepayment protection is also the main conceptual difference between commercial mortgages and investment-grade residential mortgage pools.

Prepayment protection has long been the distinguishing investment characteristic of commercial mortgages. Data available from the American Council of Life Insurance shows that as far back as the late 1960s roughly half of all commercial mortgages were closed to prepayment for nine years or longer.[6] As interest rates soared in the late 1970s and lenders realized that eventually interest rates would decline, the incidence of substantial prepayment closure rose to encompass more than 80% of all new loans.

In the early 1980s the average holding period for commercial real estate declined, with the result that prepayment closure covenants began to interfere with real estate transactions. To prevent this interference while preserving prepayment protection, lenders developed the substitute concept of yield maintenance. Prepayments are allowed under yield maintenance covenants, but a mortgagor making a prepayment must also pay a penalty if there has been a decline in interest rates between the time the loan was originally made and the time of the prepayment. Conceptually, the penalty is designed to make up for any loss of future income the lender will suffer as a consequence of re-lending the prepayment at interest rates in effect at the time of the prepayment to replace income that would have been generated by the original loan.

Loan prepayment protection continued to broaden as average loan maturity declined in the early 1980s, with the result that prepayment protection began to encompass the entire term of most loans. Snyderman [14] reported that 93.5% of commercial mortgages issued in 1989 were fully call-protected by either yield maintenance or prepayment closure

covenants, versus 65% of investment-grade corporate bonds. Titman and Torous [16] observed that a majority of all commercial real estate transactions during their test period were financed with "bullet" loans with a maturity of ten years or less that were totally closed to prepayment.

Prepayment protection is more important in the private placement debt market than in the public market, since traditional private placement investors make loans with the intent of retaining the loans through maturity.[7] These investors are interested in expected total yield over the life of the asset. Since the purpose of private placement lenders is usually to generate cash to meet ongoing obligations for periodic cash outflows, the effect of interest-rate fluctuations on portfolio value is less significant to these investors than the illiquidity premia that historically have been available in the private placement market. The present value of investor liabilities fluctuates roughly in lockstep with the present value of the illiquid assets: investor net worth is only slightly affected.

For default-free loans, the required return over an investment horizon equal to the loan term is identical to the interest rate on the loan. For risky loans, including commercial mortgages, the required annual return over the loan term equals the interest rate on the loan minus the expected loss rate due to borrower default.

As discussed in the next section, for the foreseeable future it is reasonable to expect that commercial mortgage investors will be interested in retaining their investments through maturity. Thus our approach to the examination of returns on commercial mortgages is to compare the expected loss-adjusted mortgage yield over the loan term with annualized long-term returns on corporate and Treasury bond indexes of comparable maturity.

Since some commercial mortgages contain provisions for contingent incremental returns such as equity participation or performance-based interest, it is important to determine whether these adjustments made a significant contribution to total expected returns on ACLI mortgage commitments during the test period of this study.

Financial deregulation in the early 1980s resulted in the aggressive expansion of newly deregulated lending institutions—in particular, savings and loans—into the commercial mortgage market. These institutions were oriented toward near-term accounting profits that satisfied requirements for regulatory approval of dividend payments and executive bonuses. Thus many of these new market participants were willing to exchange long-term loan risk protection for market share and the privilege of booking up-front loan fees. To reassure regulators that no significant long-term risk protection had been surrendered, loan maturities were shortened.

The expansion of lender competition by newly deregulated financial institutions coincided with a sudden and permanent reduction in late 1982 in the frequency of contingent return provisions in commercial mortgages. Table 3 of [8] shows that between 45% and 90% of quarterly ACLI mortgage commitments contained one or more such provisions during the first eleven quarters of the 1980s. This table also shows that in the fourth quarter of 1982 the value-weighted occurrence of these adjustments abruptly declined to 26% of all loan commitments, and remained at low levels for the remainder of the 1980s. These adjustments never appeared in more than 35% of value-weighted quarterly loan commitments after 1982, and were present in less than 30% of the loan commitments in all but two quarters after 1982. They declined still more during the second half of the 1980s: to less than 20% of value-weighted loan commitments during all quarters, and usually to less than 10%. Exhibit 1 shows a simultaneous and equally sudden permanent decline in average loan maturity.

While the ACLI data does not include the estimated impact of contingent return provisions, the low occurrence of these provisions during the second half of the 1980s implies that their contribution to expected mortgage returns was not significant during that period. By contrast, their appearance in so many loan commitments prior to the end of 1982 implies that their expected contribution to ACLI mortgage index returns was significant. Since lenders purchase such provisions by surrendering some fixed return, it is likely that the loss-adjusted ACLI mortgage index yield was a downward-biased estimator of expected mortgage returns for the first eleven quarters of the 1980s. For the remaining portion of the test period (from the last quarter of 1982 to the end of 1984), the expected impact of contingent return provisions on mortgage returns is not apparent on the basis of available ACLI data.

Mortgage Interest Rates

We use the required yields from the ACLI quarterly commercial mortgage loan commitment data to model historical yields on commercial mortgages.[8]

We restrict our attention to that segment of the commercial mortgage market of greater interest to institutional investors. Thus we use ACLI interest rates on mortgage commitments of $5,000,000 or more rather than ACLI data on all reported commercial mortgage commitments.

Exhibit 1 presents value-weighted interest rates on these large capitalization loans, average maturity for this index, large cap commitment value as a percentage of total commitments reported to ACLI, and the number of commitments in the large cap index as a percentage of the total reported to ACLI. The data shows that loan commitments of $5,000,000 or more comprise between 70% and 94% of the total value of quarterly reported loan commitments during the test period, with the larger percentages occurring in the more recent years. Since mortgage commitment rates and maturities in both the large cap subindex and the total ACLI index are value-weighted, these large percentages imply there was little difference between the two indexes during the 1980s, and virtually no difference after 1983.[9]

The growth in large capitalization financings is only one way in which the commercial mortgage market has changed over the last fifteen years. The market has also responded to greater volatility of interest rates and inflation by shortening average loan maturities. Because of these and related changes in the form of typical commercial mortgage investments, we restrict our attention to the ten-year period 1980–1989.

