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Value Creation through Securitization: Evidence from the CMBS Market

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Abstract Despite recent volatility and constraints in secondary market funding, analysts have ascribed substantial value creation to the securitization of commercial mortgages. Such value creation likely emanates from liquidity enhancements, regulatory arbitrage, price discrimination and risk diversification by pooling and tranching, gains from specialization in origination, servicing, and holding of mortgages, and the like. Indeed, such value creation would be consistent with past accelerated growth in the mortgage- and asset-based securities markets and the sizable profits earned by secondary market intermediaries. In this paper, we estimate the pricing effects of commercial mortgage securitization. We do so by applying loan level data from 1992–2003 to compare the pricing of conduit and portfolio loans held in CMBS structures. In contrast to portfolio loans, which are held for investment by originating institutions, conduit loans are originated for the sole purpose of sale and securitization in the secondary market. If securitization creates value, it should be evidenced in the relative pricing of conduit loans sold into CMBS pools and in a lower cost of capital to loan originators. We estimate a reduced-form model, in which the interest rate spread between commercial mortgages and comparable-maturity treasury securities varies with loan characteristics, capital market conditions, and conduit loan status. Estimation results indicate that securitization of conduit loans leads to an 11 basis points reduction in commercial

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mortgage interest rates. We assess robustness of results via hazard model tests for omitted variables and originator-specific effects. We further estimate a simultaneous equations model that accounts for the potential endogeneity of mortgage loan terms to the mortgage-treasury rate spread. Results of that analysis suggest a larger 20 basis points reduction in loan pricing among conduit loans sold into CMBS structures.

Keywords Securitization · Commercial mortgage-backed securities (CMBS) · Conduit loans · Portfolio loans · Mortgage-treasury rate spread · Simultaneous equations model

Introduction

Securitization is the process in which financial intermediaries pool assets and resell the asset pool as a collection of new securities. Significant portions of prime and subprime residential mortgages, auto loans, student loans and credit cards have been securitized and mortgage- and asset-backed securities have been issued and sold to the capital markets.

Despite recent constraints on secondary market funding and liquidity, securitization appears to have created value in financial markets. Such value creation would be consistent with the accelerated growth of the mortgage- and asset-backed securities markets and the sizable profits of secondary market intermediaries.[1] In fact, a number of academic studies have sought to deepen our understanding of that value creation process. For example, a *liquidity hypothesis* suggests that securitization enhances the liquidity of asset-backed debt markets via a pooling and pass-through mechanism that transforms illiquid financial claims into tradable ones. Further, tranching of asset-backed securities creates senior securities that are less sensitive to issuers' private information. The liquidity premium associated with these senior securities may reduce the cost of raising capital through tranching below the cost of acquiring the asset pool (Greenbaum 1986, DeMarzo and Duffie 1999 and DeMarzo 2003).[2] A *specialization hypothesis* argues that securitization facilitates separation of loan origination, servicing, and bond administration and thus capitalizes on specialization in each step of intermediation (Greenbaum 1986 and Hess and Smith 1988). According to a hypothesis of *regulatory arbitrage,* securitization allows banks to remove financial assets from their balance sheet and thus reduce deposit insurance fees and other costs of holding debt (Greenbaum and Thakor 1987).[3]

[1] Recent crises in the subprime mortgage market and CDO market have drawn critics to assert that the financial innovation associated with securitization weakened systemic management of lending risk and in so doing contributed to recent crises in those markets. For example, Fed Chairman Ben Bernanke testified before the Committee on Financial Services, U.S. House of Representatives, on September 20, 2007 and suggested that “The originate-to-distribute model seems to have contributed to the loosening of underwriting standards in 2005 and 2006.” Others argue that the traditional originate-and-hold mortgage lending kept risk low through long-term borrower-lender relationships, whereas the securitization model encouraged moral hazard on the part of loan originators.

[2] The existing studies are all from the theoretical perspective. We are not aware of any empirical study that provides evidence supporting the liquidity theory, although it is deemed as common wisdom.

[3] Recent empirical study by Ambrose, LaCour-Little and Sanders (2005) on mortgage securitization provides evidence supporting the regulatory arbitrage theory.

Finally, an *information asymmetry hypothesis* states that because security issuers may possess private information regarding asset returns, they can engage in price discrimination via tranching to maximize profits (Oldfield 2000) or use such pooling and tranching to diversify risk (DeMarzo 2005).

In this paper, we seek to empirically estimate the magnitude of value creation associated with commercial mortgage securitization. We estimate that value by comparing, all things equal, the interest rate differential between portfolio loans and conduit loans held in commercial mortgage-backed securities (CMBS) structures. Unlike portfolio loans, which are originated and held in lender portfolios, conduit loans are originated for the sole purpose of sale into the commercial mortgage-backed securities market. These loans typically are pooled and passed through to CMBS issuers shortly after origination. The rationale of our approach is as follows: if securitization creates value as suggested by the above hypotheses, it should be evidenced in the relative pricing of loans sold into CMBS pools. Given the lower cost of capital, originators of conduit loans can price more aggressively in the primary market, resulting in a rate reduction on commercial mortgage loans. However, those efficiencies and related pricing benefits associated with secondary market loan sales and securitization would not be available to portfolio lenders. Accordingly, all things equal, the commercial mortgage-treasury rate spread differential between portfolio loans and conduit loans should reflect the value enhancement of securitization.

In the empirical analysis to follow, we estimate a reduced-form model of commercial mortgage-treasury rate spreads, in which the interest rate differential between commercial mortgages and comparable-maturity treasury securities is taken to be a function of loan characteristics, capital market conditions, and conduit loan status. As suggested above, conduit loan status is the focus variable that captures the spread differential between conduit and portfolio loans, and thus the value created through secondary market sales and securitization. An array of variables representing loan characteristics and capital market conditions serve to control for loan prepayment and default risk, market price of risk, regional and lender effects, and the liquidity premium.

