Analysis of Yield Spreads on Commercial Mortgage-Backed Securities

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Abstract

Yield spreads on commercial mortgage-backed securities (CMBS) are defined as the difference between the yield on CMBS and the yield on comparable-maturity Treasuries. CMBS yield spreads declined dramatically from 1992 until 1997, then increased in 1998 and 1999. The relationship between CMBS yield spreads and other variables is estimated in an effort to explain recent trends. Results identify several variables that are related to yield spreads on both fixed-rate and variable-rate CMBS. However, even after controlling for other observable factors, the yield spread on CMBS still declined from 1992 until 1997, then increased each of the next two years. Possible explanations for this phenomenon are explored.

Introduction

The market for mortgage-backed securities (MBS) has grown rapidly in recent years. Initially, Veterans Administration (VA) and Federal Housing Administration (FHA) single-family mortgages guaranteed or insured against default by the U.S. Government supported most mortgage-backed securities. Only after secondary markets for MBS on FHA and VA loans were well established did the secondary market for MBS supported by conventional residential mortgages develop. In 1970, less than 10% of single-family mortgages had been securitized; by 1992, of the $3.1 trillion of residential mortgages outstanding, nearly half were securitized (Fabozzi and Jacob, 1997). The growth rate of securitization of commercial mortgages during the 1990s is roughly comparable to the pattern of securitization of residential mortgages in the 1980s. As of the end of 1990, 9.5% of multifamily mortgages had been securitized, almost entirely by GNMA, FNMA and FHLMC, and less than 1% of other commercial mortgages had been securitized, all by the private sector. By the end of 1999, 58.8% of multifamily mortgages were securitized. (Calculations based on figures in Mortgage Market Statistical Annual for 2000.) The slower pace of commercial mortgage securitization relative to residential mortgages may be related to the fact that very few commercial mortgages (including multifamily) are insured or guaranteed by the federal government.

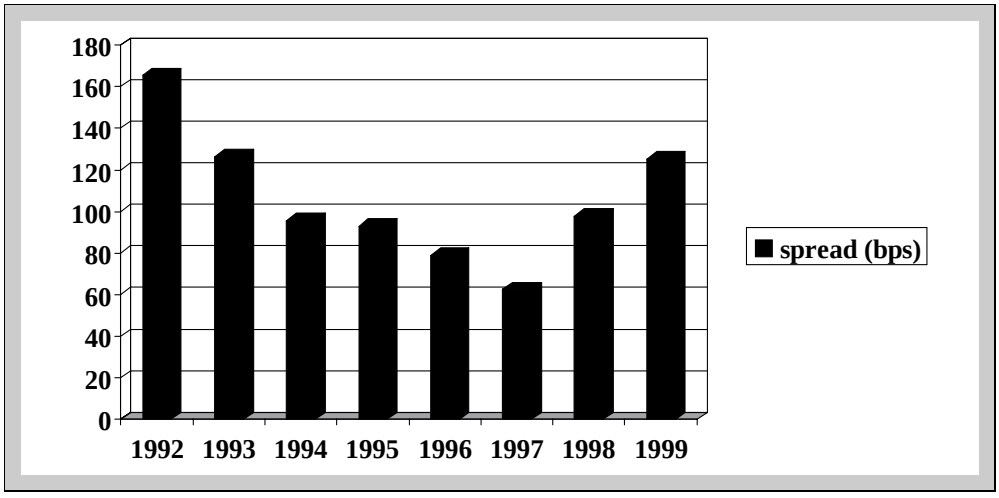
As the volume of CMBS increases, an issue of interest to investors is how the yields on such securities compare with yields on alternative investments. In the mid-1990s, the trade press noted a decline in CMBS yield spreads (defined as the difference between yields on CMBS and yields on U.S. Treasury securities of comparable maturity) (see, for example, Fathe-Aazam, 1995; Fabozzi and Jacob, 1997; and Zuckerman, 1998). As shown in Exhibit 1, CMBS AAA yield spreads in 1997 were less than one-half the level of 1992. Beginning in 1998, however, CMBS yield spreads began increasing, and in 1999 AAA yield spreads approached 1993 levels. Similar trends are evident for lower-rated investment-grade CMBS, as shown in Exhibit 2.

Yield spreads on a particular class of securities are expected to respond to a variety of factors, including differences in default risk, call risk, taxability, liquidity and possibly other factors. The purpose of this study is to estimate the relationship between CMBS yield spreads and other variables in an attempt to determine the extent to which recent trends in CMBS yield spreads can be explained by changes in other observable variables.

Development of the CMBS Market

There are several reasons securitization developed later for commercial mortgages than for residential mortgages. Until recent years, commercial mortgage lending was a local market, dominated by banks, thrifts and insurance companies. Moreover, as was true on the residential side prior to the creation of the FHA,

Exhibit 1 | CMBS AAA Yield Spreads to 10-year Treasuries, 1992–1999



Source: *CMBS Database,* 2000.