Since the ACLI index represents an average of interest rates during the quarter, it is appropriate to compare these values with quarterly government and corporate bond indexes constructed by averaging yields on each class of bonds over the quarter rather than with yield indexes constructed from end-of-month data. The Standard & Poor's Corporation (S&P) reports suitable yield indexes for publicly traded classes of government and corporate bonds.

Exhibit 1 includes quarterly yield rates on the S&P long-term Treasury bond index.[10] We obtain quarterly values by arithmetically averaging the monthly values actually reported in the *Standard & Poor's Bond Guide* over the quarter. The monthly values in turn represent arithmetic averages of the mid-week index values during the month (the *S&P Bond Guide* also reports the mid-week values).

Exhibit 1
Quarterly Treasury Bond and Mortgage Yield Commitment Data

Year: Quarter	S&P Long-term Treasuries	$5,000,000+ Mortgage Commitments	Yield Spread	Average Mortgage Maturity	Percent of Total Loans By Value	Percent of Total Loans By Number
1980:1	11.69	12.04	0.35	19.92	78.80	26.30
1980:2	10.37	12.90	2.53	19.50	85.60	32.50
1980:3	10.83	12.34	1.51	18.92	81.00	30.40
1980:4	12.01	12.86	0.85	18.92	77.50	31.50
1981:1	12.33	13.32	0.99	18.33	71.50	20.60
1981:2	13.04	13.32	0.28	21.75	83.60	34.00
1981:3	13.90	14.33	0.43	21.50	86.30	35.50
1981:4	13.54	14.65	1.11	19.83	69.60	23.00
1982:1	13.72	14.47	0.75	18.67	78.40	26.70
1982:2	13.19	14.60	1.41	17.67	74.60	25.50
1982:3	12.61	14.38	1.77	13.00	74.90	34.50
1982:4	10.51	13.32	2.81	10.83	82.40	37.70
1983:1	10.67	12.83	2.16	10.17	79.00	39.60
1983:2	10.58	12.29	1.71	11.17	81.00	42.80
1983:3	11.51	12.28	0.77	11.25	84.80	42.10
1983:4	11.60	12.56	0.96	11.00	87.90	49.10
1984:1	11.88	12.54	0.66	10.92	86.10	53.50
1984:2	13.12	12.94	-0.18	11.17	89.90	56.50
1984:3	12.72	12.79	0.07	11.92	91.00	49.30
1984:4	11.63	12.90	1.27	9.83	88.70	50.60
1985:1	11.55	12.27	0.72	10.08	85.00	47.20
1985:2	10.92	11.95	1.03	9.25	87.80	51.80
1985:3	10.53	11.40	0.87	8.58	84.70	51.60
1985:4	9.96	11.19	1.23	8.42	88.50	55.00
1986:1	8.84	10.21	1.37	10.32	88.30	54.30
1986:2	7.97	9.45	1.48	10.03	90.20	58.80
1986:3	7.88	9.27	1.39	9.84	91.10	65.00
1986:4	7.88	8.98	1.10	9.22	90.80	56.90
1987:1	7.69	8.94	1.25	9.96	89.60	60.40
1987:2	8.68	9.29	0.61	10.33	89.90	58.50
1987:3	9.26	9.75	0.49	9.65	90.50	60.30
1987:4	9.40	9.99	0.59	8.60	92.00	64.60
1988:1	8.75	9.44	0.69	9.17	90.90	60.70
1988:2	9.20	9.57	0.37	9.29	89.80	59.30
1988:3	9.37	9.81	0.44	8.41	92.10	67.60
1988:4	9.13	9.91	0.78	9.39	92.50	64.90
1989:1	9.22	10.19	0.97	9.47	91.60	63.90
1989:2	8.85	10.20	1.35	9.46	91.30	59.90
1989:3	8.30	9.41	1.11	9.28	93.60	68.30
1989:4	8.12	9.42	1.30	9.15	90.90	66.70
Average Value:	10.57	11.61	1.03	12.35	85.84	48.44
Standard Deviation:	1.84	1.80	0.61	4.27	6.15	14.07

Since the Treasury bond index yield for each quarter is an arithmetic average of weekly yields, while the mortgage index yield is a value-weighted average for the entire quarter, there is a possibility that quarterly value-weighted ACLI loan rates are biased downward relative to the S&P long-term Treasury benchmark during quarters in which monthly long-term Treasury rates change substantially during the quarter. This could result from a larger volume of mortgage commitments during months in which interest rates are low than during months in which rates are high.

To test this possibility, we constructed an alternative quarterly ACLI mortgage index by arithmetically averaging monthly value-weighted ACLI mortgage commitment interest rates.[11] This construction produced a quarterly mortgage yield index that—by virtue of its construction—is not biased downward relative to the Treasury bond index during quarters of changing interest-rate levels.

A comparison of the two ACLI mortgage interest-rate indexes revealed an average difference of six basis points and a standard deviation for the difference of seven basis points. In addition, the difference deviated two standard deviations or more from its average in only three quarters of the test period. Thus the difference in the two series is statistically insignificant, which implies that the large capitalization quarterly series is not biased downward.[12]

Exhibit 2 displays quarterly data on ACLI mortgage yields and the S&P long-term Treasury index yields during the test period. Exhibit 3 displays yields on the S&P long-term Treasury index and the S&P AAA, AA, A, and BBB corporate bond indexes for comparison with the mortgage yield data.[13] Exhibit 4 presents summary data statistics.

Exhibits 2–4 show that the yield spread on mortgages during the test period was comparable to the yield spread on investment grade corporate debt (lower on average than A-rated publicly traded debentures but higher than AA-rated debentures). In addition, they show that the mortgage yield spread fluctuated much more than the corresponding corporate bond yield spreads.