Our sample design limits the analysis to multifamily mortgages underlying private-label CMBS deals. Private-label CMBS pools require relatively standard loan underwriting requirements, which reduces the possibility that unusual products bias our estimates. Further, multifamily loans are less heterogeneous in loan characteristics and credit risk relative to loans of other property types (e.g., retail, office, and hotel). In the course of our analysis, we consider the possibility that omitted variables may differentially affect the prepayment or default risk of conduit and portfolio multifamily mortgages. To test that hypothesis, we estimate hazard models of prepayment and default. We further investigate lender-specific effects in the pricing of commercial mortgages, and thus the impact of such effects on our estimate of value creation through securitization. We do so by adding originator controls and by looking at loans originated by a single originator—Bank of America. Finally, we explore potential endogeneity in our empirical model. In that regard, commercial mortgage loan terms and mortgage rates are simultaneously determined as a result of negotiation between the borrower and the lender, e.g. a low leverage properties may have low default risk and thus can obtain a reduced credit spread, while the lender may offset high leverage by charging a high spread or alternatively requires both low leverage and a high spread if the perceived credit risk is high. We address these endogeneity concerns using a simultaneous equations approach.[4]

Results of our basic model indicate that securitization leads to an 11 basis points (bps) reduction in the pricing of multifamily mortgages, all things equal. Results of estimation of the default and prepayment hazard models enable us to reject the hypothesis that systematic differences in residual prepayment and default risks contribute to the estimated interest rate differentials. Inclusion of originator dummies serves to boost the mortgage rate reduction associated with securitization to 16 bps—an equivalent estimate is obtained for the model using only data from the Bank of America. Our simultaneous equations analysis indicates significant simultaneity in the determination of mortgage-treasury rate spreads and LTV. Origination LTV has a negative impact on rate spread possibly because a high LTV loan is associated with a high credit quality property, which accordingly requires less spread. On the other hand, mortgage-treasury rate spread has a positive coefficient in the LTV equation, meaning that the lender may trade off leverage and spread. The simultaneous equations estimate of conduit securitization effects is 20 bps. It is worth noting that our estimates provide a lower bound on value creation via securitization. This is because CMBS issuers, servicers, mortgage loan originators, and other parties participating in the securitization process may retain a portion of the gains from securitization, such that the commercial mortgage rate reduction reflects only the residual benefits from securitization as passed through to borrowers in the primary market.

Our model specification is informed by literature that analyzes the determinants of credit spreads of commercial mortgages and CMBS. Titman et al. (2004), for example, demonstrate the importance of property cash flow characteristics and loan terms in the determination of commercial mortgage-treasury rate spreads. Riddiough (2004) studies the learning process of issuers and investors in the determination of CMBS spreads. In accordance to findings of that literature, our empirical results indicate significant lender and regional effects in the pricing of commercial mortgages.

The empirical approach adopted here further bears some similarity to that employed in assessment of residential jumbo-conforming mortgage rate spreads. Those studies (see, for example, Hendershott and Shilling 1989, Ambrose, LaCour-Little and Sanders 2004) capitalize on the fact that conforming loans are eligible for purchase by Fannie Mae or Freddie Mae while jumbo loans are not, and accordingly the rate spread between jumbo and conforming loans should reflect the impact of the two government-sponsored enterprises on mortgage pricing.

Our study has important policy implications. Recent analyses of the relationship between GSE (Fannie Mae and Freddie Mac) securitization of residential mortgages and interest rates in the primary market have concluded that agency support of securitization has served to reduce the cost of mortgage credit to residential borrowers (see Ambrose, LaCour-Little and Sanders (2004) for a survey of the

[4] We estimate a simultaneous equation model in which mortgage spread is a function corporate bond credit spread and loan terms such as LTV and maturity while LTV is a function of mortgage spread and

literature).[5] Our study echoes that literature by showing that securitization helps to reduce multifamily mortgage costs. All things equal, the lower costs of multifamily mortgages should be reflected in reduced rents paid by multifamily tenants. About one-third of US households live in multifamily homes; low-income and minority households make up 25.7% and 40.3%, respectively, of multifamily households (Vandell 2000). The enhanced efficiency of multifamily financing can thus provide important social benefits to US households. Policy makers should accordingly consider enhanced GSE-related securitization of multifamily loans among policies to improve the housing conditions of low-income and underserved populations.

The remainder of the paper is organized as follows: the next section provides theoretical arguments for value creation via securitization; "Commercial Mortgage Securitization and the Rise of Conduits" briefly reviews the development of commercial mortgage securitization and the rise of conduit lending, which serves as a background for our empirical study. "Estimating the Value of Conduit Loan Securitization" presents our empirical models and "Data and Results" reports our data and results. Conclusions are drawn in the final section.

Securitization and Value Creation

Securitization has dramatically changed the landscape of the debt markets. In 2005, the issuance of mortgage-related and asset-backed securities reached 1.92 trillion and 1.10 trillion, respectively, surpassing the issuance of traditional fixed-income instruments such as treasury securities (0.75 trillion) and corporate bonds (0.68 trillion).[6] Stated simply, securitization is a process that pools assets and issues derivative securities on the asset pools. For example, a major business of the two government-sponsored enterprises, Fannie Mae and Freddie Mac, involves pooling a large number of individual home mortgages into a single financial trust, issuing mortgage-backed securities (MBSs) against the trust, and passing the monthly payments from the underlying mortgages through to MBS investors who own shares of the mortgage pool cash flow. Commercial mortgages, credit card receivables, auto loans, leases and home equity loans are securitized in a more complicated manner in which separate classes (tranches) of securities representing different claims of the asset pool cash flow are carved out of the trust. Senior tranches have the first right to receive any repayment of principal, whereas the subordinated tranche acts as a buffer to the senior tranche in that it absorbs all collateral defaults until the principal claim of that class is extinguished. Investors buying senior tranches expect to be well protected from credit losses while those holding subordinated tranches will get higher expected returns. In aggregate, all senior and subordinated tranches issued out of the trust represent a 100% interest in the trust.

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[5] The European Mortgage Federation also acknowledges that the issuance of covered bonds, another form of securitization enables credit institutions to obtain lower cost of funding in order to grant mortgage loans for housing and non-residential property (http://ecbc.hypo.org/content/default.asp?PageID=311). We thank an anonymous referee for pointing this out.

[6] Data from the Bond Market Association.

In the case of perfect capital markets, it would be redundant to pool and tranche assets and then resell that asset pool as a collection of new securities. Securitization, however, may enhance value in the mitigation of market imperfections as commonly arise. Greenbaum (1986), for example, points to the role of securitization in liquidity enhancement. In a traditional lending environment, the whole assets held by the depository financial intermediaries lack liquidity, e.g. they may be usually large in denomination, heterogeneous, and lack the necessary standardization that would make them easier to trade. Securitization accordingly transforms illiquid whole loans into divisible and tradable securities, and in this manner enhances liquidity.

Greenbaum (1986) and Hess and Smith (1988) argue that securitization also creates value by capitalizing on specialization. Portfolio lenders typically undertake the full range of loan origination, underwriting, servicing and investment functions. In marked contrast, securitization enables unbundling of these functions and accordingly allows different intermediaries to focus on those specific activities in which they enjoy a comparative advantage. For example, mortgage companies primarily originate loans and specialize in working with borrowers; loan servicing is carried out by several large servicers; and security issuers concentrate on pooling mortgages and creating CMBS structures; whereas securities dealers and brokers specialize in marketing and distributing securities to Wall Street investors.