Exhibit 2 | CMBS Yield Spreads by Year and Rating

Year	Rating	*N*	Mean Yield Spread	Mean Annual Spread for All Ratings
1992	AAA	8	165.4	
	AA	16	204.1	
	A	3	301.7	
	BBB	3	320.0	206.1
1993	AAA	25	126.4	
	AA	28	162.3	
	A	13	217.3	
	BBB	14	263.6	177.7
1994	AAA	33	95.7	
	AA	43	114.1	
	A	36	147.2	
	BBB	34	226.8	144.3
1995	AAA	62	92.8	
	AA	46	114.5	
	A	34	143.6	
	BBB	45	207.8	135.0
1996	AAA	85	79.0	
	AA	48	99.8	
	A	42	120.7	
	BBB	66	167.6	114.7
1997	AAA	105	62.6	
	AA	53	76.8	
	A	50	92.1	
	BBB	89	122.4	88.0
1998	AAA	99	97.7	
	AA	48	124.3	
	A	50	143.4	
	BBB	83	212.3	144.4
1999	AAA	119	125.3	
	AA	54	153.1	
	A	81	184.2	
	BBB	85	281.2	182.9

Source: *CMBS Database,* 2000.

commercial mortgages lacked consistent underwriting standards, documentation or agency backing, and as a result, did not easily support securitization. GNMA, FNMA and FHLMC have issued multifamily MBS for a number of years, with an annual average volume of $4.9 billion of multifamily MBS during 1985–1991 (Fabozzi, Ramsey, Ramirez and Marz, 1997). Implicit or explicit guarantees on these securities, however, might have accustomed multifamily MBS investors to a degree of protection from default risk, and therefore did not catalyze any significant degree of ''nonagency'' commercial mortgage securitization. Aside from these transactions, however, which typically require lenders to conform to ''agency'' underwriting requirements,[1] a tremendous variety of loan characteristics exists among the commercial mortgages. On the investor side, traditional fixed income investors lacked the historical data and experience to evaluate default risk and other features of commercial mortgages.

Several changes occurred in the early 1990s that affected commercial mortgage lending. The difficulties of thrifts, beginning in the 1980s, rapidly deteriorated into a widely publicized crisis. The Resolution Trust Corporation (RTC) liquidated billions of dollars in commercial mortgages. Between 1991 and 1995, the RTC securitized nearly $18 billion in performing and non-performing commercial mortgages, with nearly $14 billion of that total occurring in the two years following its first such deal in August 1991 (Fabozzi and Jacob,1997). Nonagency CMBS issuance increased from approximately $5 billion annually in 1989–1990 to approximately $15 billion in 1992, with most of the increase in the form of RTC issues. The RTC gave birth to underwriting standards, rating criteria and evaluation techniques that made it easier for nonagency deals to follow.

Another component of the government's response to the thrift crisis, FIRREA, imposed increased capital requirements on direct commercial mortgage lending by thrifts, commercial banks and insurance companies. Even credit-worthy borrowers had difficulty obtaining credit, and sought alternative sources. Interest rates were relatively low in the 1990s, and investors sought new investment vehicles. In conjunction with widespread market acceptance of RTC securities, these factors meant that, in 1993, when RTC issues dropped dramatically, the increase in private issues more than offset the drop in RTC activity, and total nonagency issues were up for the year. The volume of nonagency CMBS activity dropped slightly in 1995 to less than $20 billion, but recovered in 1996 to reach a level of $30 billion, followed by $44 billion in 1997; $78 billion in 1998 and $67 billion in 1999 (Fabozzi, Ramsey, Ramirez and Marz, 1997; and CMBS Database, 2000).

Literature

Riddiough and Polleys (1999) analyze the determinants of CMBS subordination levels and of CMBS yield spreads using time series analysis of 119 AAA-rated CMBS tranches issued during 1994–1996. A principal finding of their analysis is

that even within AAA-rated tranches, variables measuring credit risk (such as measures of geographic and property-type concentration) and the presence of cross-default clauses affect pricing via a default premium. Yield spreads are compressed in public transactions and conduit deals, which are typically comprised of newly-originated mortgages originated to CMBS investor standards, and by lockout and yield-maintenance provisions, which restrict mortgage prepayments, thereby mitigating reinvestment risk. They attribute a significant and negative time coefficient to a multilateral learning process involving issuers, rating agencies and investors. They conclude that CMBS market development ''might be better characterized as rational and orderly, as opposed to one subject to mob psychology and pricing bubbles,'' at least through 1996 (Riddiough and Polleys, 1999: 20).