However, Exhibit 5 shows that the average magnitude of quarterly mortgage yield changes was smaller than the average magnitude of quarterly changes in the S&P long-term

Exhibit 2
Mortgage and Treasury Yields

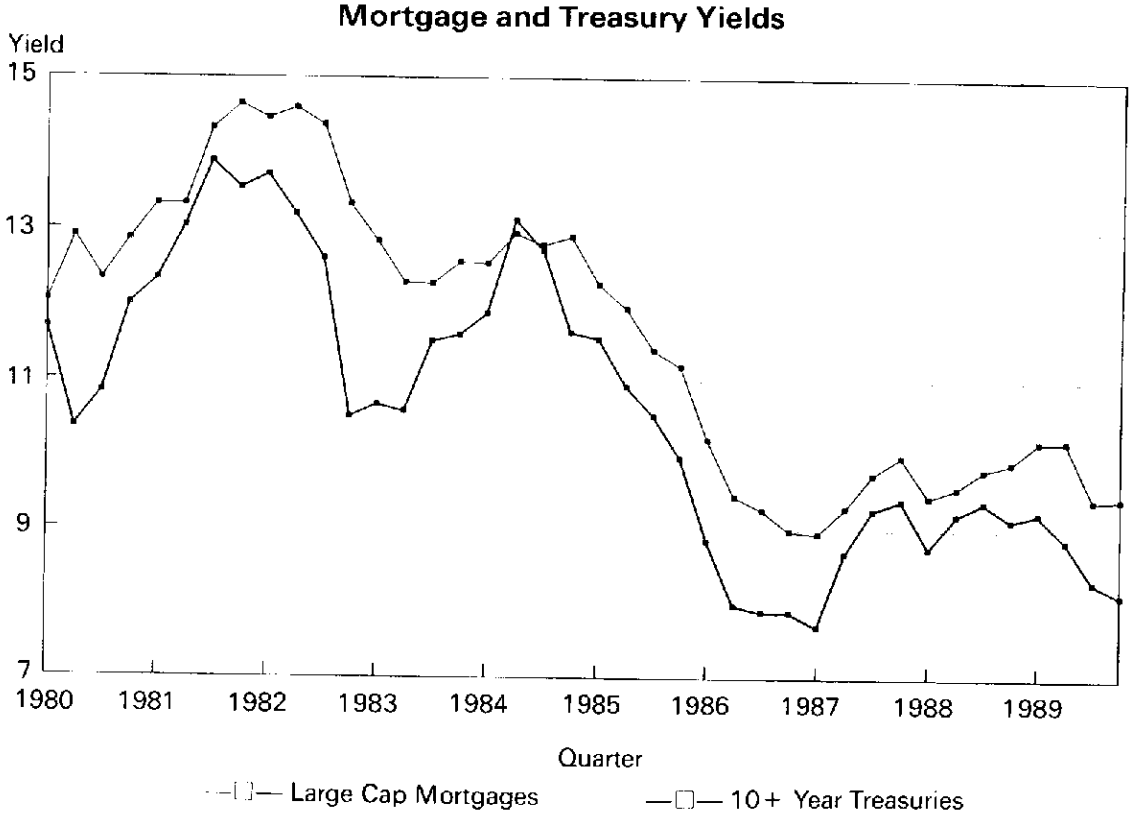


Exhibit 3
Corporate Bond Yields

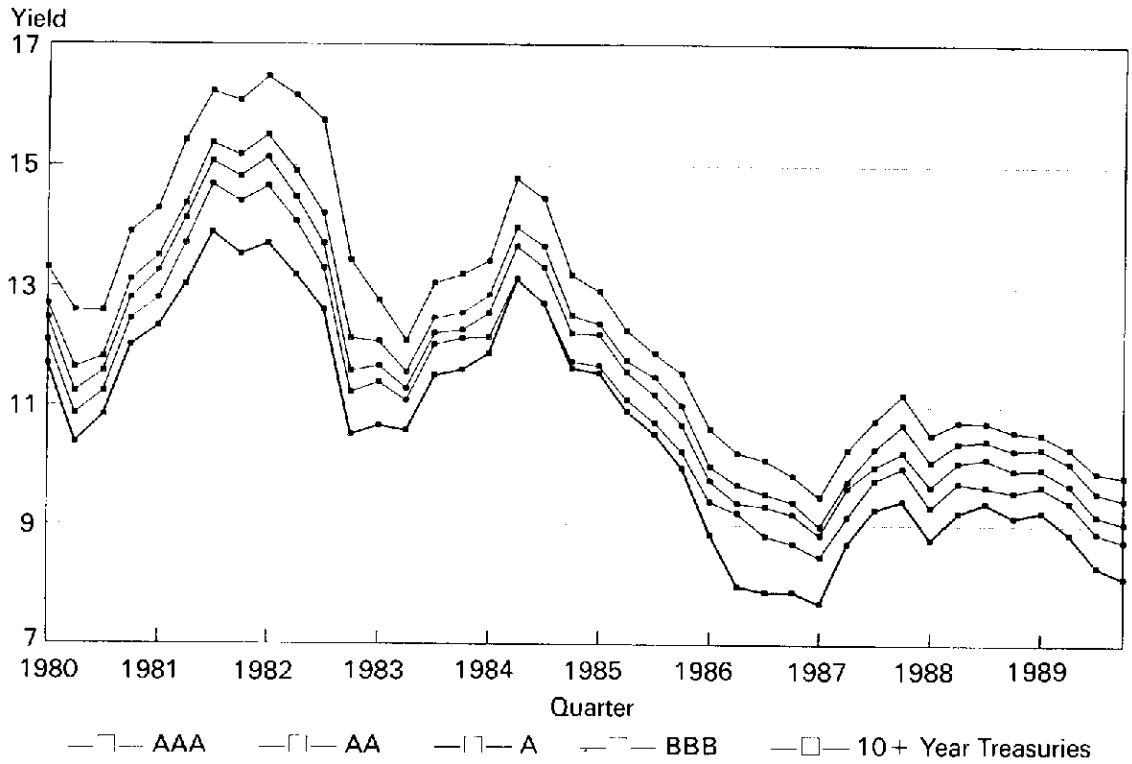


Exhibit 4
Yield Spreads over Long-Term Treasuries

Bond Index	Average Spread	Standard Deviation
$5,000,000+ Mortgage Commitments	1.03%	0.61%
AAA Corporates	0.52%	0.26%
AA Corporates	0.90%	0.24%
A Corporates	1.21%	0.27%
BBB Corporates	1.86%	0.47%

Treasury index. This suggests that the excess volatility of the mortgage yield spread relative to publicly traded corporate bond yield spread volatilities can be traced to the failure of mortgage lenders to adjust their loan commitment rates completely in response to Treasury yield fluctuations. A test of this hypothesis will depend on an economic rationale for such behavior, a model that measures the effect of this behavior on the mortgage yield spread, and a statistical test of the model. The rest of this section is devoted to these developments.