Greenbaum and Thakor (1987) additionally argue that securitization helps remove financial assets from banks' balance sheets and thus serves to reduce portfolio holding costs including deposit insurance fees and capital requirements. Commercial banks fund their lending with deposits, which require insurance. Further, loans held in their portfolios are subject to capital reserves requirements. Recent work by Ambrose et al. (2005) on mortgage securitization provides evidence in support of this theory of regulatory arbitrage.

Oldfield (2000) argues that tranching may allow security issuers to further enhance returns via price discrimination. Assuming that the demand functions for various derivative products are imperfectly price elastic, Oldfield (2000) explains that the security issuer seeks private information about investor demand via the security design and sales process, and uses that information to segment the market and price discriminate among different sets of customers. The price discrimination is facilitated by unbundling the pool and selling the different tranches at different prices.

DeMarzo and Duffie (1999) and DeMarzo (2003) build liquidity-based models of tranching. In those models, the security issuer may possess private information regarding security payoff that may cause illiquidity. However, the senior tranches (low risk tranches) are less sensitive to the issuer's private information, and thus may enjoy greater liquidity than the underlying collateral. A liquidity premium associated with the senior tranches could lower the cost of raising capital via tranching below that of acquiring the asset pool.

DeMarzo (2005) also shows that for an informed intermediary, pure pooling and sales of assets from the pool is inferior to selling assets separately. This is because asset pooling eliminates the intermediary's option regarding how aggressively to market each asset and thus reduces the payoff. This is called the “information destruction effect”. However, there is an offsetting “risk diversification effect” of pooling and tranching—in that the intermediary can create low-risk derivative securities on the asset pool, and such securities are less sensitive to the intermediary’s private information and accordingly can be more attractively priced to the investor. When the pool size gets large, gains from risk diversification likely exceed losses from the information destruction, such that on net pooling and tranching achieve higher gains than individual asset sales.

Commercial Mortgage Securitization and the Rise of Conduits

Mortgage securitization became integral to the operations of the residential mortgage markets in the 1980s. However, large scale securitization of commercial mortgages did not become commonplace until the 1990s. Prior to that time, commercial mortgage loans were mostly held by commercial banks, thrifts, and life insurance companies. CMBS issuance was a mere $2 billion in 1989. However, the difficulties encountered by thrifts and banks in the late 1980s, in the wake of a severe downturn in real estate markets and related asset disposition efforts by the Resolution Trust Corporation (RTC), expedited the pace of commercial mortgage securitization. Between 1991 and 1995, the RTC put nearly $18 billion of loans collateralized by income-producing properties into securitization.

During those early years of commercial mortgage securitization, commercial mortgages sold into CMBS structures were mostly those originated by thrifts and life insurance companies. Those entities had intended to hold the newly originated loans for investment in their asset portfolios. Subsequent sales of portfolio loans came about for two reasons: one was to liquidate non-performing loans and the other was to remove some portion of performing loans from the originator's balance sheet, so as to replenish the supply of loanable funds.[7]

The success of those early CMBS sales attracted both new issuers and new investors. More and more investment banks set up origination networks—typically through mortgage bankers—and securitize commercial mortgages. Conduit lending emerged as an important force in the commercial mortgage market. In the conduit model, the originator, usually an investment bank or a mortgage bank, originates a loan without the intention to retain that loan in portfolio. Instead, that loan is sold to a security issuer and ultimately pooled with other like loans into a CMBS structure. The originating entity typically relies on a line of credit from Wall Street to fund the commercial mortgages. Accordingly, as the name implies, the originating entity simply acts as a “conduit”. According to Mortgage Bankers Association, conduit loans grew from less than 5% of CMBS issuance in 1992 to about 75% of total CMBS issuance in 1998. In recent years, the share of conduit loans in CMBS pools has been even higher.

Estimating the Value of Conduit Loan Securitization

As described above, conduit loans are originated specifically with the intention of sales into CMBS structures in the secondary market. At loan origination, originators

[7] One example is the $1.3 billion securitization of Canadian Confederation Life Insurance's portfolio of U. S. commercial mortgages in 1995.

know with certainty that these loans will be sold to CMBS issuers. To the extent that securitization creates value, at least part of the gains should flow to the mortgage originators. Given the lower cost of capital, the originators can then price aggressively in the primary market, which results in a reduction in commercial mortgage interest rates. In contrast, portfolio loans are not intended to go to CMBS structures in the secondary market at the time of origination; rather, they are held by origination institutions for investment.[8] Benefits associated with securitization by definition do not accrue to portfolio lenders. As such, portfolio lenders expect a higher cost of capital than lenders executing to the CMBS market. Accordingly, all things equal, the commercial mortgage-treasury rate spreads differential between portfolio and conduit loans should reflect the value enhancement of securitization. By comparing the rate spreads of conduit and portfolio loans, we can empirical identify securitization effects.

Commercial mortgage-treasury rate spreads are affected by numerous other factors, notably including those associated with loan prepayment and default risks. We need to control for those factors when comparing conduit and portfolio loan spreads.

We estimate the following reduced form model:

$$R_{it} - R_{ft} = D_i\alpha + X_i\beta + Z_t\gamma + \varepsilon_{it} \tag{1}$$

Here R_{it} is the coupon rate of the ith commercial mortgage loan originated at time t, and R_{ft} is the comparable-maturity treasury rate at time t. Accordingly, our dependent variable is the commercial mortgage-treasury rate spread. X_i is a vector representing the mortgage loan contract terms, such as loan-to-value ratio (LTV), loan origination balance, amortization term, maturity term and property location. Z_t is a vector of systematic factors representing the debt market environment at the time of origination, such as the corporate bond credit spread, the slope of the Treasury yield curve, interest rate volatility, and commercial real estate market volatility. D_i is the categorical variable for a conduit loan. All things equal, we expect a significant negative coefficient of D_i representing a reduction in mortgage rate related to the securitization of conduit loans. Regarding the systematic risk factors, we expect the credit spread on corporate bonds to have a positive impact on the pricing of commercial mortgages, reflecting the general credit risk environment and market price of risk. The slope of the yield curve has an anticipated positive impact on the mortgage-treasury rate spread because a steeper yield curve implies a higher probability of a short rate increase while Merton (1974) has shown that the value of risky debt is a negative function of instantaneous risk free rate.[9] Interest rate volatility and commercial real estate volatility should have positive impacts on the mortgage-treasury rate spread because they are positively related to default risk.

A potential problem of this simple linear regression model is the endogeneity of mortgage loan terms to credit risk. Commercial mortgage borrowers and lenders

[8] Portfolio loans can be sold into the secondary market subsequent to origination.

[9] Steeper yield curve also implies higher chance of decline in long term risk free rate, which is positively related to mortgage prepayment risk.

usually negotiate mortgage terms. Accordingly, the commercial mortgage-treasury rate spread may be jointly determined with other loan terms such as LTV. For example, since default risk is of significant concern to commercial mortgages, lenders/originators undertake due diligence in assessing the credit quality of both the borrower and the property. When a lender/originator perceives that a property has higher risk than usual, he/she might downward adjust the loan-to-value ratio on the property (Archer et al. 2002). In that case, there is a simultaneity bias in the single equation model described in above.