Nothaft and Freund (1999) analyze the spreads between commercial mortgage interest rates and comparable-maturity Treasury yields. The emphasis of their research is commercial and multifamily mortgage spreads, rather than CMBS spreads *per se*. Using a variety of data sources covering the period from the late 1970s and early 1980s through the second quarter of 1998 to estimate time-series models, they find that commercial mortgage spreads are positively associated with the difference in composite between corporate bonds rated AAA and those rated A by Moody's; and inversely related to commercial property appreciation rates.

Research Methodology and Data Description

This study examines spreads between yields on CMBS securities and appropriate option-free securities of similar maturity. The difference in yields is attributed (at least in part) to the value of the prepayment and default options embedded in the underlying mortgages. The data include all publicly traded nonagency CMBS from the beginning of 1992 through 1999.[2] The sample includes 1,600 fixed-rate CMBS tranches and 479 variable-rate CMBS tranches. The analysis augments previous work by Riddiough and Polleys (1999) by utilizing a considerably larger number of observations, as well as extending the sample period beyond the early years of the CMBS market in 1992–1996 to include 1997–1999. The approach taken here differs from their time-series analysis in that this study is based on when-issued data on each security as described below. Other differences in model specifications reflect differences in data sources.[3]

The method of analysis used here is similar in some respects to that of Rothberg, Nothaft and Gabriel (1989), who identified various factors influencing the spread between yields on single-family mortgage-backed securities and U.S. Treasury securities. Among the factors they considered are credit (default) risk, prepayment risk, marketability (liquidity) and tax considerations. They estimated the relationship between yield spread and the other variables using linear regression. The method they employ is appropriate for analyzing commercial mortgage-backed securities, but the differences between single-family and commercial

mortgages are sufficient that their empirical results cannot be generalized to the commercial market. In particular, prepayment and refinancing patterns are different. A single-family mortgage can be prepaid at any time without restrictions. Recently issued fixed-rate commercial mortgages typically cannot be refinanced without incurring a penalty.[4] As a result, many researchers investigating commercial mortgages have focused on default risk and ignored prepayment risk with the justification that prepayment penalties are effective in preventing early repayment or fully compensate the lender in the event of early prepayment. Fu, LaCour-Little and Vandell (2000) present empirical evidence showing that prepayment of commercial mortgages does occur and cannot be ignored.

Data for each security is as of the issue date. The analysis cannot be characterized as cross-sectional, because the date of issue is different for nearly every issue. However, because we have data for only the issue date, it is not a time-series analysis. Linear regression is used to estimate the following, separately for fixed-rate and adjustable rate transactions:

$$\begin{aligned} SP_i = {} & a + b(ISSAMT) + c(TRAMT) \\ & + d(CORP\_SPRD) + e_1(D_{AA}CPDIFF) \\ & + e_2(D_ACPDIFF) + e_3(D_{BBB}CPDIFF) \\ & + f_1(D_{93}) + \ldots + f_7(D_{99}) \\ & + g(SD) + h(TS) + j(XRI) + \varepsilon_i. \end{aligned} \tag{1}$$

Where:

SP_i = Yield spread on CMBS tranche i;
$ISSAMT$ = Natural log of total CMBS issue amount (in millions of $);
$TRAMT$ = Natural log of tranche amount (in millions of $);
$CORP\_SPRD = r_{AAA} - r_{10TR}$;
r_{AAA} = Yield on AAA-rated corporate bonds;
r_{10TR} = Yield on 10-year Treasury bonds;
D_j = Dummy variable for highest rating on tranche i (*RATING*);
D_h = Dummy variable for year of issue (*YEAR*);
$CPDIFF = r_{BBB} - r_{AAA}$;
r_{BBB} = Yield on corporate bonds rated BBB;
SD = Standard deviation of the 10-year T-bond yield over the previous fifty-two weeks;
TS = 10-year Treasury yield − 3-month Treasury yield;
XRI = Experimental Recession Index; and
ε_i = error term.

Variable Description

SP. Because yield spreads (*SP*) differ across tranches, the tranche is the unit of observation for the dependent variable. Tranches rated below BBB (investment grade) are excluded. Because the discussion in the business and trade press has focused on the absolute spread ($r_i - r_{COMP\_TR}$, where r_i is the yield on tranche i and r_{COMP_TR} is the yield on the comparable-maturity Treasury security) the relationship is estimated using the absolute spread as the dependent variable.[5] However, as pointed out by Rothberg, Nothaft and Gabriel (1989) due to tax effects, it might be preferable to analyze the relative spread (r_i/r_{COMP_TR}). Taxes affect yield spreads because the interest on Treasury securities is exempt from state and local income taxes, while interest on nonagency MBS is not. As a result, MBS yield spreads are positively related to the level of interest rates due to tax effects. As the overall level of interest rates drops, the MBS yield spread is also expected to drop somewhat. Therefore, Equation (1) is also estimated using relative spreads.[6]