The fact that lenders hold mortgages to maturity could account by itself for such behavior on the part of mortgage lenders. Without a secondary market in commercial mortgages, there is no way for lenders to capture profits created by transitory fluctuations

Exhibit 5
Quarterly Yield Changes

Bond Index	Average Magnitude of Quarterly Change
$5,000,000+ Mortgage Commitments	0.37%
AAA Corporates	0.51%
AA Corporates	0.52%
A Corporates	0.52%
BBB Corporates	0.53%
Long-term Treasuries	0.54%

in the mortgage yield spread after loan commitments are made. At least three months are required to process commercial mortgage applications, and borrowers—who typically are highly leveraged—need to know the required interest rate before committing themselves to cover processing costs. Thus lenders specify an interest rate early in the application cycle, and are unable to respond to Treasury fluctuations after that point.

As already discussed, the most likely candidates for participation as lenders in this market are institutions with access to long-term funds at costs that respond slowly or not at all to Treasury rate fluctuations, such as life insurance companies. Such lenders are concerned primarily with the spread between the expected loss-adjusted yield on their loans and their capital costs, taking into account the spread between Treasuries and corporates only to ensure that long-term mortgage returns are at least as good as alternative fixed-income investment opportunities.

The ability to price commercial mortgage loans and value loan security represents significant overhead on the part of these lenders that must be justified by the returns on successfully concluded loans. In perfect capital markets, competition among lenders would drive long-term loan returns to the level of long-term returns on alternative allowable investments (e.g., investment-grade corporate bonds), plus an economic rent on the overhead represented by lender credit analysis and loan origination departments and an additional adjustment due to any economies or inefficiencies of scale represented by market share. In other words, lenders must balance concern with the profit potential of transitory rate adjustments against potential loss of business. Under these circumstances it is reasonable to expect lender adjustments of loan commitment rates in response to long-term Treasury yield fluctuations to be less than total.

If this explanation is correct, then changes in the mortgage yield spread should depend on changes in Treasury yields. In addition, if the dependence is a linear relation, then the coefficient of Treasury yield changes should be negative with absolute value less than one.

This hypothesis was tested by regressing the series of quarterly changes in mortgage yield spreads on the series of quarterly changes in the Treasury yield index. As shown in Exhibit 6, the regression coefficient of Treasury yield changes was negative and statistically significant. The value of the regression coefficient was -0.658, with t-statistic -6.94. Furthermore, the regression accounted for 56.6% of the variance in mortgage yield spread changes.

Exhibit 6
Regressions of Yield Spread Changes on Treasury Yield Changes

Bond Index	Beta*	Constant*	R^2	Adjusted R^2	Durbin–Watson
$5,000,000+ Mortgage Commitments	−0.658 (−6.94)	−0.036 (−0.54)	0.566	0.554	1.87
AAA Corporates	−0.086 (−2.23)	−0.002 (−0.09)	0.118	0.095	1.85
AA Corporates	−0.050 (−1.59)	−0.001 (−0.04)	0.064	0.039	1.28
A Corporates	−0.063 (−1.62)	0.002 (0.07)	0.066	0.041	1.58
BBB Corporates	0.072 (−1.16)	−0.005 (−0.10)	0.035	0.009	1.38

*t-statistics in parentheses

The Efficient Markets Hypothesis implies that the above effect should not exist in the yield premia changes of fixed-income securities that have active secondary markets. To test this implication, the yield spread changes for AAA, AA, A, and BBB corporate bonds were regressed on the series of Treasury yield changes. The results of these regressions are also shown in Exhibit 6. In three of the four cases, the regression coefficient of Treasury changes was statistically insignificant. In the case of AAA-rated bonds, the t-statistic of Treasury yield changes was −2.23. The regression R-squareds were also much smaller than those observed for mortgage yield changes: 9.5% in the case of AAA-rated bonds, and less than 5% in the other three cases.

The model shows that Treasury yield changes inflated the volatility of mortgage yield spread changes during the test period. It does not show how changes in Treasury yields affected the volatility of the mortgage yield spread itself.