To address this issue, we also estimate a simultaneous equations model in the following form:

$$R_{it} - R_{ft} = D_i\alpha + L_i\varphi + X_i\beta + Z_t\gamma + \varepsilon_{it} \tag{2}$$

$$L_i = \left(R_{it} - R_{ft}\right)\theta + Y_i\rho + \eta_{it} \tag{3}$$

Here L_i is the loan LTV. While mortgage-treasury rate spread is determined by LTV and other factors, LTV is affected by mortgage-treasury rate spread and other loan terms such as maturity, amortization and market prevailing LTV. Having controlled for such endogeneity, we infer the impact of securitization on mortgage pricing from the coefficient of our focus variable, the conduit loan dummy D_i.

Commercial mortgage underwriting is much less standardized than residential mortgages, and thus the loans originated are very heterogeneous. To facilitate our comparison of conduit and portfolio loans, we implement two strategies in our sample design. First, we include in the analysis only loans underlying private-label CMBS pools. In that private-label CMBS pools impose relatively uniform underwriting requirements, this reduces the possibility that unusual products may bias our estimates as outliers. Second, we focus only on loans of a single property type—multifamily loans—since they are less heterogeneous with respect to loan characteristics and credit risk compared to loans of other property types such as retail, office and hotels.

Data and Results

Data

We use loan level data obtained from CMBS.COM for our empirical analysis. For each loan, we have detailed information on origination date, origination balance, origination LTV, coupon rate, maturity, amortization, property location, lender and loan type (conduit, portfolio or other).

The data from CMBS.COM includes about 15,000 multifamily loans from 340 CMBS deals. We exclude adjustable rate mortgage loans (ARMs) and non-MSA loans. Furthermore, we focus exclusively on conduit and portfolio loans.[10] The final sample contains 12,084 multifamily loans, of which 11,227 (92.9%) are conduit

[10] There are other loan groups such as franchise loans, large loans and single borrower loans.

Table 1 Origination year distribution of multifamily loans in our sample

Year	All loans		Conduit loans		Portfolio loans	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1992	41	0.34	5	0.04	36	4.20
1993	202	1.67	61	0.54	141	16.45
1994	550	4.55	336	2.99	214	24.97
1995	673	5.57	582	5.18	91	10.62
1996	1,172	9.70	1,073	9.56	99	11.55
1997	1,541	12.75	1,480	13.18	61	7.12
1998	2,699	22.34	2,582	23.00	117	13.65
1999	1,458	12.07	1,373	12.23	85	9.92
2000	891	7.37	878	7.82	13	1.52
2001	1,257	10.40	1,257	11.20	0	0.00
2002	999	8.27	999	8.90	0	0.00
2003	601	4.97	601	5.35	0	0.00
Total	12,084	100.00	11,227	100.00	857	100.00

loans and 857 (7.1%) are portfolio loans. The composition reflects the fact that conduit loans dominate the private-label CMBS mortgage pools.

Loans in our sample were originated between January 1992 and June 2003 and are from 305 US MSAs. Table 1 shows the origination year distribution, which in turn reflects growth in the multifamily securitization market. Number of loans securitized is small in early 1990s. It reaches the peak in 1998 and then shrinks substantially in the following two years, due to the debt market crisis triggered by the Russian bond default in August 1998.

Table 2 reports sample statistics for the mortgage-treasury rate spread, origination LTV and origination loan balance variables in our sample. The average rate spread for all loans is 220 bps. Conduit loans have an average rate spread of 219 bps, which is 18 bps lower than that of portfolio loans. The average original LTV for all loans is slightly below 70%, substantially below that of residential mortgages. Conduit loans have slightly higher origination LTV, and higher average origination loan balance.

Table 3 shows loan amortization, maturity, region and season distributions. Most of the loans have amortization periods of 20 to 30 years. The loans are balloon mortgages with maturity of 5 to 10 years. Over 91% of conduit loans have amortization terms between 20 to 30 years, and 78% of portfolio loans fall in that category. Nearly 21% percent of portfolio loans have amortization periods of less than 20 years. Overall,

Table 2 Sample means of selected variables

	All loans	Conduit loans	Portfolio loans
Mortgage-treasury rate spread (in percent)	2.200	2.188	2.364
	(0.593)	(0.571)	(0.812)
Original LTV (in percent)	69.745	69.895	67.775
	(13.876)	(13.975)	(12.357)
Original balance ($ in thousands)	4,196	4,291	2,940
	(5,259)	(5,369)	(3,285)
Number of obs.	12,084	11,227	857

Table 3 Sample composition with respect to various loan characteristics

Characteristics	Category	All loans		Conduit loans		Portfolio loans	
		Freq.	Percent	Freq.	Percent	Freq.	Percent
Amortization	Less than 20 years	807	6.68	629	5.60	178	20.77
	20 to 30 years	10,918	90.35	10,248	91.28	670	78.18
	Over 30 years	359	2.97	350	3.12	9	1.05
Maturity	Less than 5 years	449	3.72	360	3.21	89	10.39
	5 to 10 years	9,979	82.58	9,460	84.26	519	60.56
	10 to 15 years	1,006	8.33	815	7.26	191	22.29
	Over 15 years	650	5.38	592	5.27	58	6.77
Region	Midwest/Eastern	1,273	10.53	1,212	10.80	61	7.12
	Midwest/Western	530	4.39	486	4.33	44	5.13
	Northeast/Mid-Atlantic	1,525	12.62	1,477	13.16	48	5.60
	Northeast/New-England	491	4.06	451	4.02	40	4.67
	Southern/Atlantic	2,306	19.08	2,221	19.78	85	9.92
	Southern/East-Coast	455	3.77	438	3.90	17	1.98
	Southern/West-Coast	2,517	20.83	2,379	21.19	138	16.10
	Western/Mountain	1,032	8.54	917	8.17	115	13.42
	Western/Northern-Pacific	792	6.55	649	5.78	143	16.69
	Western/Southern-Pacific	1,163	9.62	997	8.88	166	19.37
Season	First quarter	2,703	22.37	2,514	22.39	189	22.05
	Second quarter	3,038	25.14	2,790	24.85	248	28.94
	Third quarter	3,083	25.51	2,883	25.68	200	23.34
	Fourth quarter	3,260	26.98	3,040	27.08	220	25.67
	Total	12,084	100.00	11,227	100.00	857	100.00

portfolio loans have longer average maturity. Loans in our sample are from ten U.S. regions. The regional distributions of conduit and portfolio loans are similar, except that conduit loans tend to be more concentrated in Northeast/Mid-Atlantic and Southern/Atlantic, while portfolio loans are more common on the west coast. The loans are almost evenly distributed across the four seasons.