ISSAMT. As the CMBS market has grown, and the size of individual issues has increased, one might expect yield spreads to narrow due to greater liquidity. According to Levy (1997) the trend is toward bigger CMBS deals with two or more investment banking firms participating. Investors are attracted because they expect the improved liquidity associated with a deeper market.[7] If liquidity is positively impacted by larger deals, the liquidity premium is expected to decline with transaction size. In 1992, the average size for CMBS deals included in the sample was $598 million. In 1999, the average size of CMBS deals included in the sample increased to $799 million. Alternatively, however, some transactions might be too large for the market to absorb them without a widening of the yield spread. The size of the transaction, *ISSAMT*, is therefore included to control for size effects and to measure which of these competing effects is empirically greater.

TRAMT. Individual securities, not the entire MBS deal, are traded in the secondary market. For this reason, tranche size, *TRAMT*, may have even greater effects on liquidity and pricing than does the total deal size.[8] Therefore, *TRAMT* is also included in the model. To the extent that either tranche size or total deal size is positively related to liquidity, the expectation is that yield spreads will be inversely related to size.

SD, TS, CORP__SPRD, CPDIFF, XRI. Several variables are included in the Rothberg, Nothaft and Gabriel (1989) model to capture the probability of prepayment. Prepayment risk on MBS arises from two sources: prepayments and default. The value of a mortgage incorporates the borrower's option to prepay (a call option on the mortgage) and the borrower's option to default (a put option on the collateral property). For single-family residential mortgages, prepayment is more common than default, and the call option dominates. An increase in interest rate volatility *SD* increases the value of the borrower's option to refinance, and therefore interest rate volatility is positively related to yield spreads on single-

family mortgages and the associated MBS. Similarly, according to the expectations theory of the term structure, the slope of the yield curve *TS* is an indicator of the expected future course of interest rates. If interest rates are expected to be lower in the future, it increases the likelihood that prepayment will be financially beneficial, and should result in larger spreads on single-family mortgages (see Rothberg, Nothaft and Gabriel, 1989: 303 for further discussion). The results of Rothberg et al. for single-family MBS are consistent with those expectations.

For commercial mortgages, as well as for CMBS, however, the effect of interest-rate volatility might be somewhat different. As mentioned, recently issued fixed-rate commercial mortgages typically contain prepayment penalties.[9] As a result, it is likely the put option to default on a commercial mortgage dominates the call option to prepay. For CMBS, the losses associated with default are borne by the lower-rated tranches. The effect of default on the senior tranches is to accelerate the repayment of principal. The resulting early return of principal may be advantageous to the investor because of the time value of money, but will be disadvantageous to the extent it results in reinvestment risk. The net effect of default risk on yield spreads is therefore an empirical question. In addition, the results of Fu, LaCour-Little and Vandell (2000) indicate that even for commercial mortgages, prepayments due to refinancing are of sufficient magnitude that they cannot be ignored. Hence interest-rate volatility may also contribute to higher yield spreads because of its effects on prepayments, to the extent that reinvestment risk dominates the time-value-of-money effects of the early return of principal.

Titman and Torous (1989) show a positive correlation between changes in commercial property values and the variability of interest rates. Consequently, increased interest rate variability (*SD* in this analysis) is associated in turn with the greater variability of property values, and increased likelihood of default in circumstances where unpaid principal balance exceeds property value. Titman and Torous also indicate that the default risk on commercial mortgages is related to the slope of the yield curve (*TS*).

The NBER's Experimental Recession Index (*XRI*), which is an estimate of the probability of a recession in six months, is also included in the analysis as an additional measure of default risk.[10] The *XRI* is computed using four monthly series from the NBER's Experimental Coincident Index and all seven monthly series included in the NBER's Experimental Leading Index.[11] During the 1992–1999 sample period, values for XRI are greater than 5% only fifteen months. The index exceeded 5% for the first time in November 1994, and was above that threshold in five of the following six months. It exceeded 5% again in May 1997, in five months from June through December 1998, and in four months during 1999. The index exceeded 10% only twice during the sample period.

In addition, two more variables are included in the model that is intended to reflect default risk. The spread between AAA-rated corporate bond yields and 10-year Treasury yields (*CORP_SPRD*) is included as a proxy for the overall credit market's default risk premium. Additionally, the difference between yields on low-

and high-rated corporate bonds (*CPDIFF*) is included, based on the results of Duca and Rosenthal (1991). *CPDIFF* is entered in the regression through interactive terms created by multiplying *CPDIFF* times the dummy variables representing security ratings (the rationale for the interactive terms is provided below). Because *CORP_SPRD* and *CPDIFF* are calculated as default premiums, these are expected to be positively correlated with CMBS yield spreads.