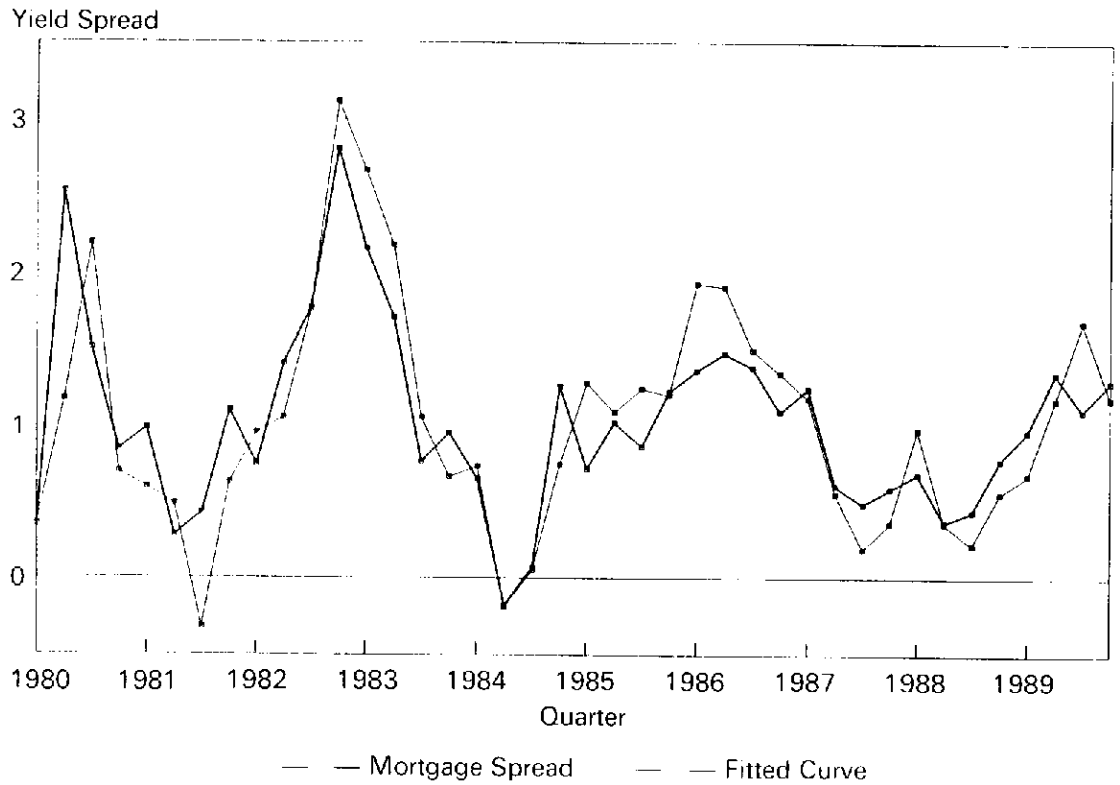
We model the effect of Treasury yield changes on the mortgage yield spread by numerically integrating the fitted curve from the model for mortgage yield spread changes to obtain a fitted curve of mortgage yield spread values. This curve is defined as follows: the fitted yield spread for the first quarter of 1980 is set equal to the observed yield spread, and subsequent fitted values are defined iteratively by the relation:

$$y_k = y_{k-1} - b \cdot \Delta T_k + \Delta S_k,$$

where b is the regression coefficient of mortgage yield spread changes on Treasury yield changes, and ΔT and ΔS are the Treasury yield change and mortgage yield spread change for the K^{th} quarter, respectively. The mortgage yield spreads and the fitted values due to Treasury yield changes are shown in Exhibit 7.

The differences between observed mortgage yield spreads and fitted values are the fluctuations in mortgage yield spreads during the test period due to factors other than

Exhibit 7
Mortgage and Model Spreads



Treasury yield changes. Assuming that these differences are independent samples from a stationary distribution, the adjusted mortgage yield spread standard deviation is defined to be the standard deviation of the distribution for the differences. The sample standard error of the differences is an unbiased estimator of the adjusted mortgage yield spread standard deviation.

The difference series satisfies statistical tests for stationarity and independence. The sample adjusted standard deviation of the mortgage yield spread was 41 basis points, which is consistent with the sample standard deviations of the four corporate bond yield spreads (these ranged from 24 basis points for AA-rated corporates to 47 basis points for BBB-rated corporates). Thus the model accounts for the excess mortgage yield spread volatility observed during the test period relative to the yield spread volatilities of publicly traded investment-grade corporate bonds. The percentage of mortgage yield spread variance explained by Treasury yield changes was $(61^2-41^2)/61^2=55\%$.

There was a brief time during the test period in which the behavior of the yield data did not conform with standard views of rational behavior in the pricing of risky debt. Exhibit 2 shows that during the second quarter of 1984 the mortgage yield spread was actually negative, and was barely positive during the third quarter of 1984 (monthly ACLI data shows that the mortgage yield spread was negative during May, June, and July). Similarly, Exhibit 3 shows that the yield spread on AAA-rated corporates virtually vanished during the second and third quarters of 1984, and that these were the only quarters in the test

period during which values this low were observed for the AAA yield spread.[14] In addition, the lowest AA yield spreads observed in the test period occurred during the last three quarters of 1984, although the reduction in the AA yield spread during these quarters was not as dramatic as it was for AAA bonds and mortgages. This anomalous behavior in the yield spread data of both commercial mortgage loan commitments and publicly traded high-grade bonds suggests that the anomaly is not purely a data measurement problem, but rather signaled the presence of some unusual characteristic of the fixed-income markets during this period. We cannot account for these observations, but believe they warrant future examination.

Historical Frequency of Problem Loans

Mortgages that result in lender losses can be classified as either workouts or foreclosures. In foreclosures, lenders assume ownership of the property in response to borrower default, and in so doing assume responsibility for asset disposition and the ultimate magnitude of capital loss. In workouts, lender and borrower agree to restructure the terms of the loan in response to actual or anticipated borrower default. A workout typically involves an extension in loan maturity and/or reduction in debt service and relaxation of loan covenants to give owners some time in which to improve property yield to the point where it will be able to service the revised loan agreement. Since these changes increase downside risk, lenders often require a higher interest rate or equity participation as compensation, or additional collateral to lower downside risk in event of subsequent default on the modified loan agreement.

Foreclosures and workouts are not mutually exclusive. It is not uncommon for loans classified as workouts during one period to result later in foreclosures. However, all losses due to default risk can be considered as arising from one of these two situations.

The American Council of Life Insurance distributes data on problem mortgages of all types in a companion publication to the ACLI mortgage commitment bulletin.[15] The companion bulletin includes annual data on foreclosure volumes and workout loans.

Exhibit 8 presents the annual value of commercial mortgage foreclosures as a percentage of the value of commercial mortgages outstanding for the test period 1980–1989. It would be appropriate to present foreclosure rates for large capitalization commercial loans, but this subcategory is not broken out by ACLI.