Two points can be taken from Tables 2 and 3. First, there are substantial variations in loan contract characteristics within each of the conduit and portfolio loan groups. Second, comparing the two groups of loans, the loan characteristics are roughly similar.

We use the corporate credit spread as a systematic factor to control for the credit environment and the market price of risk. That variable is defined as the yield of BBB corporate bonds minus the yield of AAA corporate bonds at loan origination. The data is from the Federal Reserve and is plotted in Fig. 1. We see a peak in credit spreads in late 1998 because of the Russian bond default and resulting debt market crisis. In late 2001 and early 2002, there is again a sharp increase in the credit spread possibly because of the bankruptcies of Enron, WorldCom and the economic recession triggered by the bursting of the tech bubble. Generally, credit spreads after 1998 are higher than those before 1998, reflecting the market trend of "flight to quality".

The slope of the yield curve is included as an explanatory variable to control as well for market-wide default risk as discussed in the previous section. In addition, the slope of the yield curve serves as a proxy for potential prepayment risk. Although many of the multifamily loans have prepayment constraints such as lock out, yield maintenance and defeasance, prepayment risk is still observed from the

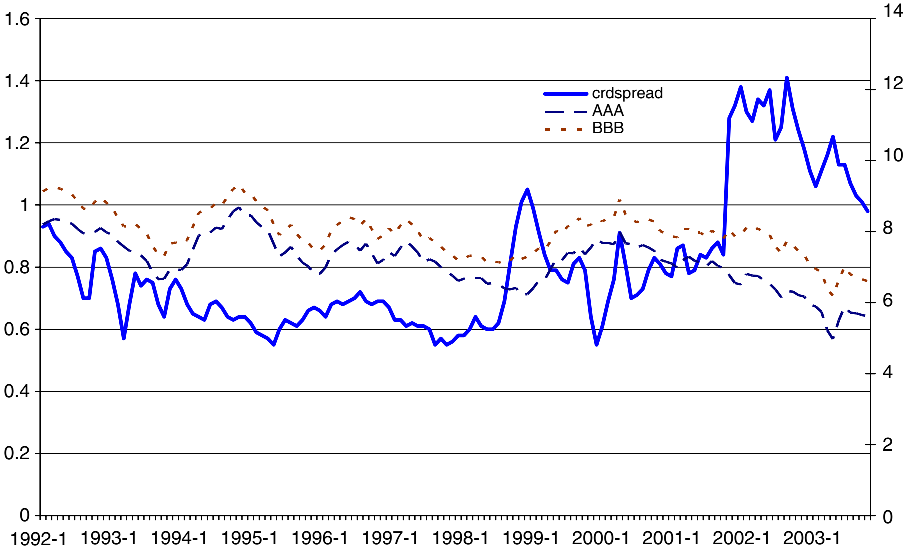

Fig. 1 Corporate bond credit spreads. Note: The corporate bond spread is calculated as the BBB corporate bond rate minus the AAA corporate bond rate, and it is marked to the *left hand side axis*

sample of those loans. The variable is defined as the difference between 10-year and 1-year constant maturity Treasury bond rates and the data series are plotted in Fig. 2. Interest rate volatility and multifamily market volatility are also included in the model. They are simply calculated as the standard deviations of the past 24 months' 10 year treasury rates and National Association of Real Estate Investment Trusts (NAREIT) all REITs index for the multifamily sector. The data are presented in Figs. 3 and 4.

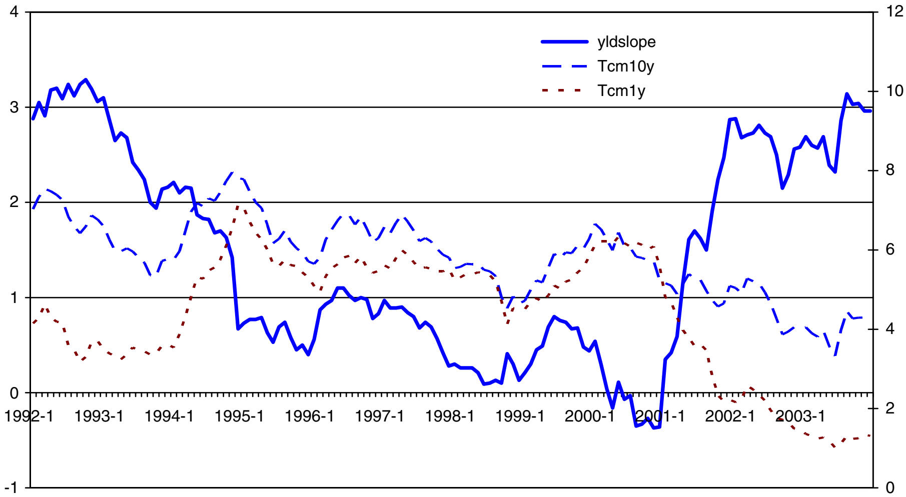

Fig. 2 Yield slopes during the study period. Note: The yield slope is calculated as the difference between the 10-year and 1-year Treasury constant maturity bond rates, and it is marked to the *left hand side axis*

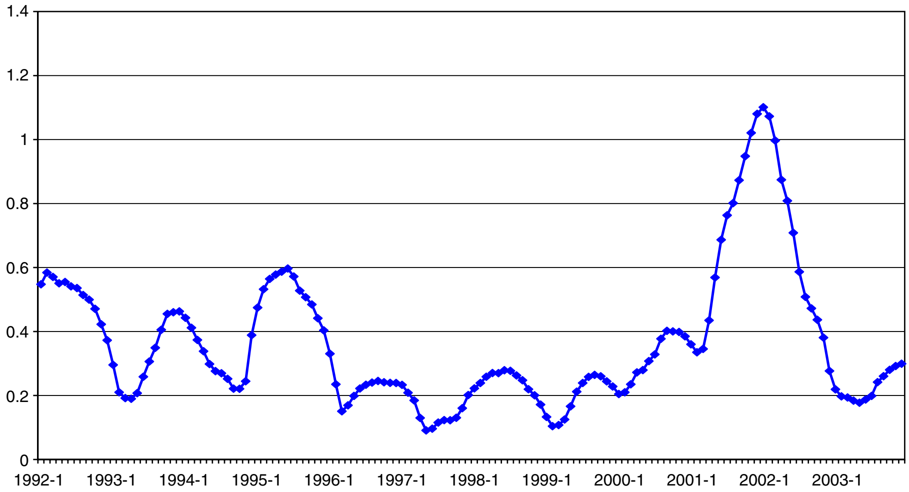

Fig. 3 Ten year Treasury rate volatility. Note: The 10-year Treasury rate volatility is calculated as the standard deviation of the previous 24 months' rates

Basic Regression Results

The results of our simple linear regression model (Eq. (1)) are shown in Table 4. The conduit loan control is associated with a significant lower interest rate spread over Treasuries, all else equal. The estimated reduction in the rate spread is 11 bps.