D. Dummy variables (*YEAR*) are included for each year other than 1992. Another set of dummy variables (*RATING*) are included for security ratings (other than AAA) because lower rated securities have higher yields to compensate investors for the greater default risk. The base case is therefore an AAA-rated CMBS issued in 1992. As noted, interactive terms were created by multiplying the rating dummies by *CPDIFF*. This has the effect of making estimated spreads between AAA-, AA-, A- and BBB-rated CMBS tranches proportional to changes in the corporate bond yield spread.

Empirical Results

The results of estimating regression Equation (1) for both the absolute spread and the relative spread are shown in Exhibit 3. Results for fixed-rate CMBS, shown on the left-hand side of Exhibit 3, are discussed next.

Exhibit 3 | Regression Results

CMBS Type	Fixed Rate		Variable Rate	
Dependent Variable	*RelSP*	*AbsSP*	*RelSP*	*AbsSP*
Constant	−0.021	0.52	−0.002	−18.80
	−0.58	0.02	−0.026	−0.61
ISSAMT	0.007*	4.98*	0.005	3.84
	2.73	3.58	0.81	1.48
TRAMT	−0.002	−2.40*	−0.009	−4.23
	−0.86	−2.04	−1.58	−1.81
$r_{AAA} - r_{10TR}$	0.253*	101.21*	0.197*	56.65*
	23.92	16.44	7.82	5.33
D_{AA}*CPDIFF*	0.062*	30.45*	0.083*	34.81*
	8.91	7.49	5.10	5.03
D_{A}*CPDIFF*	0.123*	66.92*	0.213*	95.08*
	16.10	15.07	11.29	11.92
D_{BBB}*CPDIFF*	0.29*	160.79*	0.429*	192.53*
	37.73	35.90	21.28	22.62
D_{93}	−0.076*	−57.09*	−0.052	−34.96*
	−5.16	−6.65	−1.82	−2.89

Exhibit 3 | (continued)

Regression Results

CMBS Type	Fixed Rate		Variable Rate	
Dependent Variable	*RelSP*	*AbsSP*	*RelSP*	*AbsSP*
D_{94}	−0.096*	−71.12*	−0.142*	−50.14*
	−6.54	−8.35	−5.35	−4.48
D_{95}	−0.151*	−75.87*	−0.178*	−49.07*
	−7.48	−6.46	−3.95	−2.57
D_{96}	−0.147*	−82.04*	−0.195*	−57.09*
	−8.03	−7.69	−4.97	−3.45
D_{97}	−0.178*	−98.74*	−0.216*	−62.02*
	−8.73	−8.31	−4.77	−3.24
D_{98}	−0.159*	−89.35*	−0.226**	−69.41*
	−7.13	−6.88	−4.14	−3.01
D_{99}	−0.161*	−82.76*	−0.170*	−38.30
	−8.30	−7.31	−3.61	−1.92
SD	0.028	38.64*	0.027	52.97*
	1.35	3.23	0.57	2.64
TS	−0.014*	9.49*	0.034*	12.65
	−2.44	2.78	2.13	1.89
XRI	0.492*	413.77*	−0.058	77.42
	5.70	8.23	−0.267	0.84
Adj. R^2	0.765	0.724	0.718	0.716
F	326.30	262.96	77.18	76.44

Notes: Below each coefficient is the associated *t*-Statistic. $N = 1600$ for fixed rate; $N = 479$ for variable rate.

*Significant at the .05 level.

Variable definitions:

AbsSP = Absolute spread
= CMBS yield − Yield on Treasury of comparable maturity (in basis points)

Rel SP = Relative spread
= *AbsSP*/ Yield on 10-year Treasury (fixed-rate CMBS)
= *AbsSP*/ Yield on 3-month T-bill (variable-rate CMBS)

ISSAMT = Natural log of issue amount in millions of $

TRAMT = natural log of tranche amount in millions of $

r_{AAA} = yield on AAA-rated corporate bonds

r_{10TR} = yield on 10-year Treasury bonds

D_i = Dummy variable for highest rating on tranche *i* or for year of issue

CPDIFF = $r_{BBB} - r_{AAA}$

r_{BBB} = yield on corporate bonds rated BBB

SD = standard deviation of the 10-year T-bond yield over previous fifty-two weeks

TS = 10-year Treasury yield − 3 month Treasury yield

XRI = Experimental Recession Index

Because the results for relative spread and absolute spread are so similar, they are discussed together. The coefficients for tranche size (*TRAMT*) are negative, although it is significant only for absolute spread. This provides some support for the notion that larger tranches are associated with lower liquidity premia, as expected. On the other hand, the coefficients for total deal size (*ISSAMT*) are positive and significant for both the absolute spread and the relative spread, indicating that larger deals are associated with higher spreads. Evidently, the main effect of deal size is that larger transactions require larger spreads to attract a sufficient number of investors to place the issue.