If there were a significant difference in observed defaults on large and small cap loans, it would be reflected in different required yields on the two types of loans. However, we have already observed that there is virtually no difference in the required yields on large and small cap loans during periods of stable interest rates. This suggests it is acceptable to use the foreclosure rate on all commercial mortgages as a proxy for the foreclosure rate on large cap commercial mortgages.

It would be appropriate to present corresponding data for workouts, but two problems prevent this direct approach: first, unlike foreclosures, workouts are outstanding loans, and could be counted in more than one year; and second, the ACLI only began to compile data on workouts in 1988.

A natural question to ask is whether one of these two classes—foreclosures or workouts—is more important in the computation of loan losses than the other; and here it is possible to arrive at a practical conclusion.

Exhibit 8
Commercial Mortgage Foreclosure Rates

Year	Foreclosures
1980	0.06%
1981	0.05%
1982	0.12%
1983	0.09%
1984	0.19%
1985	0.24%
1986	0.75%
1987	0.97%
1988	1.32%
1989	1.06%
Average Value:	0.48%

To begin with, it is reasonable to expect that lenders are more willing to renegotiate loan terms and accept a higher degree of loss risk in lieu of foreclosure when the real estate market is weak. In this economic setting, subsequent real estate market improvement could enable distressed borrowers to fulfill their loan obligations, repairing de facto defaults and enabling lenders to avoid recognizing loan losses on their books. By contrast, if borrowers face default when the real estate market is healthy, then lenders are much more likely to view foreclosures as inevitable and foreclose as soon as practical to close out the loan and prevent any additional losses.

This suggests that the ratio of new workouts to foreclosures was as high or higher during the last years of the test period than it was during earlier years of the test period. If so, it follows that the average (annual) ratio of new workouts to foreclosures during the entire test period was no larger than the average ratio of workouts to foreclosures during the last four years of the test period.

The ACLI bulletin reported in 1990 that the percentage of commercial mortgages classified by the ACLI as workouts at the end of 1989 represented 2.73% of the total value of commercial mortgages outstanding. This percentage represents all workouts in good standing at the end of 1989 that lenders in the ACLI survey reclassified as workouts at some point during the four-year period 1986–1989.

Exhibit 1 shows that average maturity for new loans was approximately nine years throughout the period 1986–1989. Assuming that the ratio of new workouts to foreclosures was constant during this four-year period, a simple equation can be used to solve for this ratio.

The equation results from the observation that the sum over the years 1986–1989 of the annual value-weighted percentages of new workout loans still outstanding at the end of 1989 equals the value-weighted percentage of all outstanding commercial mortgages ACLI reported in workout status at the end of 1989, i.e., 2.73%.

It is widely accepted that the probability of loan restructuring is greatest in the early years of the loan.[16] Since restructurings typically include loan maturity extensions, and since new loan maturities averaged more than nine years during each year of the test period, it is reasonable to assume that virtually all new workouts during the period 1986–1989 were either still outstanding at the end of 1989 or had been foreclosed.

Assume for the moment that all new workouts during 1986–1989 were still outstanding at the end of 1989. It follows that, for each $1986 \leq t \leq 1989$, the value-weighted percentage of new workouts in year t equaled the value-weighted percentage of foreclosures in year t multiplied by the annual ratio of new workouts to foreclosures. Letting a_t represent the value-weighted percentage of foreclosures in year t, and x represent the annual ratio of new workouts to foreclosures, the following equation results:

$$\sum_{t=1986}^{1989} a_t \cdot x = 2.73\%.$$

The values for a_t are given in Exhibit 8. Substituting and solving for x shows that the annual value-weighted ratio of new workouts to foreclosures equaled 0.67.

We estimate the contribution of workouts to the problem loan development rate by assuming that the ratio of new workouts to foreclosures was constant during the entire test period, and that workouts and foreclosures were mutually exclusive. This implies that the average rate of problem loan development during the test period equaled 1.67 times the average foreclosure rate.

From Exhibit 8, the average annual foreclosure rate during the test period equaled 0.48%. Together with the contribution from new workouts, this implies an average annual problem loan development rate during the test period of $1.67*0.48\% = 0.80\%$.

We are only interested in estimating the volume of workouts not included in foreclosure data. While workouts and foreclosures are not mutually exclusive, informal experience on the part of one author indicates that no more than one-half of all workouts end in foreclosure. If this experience is generally applicable, then data on the workout-foreclosure overlap would produce a problem loan development rate estimate somewhere between 1.34 and 1.67 times the average foreclosure rate. Thus error in the problem loan development rate due to the fact that some workouts end in foreclosure is no more than 20% of the value estimated under the assumption that workouts and foreclosures are mutually exclusive. This error contribution is no greater than expected contributions from other parts of the loss rate model, and justifies the assumption in the absence of reliable data on the size of the overlap.

It is significant to note from Exhibit 8 that the foreclosure rate in 1986 was more than triple its value in any of the preceding six years, and that the foreclosure rate in the subsequent three years was higher than its 1986 value. However, the 1980s was an era of expansive credit that witnessed the entry of new lenders into the mortgage market, an extreme level of competition among lenders that encouraged relaxed underwriting standards, and willingness on the part of many lenders to exceed the traditional 75% lending limit on property valuation in exchange for the privilege of booking up-front fees on new loans.[17] The relaxation of risk control made it highly probable that the default rate would mushroom during the next downside of the real estate cycle.

The mortgage loan volume was at record levels in the 1980s and has declined in the first two years of the 1990s. This implies that the preponderance of loans outstanding during the early 1990s will be loans that were made during the 1980s. Since these loans were made during a period of relaxed underwriting standards, there is every reason to expect that a continuation of the current real estate downcycle will keep defaults at the high rates of the late 1980s for the next few years.

On the other hand, many of the more aggressive lenders of the 1980s have since adopted a less aggressive business stance, and those that are still in the business of mortgage lending have returned to more conservative, traditional underwriting standards.[18] Consequently, it is reasonable to expect the default rate on loans made in the 1990s to display at least as much consistency with observed foreclosure rates prior to 1986 as with rates observed during the period 1986–1989. This suggests that we model the expected value-weighted problem loan development rate for future loans by averaging annual problem loan development over the entire test period. This implies an expected problem loan development rate of 0.80%.