Loan contract terms matter. For example, origination LTV is positively correlated with the multifamily mortgage rate spread, possibly because of higher credit risk associated with higher LTV loans.[11] Origination loan balance is negatively associated with the spread. This is because, on the one hand, larger loans have lower default risk (See Ciochetti, Deng, Lee, Shilling and Yao 2003), and on the other hand, originators put more effort into the underwriting of large loans.[12] There is a U-shaped relationship between maturity and rate spread. Both short-term loans and long-term loans have higher spreads.

Turning to systematic risk factors, and as would be expected, a higher market credit spread is associated with a higher multifamily mortgage interest rate spread. The slope of the yield curve is shown to have a negative relationship with the multifamily mortgage-treasury rate spread, contrary to expectations. However, it is consistent with that in previous empirical studies including Rothberg et al. (1989), Bradley et al. (1995), and Todd (2001). Higher interest rate volatility leads to higher values of call (prepayment) and put (default) options. Therefore, the positive coefficient of interest rate volatility is consistent with expectations. Finally,

[11] It is noteworthy that commercial real estate valuation may be "smoothed" as it tends to rely on appraised values. As a result, the LTV may be biased. If this is the case, the appraisal smooth may cause potential inconsistent estimates in our model. Thanks for an anonymous referee for pointing this out.

[12] Later we will present our own estimates showing original loan balance has a negative relationship with both default risk and prepayment risk.

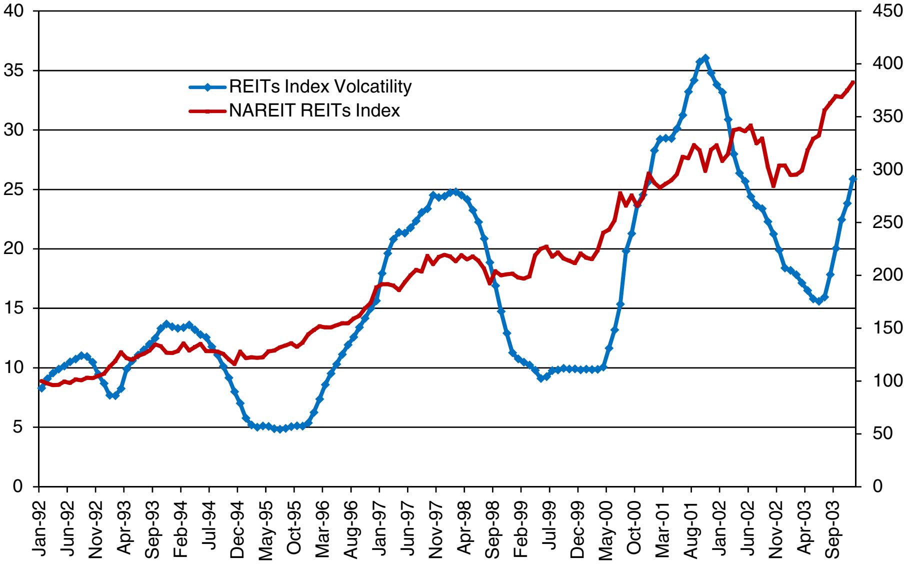

Fig. 4 NAREIT REITs index and volatility. Note: The REITs index volatility is calculated as the standard deviation of the previous 24 months' indexes

multifamily market volatility has a significant negative impact on mortgage rate spread, contrary to our expectations.

There are substantial regional variations. Here our reference group is Western/ Southern Pacific (including Southern California). Loans on the east coast and in the South generally have higher spreads. For example, loans in New England have a 6 bps higher spread than those in southern California, and loans in Florida and Texas have significantly higher spreads. This may be because of the differences in default risk across regions. The Western/Mountain area has the highest mortgage spreads.

There are also significant seasonal effects. Loans originated in the summer have 7 bps lower spreads than loans originated in the spring, while those originated during fall and winter time have 3 and 4 bps higher spreads, respectively.

Tests for Omitted Variables associated with Prepayment and Default Risk

Commercial mortgage rates vary as a function of prepayment risk and default risk, especially the latter. In the above basic regression model, we use some simple controls to account for the differences in prepayment and default risks of individual loans. A critique of the above model is that there may be bias associated with omitted variables even after inclusion of controls for default and prepayment risks including origination LTV, loan balance, loan terms and property location. Differences in those omitted variables among conduit and portfolio loans may contribute to the observed difference in mortgage spreads between the two groups. In other words, systematic differences in residual prepayment and default risk may affect the estimated conduit loan premium evidenced in the model.

In order to test this hypothesis, we estimate a prepayment model and default risk model for the loans in our sample, using exactly the same set of explanatory variables as

Table 4 Base regression results of the multifamily mortgage-treasury rate spread

	Coefficient (S.E.)
Intercept	4.96***
	(0.07)
Conduit loan dummy	−0.11***
	(0.02)
Original LTV	0.01***
	(0.00)
Log of original balance	−0.24***
	(0.00)
Amortization less than 20 years	−0.01
	(0.02)
Amortization over 30 years	0.07*
	(0.03)
Maturity less than 5 years	0.39***
	(0.03)
Maturity 10 to 15 years	0.01
	(0.02)
Maturity over 15 years	0.10***
	(0.02)
Corporate bond credit spread	0.71***
	(0.03)
Yield curve	−0.09***
	(0.01)
10 year risk-free rate volatility	0.49***
	(0.03)
Multifamily REITs index volatility	−0.01***
	(0.00)
Midwest/Eastern	−0.01
	(0.02)
Midwest/Western	−0.02
	(0.03)
Northeast/Mid-Atlantic	0.04*
	(0.02)
Northeast/New-England	0.06*
	(0.03)
Southern/Atlantic	0.04*
	(0.02)
Southern/East-Coast	0.05
	(0.03)
Southern/West-Coast	0.06***
	(0.02)
Western/Mountain	0.09***
	(0.02)
Western/Northern-Pacific	−0.03
	(0.02)
Second quarter	−0.07***
	(0.01)
Third quarter	0.03*
	(0.01)
Fourth quarter	0.04**
	(0.01)
Number of obs.	12,084
Adjusted R-square	0.2412

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$. *Dependent variable: Multifamily mortgage-treasury rate spread*