The coefficients for the difference between AAA-rated corporate bond yields and Treasury bond yields (*CORP_SPRD*) are positive, as expected, and statistically significant. A 1% increase in *CORP_SPRD* corresponds to a 101 basis point increase in spread between AAA-rated CMBS and Treasuries.

The interactive dummy variables formed by multiplying security rating dummies times *CPDIFF* are each significant, and indicate that spreads are inversely related to rating, as expected. The coefficients represent average differences between yield spreads during the sample period: AA-rated securities averaged yields 30.4 basis points higher than AAA after controlling for other variables, given an average value for *CPDIFF*; A-rated issues averaged 66.9 basis points higher than AAA, and BBB-rated issues averaged 160.8 basis points higher than AAA.

As discussed in the previous section, higher interest rate volatility (*SD*) and the Experimental Recession Index (*XRI*) are both positively associated with greater likelihood of default on the underlying mortgages. As shown in Exhibit 3, the coefficients for both *SD* and *XRI* are positive. In the case of the absolute spread, both coefficients are significant, while for relative spread, only the coefficient for *XRI* is significant. Evidently, reinvestment risk dominates the time value of money, resulting in a default risk premium for investment grade CMBS as measured by coefficients on these two variables.[12]

The term structure variable (*TS*) is positive and significant for the absolute spread, and negative and significant for the relative spread. Because interest on nonagency CMBS is fully taxable, the relative spread is arguably the more reliable of these two measures in the present context. To the extent that a flat or inverted yield curve is associated with the possibility of recession, the negative coefficient on *TS* in the relative spread specification is consistent with the preceding result regarding *XRI*: the larger is *TS*, the less likely is recession and therefore default, providing investors with an additional measure of protection from reinvestment risk.

The results for variable-rate CMBS (shown on the right-hand side of Exhibit 3) are in some regards similar to those for fixed-rate CMBS. Although their signs are the same as for fixed-rate CMBS, neither of the size variables have coefficients that are significantly different from zero in either the absolute spread or the relative spread cases. The coefficient for interest rate volatility (*SD*) is positive and

significant for the absolute spread, and positive but not significant for the relative spread (as was also the case for fixed-rate).

The coefficient for the term structure (*TS*) is positive in both adjustable-rate specifications, and significant for the relative spread case, the opposite of the result in the fixed-rate case. In part, this difference may relate to the fact that reinvestment risk, which evidently commands an investor premium in the fixed-rate case, is of course absent for holders of variable-rate instruments. To the extent that a steeper yield curve indicates that recession is unlikely, the possibility of default and the attendant early return of principal, which would be advantageous to the investor from the standpoint of the time value of money, is reduced. The coefficient for the Experimental Recession Index (*XRI*) is not significantly different from zero for either the absolute or the relative spread regressions, possibly because the effects of recessionary prospects on variable-rate CMBS spreads are captured through *TS*.

Each of the dummy variables for year is significant, indicating that CMBS spreads are decreasing from year-to-year, beginning in 1992, until 1997. They then increase each of the next two years. This is consistent with the average spreads shown in Exhibit 2, but more importantly, indicates that, even after controlling for changes in the other variables, the trend in CMBS spreads changed course in 1998.

Yield spreads on CMBS declined dramatically from 1992 to mid-1998. The results indicate that yield spreads on fixed-rate CMBS are positively related to total deal size, to the spread between AAA-rated corporate bonds and T-bonds, and to the XRI, and inversely related to the security rating. Variable-rate CMBS yield spreads are positively related to the spread between AAA-rated corporate bonds and T-bonds, and inversely related to rating. However, the results indicate that, even after controlling for other factors, CMBS yield spreads declined during 1992–1997, followed by increases during 1998 and 1999.

The compression of CMBS yield spreads during 1992–1997 may have resulted from a number of factors. Certainly there is evidence to support the notion of multilateral learning involving issuers, rating agencies and investors as hypothesized by Riddiough and Polleys (1999). In the early 1990s, when nonagency CMBS issues were first issued in substantial amounts, the U.S. was recovering from a recession that hit commercial property values very hard. Many loans held by the FDIC and RTC were of low or questionable quality and proper documentation was often lacking. Investors (and rating agencies) were unfamiliar with analyzing commercial mortgages and the risks they posed. Lack of familiarity might have caused investors to overestimate the risks, and could explain why yield spreads were high in the early 1990s.