Recovery Rates on Problem Loans

The corporate bond studies cited in Notes 1 and 2 examined bonds with active secondary markets. The authors of those articles referred to actual price quotes to measure the loss of asset value from defaults and restructurings. Altman [1] observed that price quotes on corporate bonds immediately after initial default events average around forty, indicating that the market estimates the average present value of the eventual payoff from these issues to be around 40%.

For debt without a secondary market such as commercial mortgages, an alternative approach to loss estimates must be found. Altman [2, pp. 93 94] suggested such an alternative.

Altman based this approach on the observation that, for each interest rate on a risky fixed-income asset, there is precisely one value for the yield spread over Treasuries of comparable maturity such that expected annual loss exactly balances the expected incremental income resulting from the spread. Furthermore, this break-even spread is robust to variations in the loan coupon rate.

For a well-diversified portfolio of fixed-income assets, the value-weighted yield spread determines whether or not the average portfolio return over longer investment horizons exceeds the return on a Treasury portfolio of comparable maturity. If portfolio yield spread exceeds the break-even spread, returns are likely to exceed Treasury returns over a long-term investment horizon; if portfolio yield spread does not exceed the break-even spread, long-term portfolio returns are unlikely to exceed corresponding Treasury portfolio returns.

Risk-averse behavior implies that rational investors require compensation for holding risky investments in the form of added expected return. In the case of fixed-income securities, this added expected return is the spread between interest rate and break-even yield. In other words, rational lenders price risky debt so that the yield spread exceeds the break-even spread.[19] Furthermore, the higher the break-even spread, the greater the difference between required spread and break-even spread.

If the expected problem loan development rate is known with reasonable certainty, but not the recovery rate on problem loans, then it is possible to set up a table listing the break-even spread as a function of sample values from a range of estimated average recovery rates and allow investors to select their own break-even spreads on the basis of individual expectations about average recovery rates. Exhibit 9 presents our range of reasonable average recovery rates and implied break-even spreads for selected rates of problem loan development.

Exhibit 9
Break-Even Yield Spreads

Expected Recovery Rate on Defaults	Break-even Yield Spread (0.80% Default Rate)
50%	0.41%
60%	0.33%
70%	0.25%
80%	0.16%
90%	0.08%

We assume mortgage payments are due monthly. The equation for the break-even spread assumes that an initial loan problem results in nonpayment of both principal and three months of interest, so the problem event includes nonreceipt of one-quarter of the loan coupon rate on the principal balance outstanding.

The break-even point is robust to variations in the loan coupon rate and the number of months of lost interest. The break-even values in Exhibit 9 assume a loan coupon rate of 10%.

The range of recovery rates assumed in Exhibit 9 is very different from that assumed by Altman. This is due to the differing characteristics of commercial mortgages and unsecured general corporate debt. In the case of rated unsecured corporate debt, the default rate by creditworthy borrowers is very low. However, the value of the assets securing the loan can be expected to deteriorate along with the financial health of the company, ensuring that the value of loan security is least precisely when creditors need to attach it. Thus the expected recovery rate on defaulted debt is not high.

By contrast, mortgage borrowers are often low-grade credit risks with a higher probability of default. However, the value of the assets securing the loan is often unaffected or only slightly impaired if the financial condition of the borrower deteriorates. Thus, assuming that lenders exercise traditional levels of due diligence in valuing commercial properties that serve as loan security, the expected recovery rate on problem loans should be much higher than recovery rates on defaulted corporate debentures.

Variations in expected default and recovery rates due to changing real estate market conditions produce real changes in loss risk that vary the break-even spread over time. In addition, changes in interest rates affect loss risk indirectly by changing available reinvestment opportunities for recovered principal from opportunities available at the time loans were made, although this financial effect is less significant than the effect of real economic changes in the real estate market itself. Finally, changes in underwriting standards such as those that occurred in the 1980s also affect loss risk, although the effect is asymmetric: on the downside of the real estate cycle lenders observe dramatic loss dependence on loan underwriting standards, while on the upside improving real market conditions bolster property performance in general and enable most borrowers to service their debt.

Conclusions

Our personal choice for the expected average recovery rate on problem loans is 70%, based on years of experience on the part of one author in the commercial mortgage market.

Thus the expected rate of problem development for future loans implies a break-even yield spread over long-term Treasuries of 25 basis points (Exhibit 9). From Exhibit 1, the average quarterly yield spread on large cap mortgage commitments exceeded 25 basis points during 38 of the 40 quarters of the test period. In fact, average yield spread during the test period was 103 basis points. Thus most well-diversified commercial mortgage portfolios of properly secured loans should have earned higher returns during the test period than returns earned by long-term Treasury portfolios.

By comparison, Altman [1] and [2] observed an average annual loss rate of 21 basis points for publicly traded BBB-rated bonds over the first ten years of bond life, and an annual loss rate of 9 basis points for publicly traded A-rated bonds; and during the test period the average yield spread on BBB-rated and A-rated bonds was 186 and 121 basis points respectively (Exhibit 4). Thus the average loss rate on commercial mortgages during the test period was close to the loss rate on BBB bonds, but the average mortgage yield premium was close to the premium on single-A bonds.

Some of this discrepancy can be explained by the fact that many mortgages carry some degree of prepayment protection (a form of call protection), and as asset-backed bonds are less vulnerable to event risk than general obligation debt. In the corporate bond market, covenants providing this kind of protection reduce single-A coupon rates by as much as 30 basis points, and it is reasonable to assume that these features produce comparable reductions in mortgage commitment yields.[20] While this is enough to account for the absence of an observed illiquidity premium, it is not enough to account for the risk/return discrepancy.