Table 5 MLE estimates of the default model for multifamily loans

	Coefficient (S.E.)
Conduit loan dummy	0.17
	(0.24)
Original LTV	0.02***
	(0.01)
Log of original balance	−0.26***
	(0.06)
Amortization less than 20 years	−0.30
	(0.33)
Amortization over 30 years	0.22
	(0.46)
Maturity less than 5 years	0.53
	(0.31)
Maturity 10 to 15 years	−0.60*
	(0.26)
Maturity over 15 years	−0.27
	(0.24)
Corporate bond credit spread	0.26
	(0.46)
Yield curve	−0.08
	(0.11)
10 year risk-free rate volatility	1.35***
	(0.37)
Multifamily REITs index volatility	−0.02*
	(0.01)
Midwest/Eastern	1.40***
	(0.34)
Midwest/Western	0.76
	(0.44)
Northeast/Mid-Atlantic	1.11**
	(0.35)
Northeast/New-England	1.69***
	(0.36)
Southern/Atlantic	1.16***
	(0.33)
Southern/East-Coast	1.70***
	(0.37)
Southern/West-Coast	1.29***
	(0.32)
Western/Mountain	1.32***
	(0.35)
Western/Northern-Pacific	0.07
	(0.49)
Second quarter	−0.01
	(0.17)
Third quarter	0.14
	(0.16)
Fourth quarter	0.00
	(0.16)
Number of obs.	11,631
−2 Log likelihood	5973.42

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$. We lose 453 observations due to the unidentified mortgage termination (prepayment/default/continue to pay) status

Table 6 MLE estimates of the prepay model for multifamily loans

	Coefficient (S.E.)
Conduit loan dummy	−0.09 (0.08)
Original LTV	0.00 (0.00)
Log of original balance	−0.26*** (0.03)
Amortization less than 20 years	0.27* (0.11)
Amortization over 30 years	0.87*** (0.24)
Maturity less than 5 years	0.89*** (0.12)
Maturity 10 to 15 years	−0.76*** (0.10)
Maturity over 15 years	−1.48*** (0.15)
Corporate bond credit spread	−6.43*** (0.46)
Yield curve	0.57*** (0.05)
10 year risk-free rate volatility	0.82*** (0.24)
Multifamily REITs index volatility	−0.04*** (0.01)
Midwest/Eastern	−0.29* (0.12)
Midwest/Western	−0.46* (0.18)
Northeast/Mid-Atlantic	−0.17 (0.11)
Northeast/New-England	0.06 (0.14)
Southern/Atlantic	0.00 (0.10)
Southern/East-Coast	−0.38* (0.17)
Southern/West-Coast	−0.12 (0.10)
Western/Mountain	−0.08 (0.12)
Western/Northern-Pacific	−0.22 (0.12)
Second quarter	0.06 (0.07)
Third quarter	0.10 (0.08)
Fourth quarter	0.21** (0.07)
Number of obs.	11,631
−2 Log likelihood	24,969.69

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$. We lose 453 observations due to the unidentified mortgage termination (prepayment/default/continue to pay) status in our mortgage-treasury rate spread equation (1). The rationale is as follows: if there exists systematically different residual prepayment or default risk between the two groups of loans, which is not captured by the factors X_i and Z_i, it should be reflected in the coefficient of the conduit loan dummy in the prepayment or default risk model.

Tables 5 and 6 present the maximum likelihood estimates of a prepayment hazard model and a default hazard model, in which the hazard rate of prepayment or default is a function of the covariates D_i, X_i and Z_i.

$$h_i(t) = h_0(t)\, exp\,(D_i\tau + X_i\theta + Z_t\eta) \tag{4}$$

Estimation results indicate that the conduit dummy is insignificant in both the default and prepayment models. However, other variables enter the model with anticipated effects. For example, origination loan balance has significant and negative impacts on both prepayment risk and default risk, consistent with the notion that small loans are riskier than large loans. Interest rate volatility is significantly and positively associated with prepayment and default risks, because the put and call option values are positively related to interest rate volatility. In addition, loans in the Western/Southern Pacific region (the reference group) are significantly less risky than those in most other regions. The results of hazard model analysis fail to support the hypothesis that the estimated mortgage-treasury rate spread differentials between conduit and portfolio loans are due to residual prepayment or default risk not well-controlled in our basic model.

Tests of Lender Effects

In a fully competitive market, no lender has sufficient market power so as to influence pricing outcomes. In the commercial mortgage market, however, certain “big” lenders may enjoy either pricing advantages or scale economies. Accordingly, it is desirable to evaluate the null hypothesis of no lender-specific effects on loan pricing. To do so, we identify the top ten multifamily mortgage lenders, each of which has over 3% of loan originations in our sample. They include Column Financial, Bank of America, Wachovia, GE Capital, JP Morgan Chase, Merrill Lynch, CITI Corp, GMAC, NCB and Midland (Table 7). We include dummy variables for these lenders in our model.

Table 7 Top ten originators of multifamily loans in our sample

Originator	Number of loans	Percentage of our sample
Column Financial	1,561	12.92
Bank of America	1,044	8.64
Wachovia	992	8.21
GE Capital	581	4.81
JPMorgan Chase	551	4.56
Merrill Lynch	476	3.94
CITI Corp	441	3.65
GMAC	422	3.49
NCB	407	3.37
Midland	386	3.19

Table 8 Regression results with originator dummies

	Coefficient (S.E.)
Intercept	5.05***
	(0.08)
Conduit loan dummy	−0.16***
	(0.02)
Original LTV	0.00***
	(0.00)
Log of original balance	−0.23***
	(0.01)
Amortization less than 20 years	−0.02
	(0.02)
Amortization over 30 years	0.11***
	(0.03)
Maturity less than 5 years	0.40***
	(0.03)
Maturity 10 to 15 years	0.02
	(0.02)
Maturity over 15 years	0.09***
	(0.02)
Corporate bond credit spread	0.71***
	(0.03)
Yield curve	−0.09***
	(0.01)
10 year risk-free rate volatility	0.44***
	(0.03)
Multifamily REITs index volatility	−0.01***
	(0.00)
Midwest/Eastern	−0.02
	(0.02)
Midwest/Western	−0.02
	(0.03)
Northeast/Mid-Atlantic	0.08***
	(0.02)
Northeast/New-England	0.05
	(0.03)
Southern/Atlantic	0.03
	(0.02)
Southern/East-Coast	0.04
	(0.03)
Southern/West-Coast	0.05*
	(0.02)
Western/Mountain	0.09***
	(0.02)
Western/Northern-Pacific	−0.02
	(0.02)
Second quarter	−0.07***
	(0.01)
Third quarter	0.03*
	(0.01)
Fourth quarter	0.05***
	(0.01)
Column Financial	0.17***
	(0.02)
Bank of America	−0.11***
	(0.02)

Table 8 (continued)

	Coefficient (S.E.)
Wachovia	0.07***
	(0.02)
GE Capital	−0.15***
	(0.02)
JPMorgan Chase	−0.05*
	(0.02)
Merrill Lynch	−0.10***
	(0.02)
CITI Corp	0.08**
	(0.03)
GMAC	−0.04
	(0.03)
NCB	−0.34***
	(0.04)
Midland	−0.03
	(0.03)
Number of obs.	12,084
Adjusted *R*-square	0.2641

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$

Table 8 shows the results of regressions that control for lender-specific effects. Many of these lenders do charge lower spreads, e.g. spreads of loans originated by GE Capital are 15 bps lower than the loan population at large, Bank of America has an advantage of 11 bps, and Merrill Lynch loans have 10 bps lower spreads. However, we also see some of these “big” lenders charge higher-than-average spreads; e.g., loan spreads of Column, CITI Corp, and Wachovia are 17, 8, and 7 bps higher, respectively. Upon controlling for lender effects, the estimated spread differential between conduit and portfolio loans is 16 bps, higher than that shown in our basic results.