As investors gained familiarity, they developed greater confidence in their ability to assess the risks, and required lower risk premiums. An indication of this is the change in the percentage of tranches with ‘‘split’’ ratings: ratings from different

Exhibit 4 | Percentage of Split Ratings by Year

Year	% Split Ratings
1992	34.5
1993	17.1
1994	10.3
1995	5.7
1996	9.4
1997	1.7
1998	1.6
1999	5.8

Note: A split rating occurs if different raters provide different ratings to the same security.

raters that are a full rating category apart (AAA by Standard and Poor's, Aa by Moody's, for example). Exhibit 4 shows the percentage of split ratings by year. For the first two years (1992–1993), more than 21% of the tranches received split ratings. For 1994–1999, the percentage was less than one-fourth as high, at 4.7%. The hypothesis that the two percentages are the same must be rejected (the *z*-Statistic = 6.8). This indicates a higher degree of uncertainty on the part of security raters about the default risk of individual CMBS in the early 1990's.[13]

Conclusion

Now that the 1992–1997 trend toward compression of yield spreads has reversed course, it appears that some additional factors may also have been at work. A number of studies have concluded that lenders eased their underwriting standards during the mid-1990s. The *1998 Survey of Credit Underwriting Practices* published by the Office of the Comptroller of the Currency states that underwriting standards for commercial loans have eased each year during 1994–1997. The primary reason cited by examiners for easing underwriting standards was competitive pressure. According to the FDIC's 1998 *Report on Underwriting Practices* the weakening of underwriting practices was especially noteworthy in commercial real estate lending. A general lowering of underwriting standards by lenders will increase the overall probability of default on commercial mortgages. If lender underwriting standards fell due to competitive pressure, it is plausible that similar pressures could have affected rating agencies. Rating agencies often recruit staff from issuers, and vice versa, and may therefore be subject to similar influences.[14] The turning point in CMBS yield spreads coincided with the financial markets turmoil in the fall of 1998. Investors began to express reluctance to purchase the subordinate tranches in CMBS transactions, jeopardizing the ability

of issuers to credit enhance the senior tranches as well.[15] Judging by articles in the trade press, the CMBS market during that time might have reflected a degree of internal ''financial contagion'' in which investors were influenced by actions of other investors in a manner with lasting consequences for CMBS yield spreads and issuance volume.

The notion that the events of Fall 1998 represent a turning point in financial markets has gained widespread acceptance. Federal Reserve Board Chairman Alan Greenspan commented as follows in a recent speech:

> During the past couple of years . . . the widespread optimism that was apparent in financial markets has given way to some reassessment of risks and opportunities. This process has been underway ever since the global financial crisis in the Fall of 1998. That episode forced many market participants to recognize the potential for international risks to feed back on U.S. markets. Events brought into sharper focus the possibility that liquidity in many markets can dry up simultaneously when fear spurs risk aversion, and an intense, near-term focus on protecting capital values markedly elevates the demand for liquidity. Markets largely recovered from that episode, but an imprint was left in the form of wider credit spreads and more cautious behavior on the part of banks and other lenders.[16]

Chairman Greenspan's remarks are consistent with the notion that, at least for a time in the Fall of 1998, an element of herd behavior, in which few could withstand the fear of being left behind, took the place of the atomistic decision-making sometimes ascribed to investors. If so, this begs the question of whether interaction effects between investors (''irrational exuberance'') also contributed to the compression of yield spreads in prior years. It is hoped that further research will shed light on these questions.

Endnotes

[1] The Government Sponsored Enterprises, or GSEs, do purchase loans that do not comply with their standard underwriting guidelines in ''negotiated transactions.''

[2] Most of the data were obtained from the *CMBS Database*, 2000. The conclusion that this data source includes the entire publicly-traded CMBS market is supported by a comparison of total issuance volume with other industry sources The *CMBS Database* is available to subscribers to *Commercial Mortgage Alert*, published by Harrison-Scott Publications, http://www.cmalert.com/cma/index.htm. Other data were obtained from the Federal Reserve website, the NBER website and the U.S. Department of Commerce website.

[3] This article departs significantly from the approach of Nothaft and Freund (1998), who seek to explain variation in mortgage spreads, which is a different issue than spreads on investment-grade CMBS, which are protected from default risk in a manner quite different from the underlying mortgage collateral.

[4] The effects of a number of different types of commercial mortgage prepayment penalties are discussed in Fu, LaCour-Little and Vandell (2000). They present empirical results indicating that prepayment of commercial mortgages occurs with sufficient frequency that it cannot be ignored. See also Manus J. Clancy and Michael Constantino, The Effects of Prepayment Restrictions on the Bond Structures of CMBS in Fabozzi and Jacob (1997).

[5] In some cases, the benchmark is identified in the data as the ''Treasury yield curve.'' For some variable-rate issues, LIBOR is used.

[6] The relative spread for fixed-rate CMBS is defined as the absolute spread divided by the yield on a 10-year Treasury. For variable-rate CMBS, the 3-month Treasury bill is used in the denominator.

[7] On the closely related issue of the connection between transaction size and execution costs, see Leinweber (1993).