This does not mean that mortgages were priced inefficiently on the basis of loss expectations. We have already observed that the foreclosure rate during the first six years of the test period was only one-third the rate for the entire test period. Using our modeling procedure, this corresponds to an annual loss rate of 8 basis points, which is very close to the loss rate Altman observed for single-A bonds. Thus during the first six years of the test period lenders would have been justified in setting mortgage yield spreads at levels comparable to the spreads on A-rated corporate debt on the basis of previous and concurrent loss experience. Although Exhibit 2 shows that mortgage spreads remained at these levels for the rest of the test period, lenders may not have been convinced that a fundamental increase in loss risk had occurred on the basis of only one or two years of exceptional losses.

At the time this is being written—the end of the first quarter of 1991—commercial mortgage spreads are running between 200 and 225 basis points over ten-year Treasuries. This is comparable to the average yield spread available on BBB-rated bonds during the test period, and substantially higher than the spread usually available on corporate bonds rated single-A or better. This suggests that lenders have now responded to loss experiences of the late 1980s by adjusting their mortgage risk perceptions to levels slightly higher than BBB-rated corporate debt.[21]

In short, the results of our analysis are consistent with the conclusion that commercial mortgage originations were efficiently priced during the test period on the basis of perceived risk, and continue to be efficiently priced at the present time.

The significance of these conclusions is that they are extremely robust to the assumptions used to derive expected mortgage loss rates from ACLI default and delinquency data. Varying the assumptions does not change the break-even values in Exhibit 9 enough to affect the qualitative conclusions in this section.

We found the only qualitative effect on the conclusions results from varying our choice for the expected recovery rate on problem loans; and even here, the basic conclusions are unchanged as long as the expected recovery rate is assumed to be between 60% and 80%.

Notes

[1]See Asquith et al. [3], Blume and Keim [4], and Fons [6].

[2]See Altman [1] and [2].

[3]Titman and Torous [16] make these observations in their introduction. They point out that prepayment protection covenants in most commercial mortgages together with the non-recourse nature of commercial mortgage debt combine to make commercial mortgages more appropriate for a test of the contingent-claims approach to securities valuation than either corporate bonds or residential mortgages.

[4]The only previous empirical examinations of historical commercial mortgage returns were Snyderman [13] and [14]. In [13], Snyderman used ACLI data to model mortgage returns but did not allow for loss risk. In [14], Snyderman constructed his own data set of 7200 large-cap loans, analyzed the defaults and delinquencies and modeled portfolio losses. His estimated annual mortgage loss rate was 27 basis points, virtually identical to the annual loss rate estimated in this article with different data and methodology. Snyderman compared mortgage loss risk with corporate bond loss risk as determined by Altman [1] and [2]. Although Altman used S&P bond data, Snyderman used Shearson-Lehman bond data in computing mortgage and corporate bond return spreads. For the period during which [13] and [14] reported comparisons (1983 1989), Shearson-Lehman Treasury and corporate bond index yields were biased downward relative to corresponding S&P bond index yields. This contributed to the observance in [13] and [14] of higher returns from mortgages than from corporate bonds of comparable risk, a result not observed in the present study.

[5]See the introduction to Titman and Torous [16].

[6]See [8], Table G (prior to 1989) and Table 7 (starting in 1989).

[7]See Maher and Sommar [9, p. 17]. For an overview of the development of the private placement market over the last decade, see Mintz [10] and Pressman [11].

[8]See [8], Table C (prior to 1989) and Table 8 (starting in 1989).

[9]An examination of data in the ACLI bulletins shows little difference between required yields on large and small commercial loans when interest rates are stable and moderate. When interest rates are volatile or at unusually high levels, required yields on small loans are significantly higher than required yields on large loans.

[10]See [15]. The S&P long-term Treasury index is constructed from Treasury issues with ten or more years remaining to maturity.

[11]The monthly values represent the value-weighted average of required yields on all loan commitments reported to ACLI each month. ACLI only received aggregate monthly data: breakdowns by loan size, maturity, etc., were never reported. ACLI stopped tracking monthly data after the first quarter of 1989.

[12]This test demonstrates indirectly that it takes at least three months for the monthly volume of mortgage commitments to react to a change in interest rates. Direct analysis of monthly ACLI loan commitment volume produces the same conclusion.

[13]Monthly data on corporate bond index yields from the *S&P Bond Guide* are averaged arithmetically to generate quarterly yields; the same procedure produces quarterly yields on the S&P long-term Treasury index. These yields are the same as the corporate bond yields reported by Altman [1], except that we present quarterly averages whereas Altman presented annual averages.

[14]The yield premium on AAA corporates was 2 basis points for the second quarter of 1984, and zero basis points for the third quarter of 1984. These were the only quarters in the test period during which the AAA yield premium was less than 10 basis points.
[15]See [7].
[16]See for example [13, Note 2].
[17]Lending institutions were able to circumvent regulations designed to prevent more liberal loan policies through inflated property valuations based upon cash flow and appreciation projections that ranged from somewhat to wildly optimistic.
[18]See Roulac [12] for analysis of the impact of changing capital sources and financial institution reregulation on loan underwriting standards, financing structures, and equity investment opportunities in the commercial real estate market of the 1990s.
[19]Modern Portfolio Theory suggests that portfolio risk consists of two components, systematic risk and diversifiable risk, and that investors only demand compensation for systematic portfolio risk. While the theory has been supported by historical studies of U.S. stock returns, applicability of the theory to the pricing of fixed-income investments is much less certain.
[20]See [5, p. 64] and [10, p. 56].
[21]Part of the increase in required yield spread could result from heightened investor perception of the extent of environmental damage and financial responsibility for repairing the damage. Federal court rulings in 1986 established the precedent that any current or previous owner of property found to be an environmental hazard may be liable for the cost of removing the hazard. If property is mortgaged when determined to be a hazard its value as loan security diminishes or vanishes, since foreclosure would expose the lender to liability for the cost of environmental clean-up. The possibility that the security for a mortgage could subsequently be found to constitute an environmental hazard is a loan risk factor that has only existed since 1986. Rational investors would have required compensation for bearing this risk since 1986, but not prior to that time.

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