[8] During 1992–1999, when deal size was increasing significantly, the average number of tranches per issue also increased, so the average tranche size increased only slightly, from $110 million to $112 million.

[9] Earlier commercial mortgages often lacked such penalties. RTC deals were backed by such mortgages, which might have contributed to higher spreads for those issues.

[10] Specifications were estimated including other default risk proxies, such as the rental vacancy rate, the quarterly change in GDP, and the quarterly change in the NBER's Index of Coincidental Indicators, but did not perform as well as the selected specification.

[11] For more details, see Stock and Watson (1989).

[12] The effects of interest-rate volatility on prepayments are also likely to contribute to wider yield spreads, but this effect is likely to be smaller than that of defaults due to the presence of yield spread maintenance agreements, as discussed.

[13] However, the fact that rating agencies tend to have greater agreement now about the appropriate rating for CMBS does not mean that the current consensus rating accurately reflects default risk or that existing yield spreads adequately compensate investors for that risk. Nor does it explain why the percentage of split ratings increased in 1999 or yield spreads have recovered in the last two years of the 1990s.

[14] *Commercial Mortgage Alert*, various issues.

[15] See New CMBS Headache: B-Piece Market Softens, *Commercial Mortgage Alert*, September 21, 1998; Criimi Bankruptcy Accelerates CMBS Freefall, *Commercial Mortgage Alert*, October 12, 1998.

[16] Remarks by Chairman Alan Greenspan, Structural Changes in the Economy and Financial Markets, America's Community Bankers Conference, New York, NY, December 5, 2000.

References

Board of Governors of the Federal Reserve System, Selected Interest Rates, *Federal Reserve Statistical Release*, www.federalreserve.gov.

CMBS Database, Harrison-Scott Publications, 5 Marine View Plaza, Suite 301, Hoboken, NJ, April 2000.

Comptroller of the Currency National Credit Committee, *1998 Survey of Credit Underwriting Practices*, 1998.

Corcoran, P. J. and D. Kao, Assessing Credit Risk of CMBS, *Real Estate Finance*, 1994, Fall, 29–40.

Duca, J. and S. Rosenthal, An Empirical Test of Credit Rationing in the Mortgage Market, *Journal of Urban Economics*, 1991, 29, 218–33.

Fabozzi, F. J. and D. P. Jacob, (Eds.), *The Handbook of Commercial Mortgage-Backed Securities*, New Hope, PA: Frank J. Fabozzi Associates, 1997.

Fabozzi, F. J., C. Ramsey, F. Ramirez and M. Marz, (Eds.), *The Handbook of Nonagency Mortgage-Backed Securities*, New Hope, PA: Frank J. Fabozzi Associates, 1997.

Fathe-Aazam, D., Commercial Mortgage Whole Loans versus Commercial Mortgage-Backed Securities: A Comparison for Prospective Investors, *Real Estate Finance*, 1995, Spring, 40–47.

Federal Deposit Insurance Corporation, *Report on Underwriting Practices*, March 1998.

Fu, Q., M. LaCour-Little and K. Vandell, Commercial Mortgage Prepayments Under Heterogeneous Prepayment Penalty Structures, Paper presented at the Financial Management Association Conference, October 2000.

Leinweber, D. J., Using Information from Trading in Trading and Portfolio Management in K. F. Sherrerd, (Ed.), *Execution Techniques, True Trading Costs, and the Microstructure of Markets*, Charlottesville, VA: Association for Investment Management and Research, 1993.

Levy, J. B., MBS Market Continues to Expand, *Real Estate Finance Today*, June 9, 1997, 16.

Mortgage Market Statistical Annual for 2000, Washington, DC: Inside Mortgage Finance Publications.

Nothaft, F. E. and J. L. Freund, Recent Developments in Multifamily Mortgage Markets: The Increasing Role of Securitization, Working paper, April 1999.

Riddiough, T. J. and C. Polleys, Commercial Mortgage-Backed Securities: An Exploration into Innovation, Product Design and Learning in Financial Markets, Working paper, July 1999.

Rothberg, J. P., F. E. Nothaft and S. A. Gabriel, On the Determinants of Yield Spreads Between Mortgage Pass-Through and Treasury Securities, *Journal of Real Estate Finance and Economics*, 1989, 2, 301–15.

Stock, J. H. and M. W. Watson, New Indexes of Coincident and Leading Economic Indicators, NBER Macroeconomics Annual, 1989, 351–94.

Titman, S. and W. Torous, Valuing Commercial Mortgages: An Empirical Investigation of the Contingent-Claims Approach to Pricing Risky Debt, *Journal of Finance*, 1989, 44, 345–73.

Zuckerman, G., Mortgage Debt, Hit Hard, Climbs Back to Its Feet, *The Wall Street Journal*, Nov. 30, 1998, C1 and C21.

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