We also separately assess loans associated with one specific lender, the Bank of America. Bank of America is a large lender in both the conduit and portfolio loan markets. Table 9 reports regression results. The spread differential between conduit and portfolio loans remains significant at 16 bps. The results for Bank of America loans are then consistent with those for the other large lenders, as reported above.

Simultaneous Equation Model Results

Finally we estimate a simultaneous equation model (Eqs. (2) and (3)), where mortgage-treasury rate spread and LTV are simultaneously determined. Estimation results displayed in Table 10 demonstrate that controlling the simultaneity is important, and that our simple single-equation model under-estimates the spread differentials between conduit and portfolio loans. The simultaneous equations estimate is 20 bps, rather than 11 bps derived from our single equation model.

Interestingly, LTV becomes negative in the rate spread equation, which means that if the lender perceives that a property is of high credit quality, he may allow the borrower to borrow more while at the same time charging a lower spread. Or, if the lender perceives that a property has high credit risk, he may require low leverage in addition to a high spread. Other results are generally consistent with previous results.

Table 9 Regression results based on Bank of America loans only

	Coefficient (S.E.)
Intercept	5.03***
	(0.23)
Conduit loan dummy	−0.16***
	(0.04)
Original LTV	0.00
	(0.00)
Log of original balance	−0.25***
	(0.02)
Amortization less than 20 years	−0.03
	(0.06)
Amortization over 30 years	0.09
	(0.14)
Maturity less than 5 years	0.21*
	(0.09)
Maturity 10 to 15 years	0.03
	(0.06)
Maturity over 15 years	0.12
	(0.14)
Corporate bond credit spread	1.26***
	(0.11)
Yield curve	−0.20***
	(0.03)
10 year risk-free rate volatility	1.03***
	(0.10)
Multifamily REITs index volatility	0.00
	(0.00)
Midwest/Eastern	−0.29***
	(0.07)
Midwest/Western	−0.16*
	(0.06)
Northeast/Mid-Atlantic	−0.02
	(0.07)
Northeast/New-England	−0.06
	(0.13)
Southern/Atlantic	−0.03
	(0.05)
Southern/East-Coast	−0.07
	(0.09)
Southern/West-Coast	−0.02
	(0.05)
Western/Mountain	−0.07
	(0.05)
Western/Northern-Pacific	−0.13**
	(0.05)
Second quarter	−0.12**
	(0.04)
Third quarter	−0.05
	(0.04)
Fourth quarter	0.13**
	(0.04)
Number of obs.	1,044
Adjusted R-square	0.4338

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$

Table 10 Estimates of the simultaneous equations model

	Coefficient (S.E.)
Mortgage-treasury spread equation	
Intercept	6.55*** (0.42)
Conduit loan dummy	−0.20*** (0.04)
Original LTV	−0.05*** (0.01)
Log of original balance	−0.07 (0.04)
Amortization less than 20 years	−0.73*** (0.19)
Amortization over 30 years	−0.62*** (0.18)
Maturity less than 5 years	0.52*** (0.05)
Maturity 10 to 15 years	−0.09* (0.04)
Maturity over 15 years	0.08* (0.03)
Corporate bond credit spread	0.55*** (0.06)
Yield curve	−0.17*** (0.03)
10 year risk-free rate volatility	0.26*** (0.07)
Multifamily REITs index volatility	−0.01*** (0.00)
Midwest/Eastern	0.13** (0.05)
Midwest/Western	0.15* (0.06)
Northeast/Mid-Atlantic	−0.51*** (0.14)
Northeast/New-England	0.15** (0.05)
Southern/Atlantic	0.14*** (0.04)
Southern/East-Coast	0.25*** (0.07)
Southern/West-Coast	0.20*** (0.04)
Western/Mountain	0.12*** (0.04)
Western/Northern-Pacific	−0.12** (0.04)
Second quarter	−0.07** (0.02)
Third quarter	0.04 (0.02)
Fourth quarter	0.08*** (0.02)
Adjusted R-square	0.1114

Table 10 (continued)

	Coefficient (S.E.)
LTV equation	
Intercept	−71.20***
	(7.93)
Mortgage-treasury rate spread	5.09***
	(0.86)
Log of original balance	4.75***
	(0.22)
Amortization less than 20 years	−14.21***
	(0.48)
Amortization over 30 years	−15.77***
	(0.66)
Maturity less than 5 years	1.21
	(0.7)
Maturity 10 to 15 years	−1.00***
	(0.42)
Maturity over 15 years	−0.06
	(0.52)
Market prevailing LTV	0.93***
	(0.08)
Corporate bond credit spread	−4.75***
	(0.96)
Adjusted R-square	0.2218
Number of obs.	12,084

NOTE: Standard errors are in parenthesis, ***$p<0.001$, **$p<0.01$, and *$p<0.05$

For example, market credit spread and interest rate volatility are positively related to rate spread, while yield slope is negatively related to rate spread.

The LTV equation also shows interesting results. For example, LTV of a specific loan is tied to the prevailing market LTV. Larger loans tend to have a higher LTV, all else equal. In addition, when market credit conditions deteriorate, (i.e. the corporate bond credit spread widens), lenders tend to be more conservative by requiring lower LTVs. The relationship between spread and LTV is significant and positive, which means that borrowers can trade off a higher spread with higher leverage.

Conclusions and Discussions

Despite recent constraints on secondary market funding and liquidity, analysts have suggested substantial value creation associated with the securitization of commercial mortgages. Such value creation would derive, among other things, from liquidity enhancements, regulatory arbitrage, price discrimination, and risk diversification by pooling and tranching, gains from specialization in origination, servicing, and holding, and the like. Indeed, such value creation would be consistent with past accelerated growth in the mortgage- and asset-based securities markets and the sizable profits earned by the intermediaries involved.

In this paper, we seek to empirically measure the magnitude of the value creation via securitization of commercial mortgages. We estimate such value creation by comparing the mortgage-treasury rate spreads of two types of loans in commercial mortgage-backed securities (CMBS) market: conduit and portfolio loans.

Research findings indicate an 11 bps rate reduction among conduit multifamily loans sold into CMBS structures, all things equal. Further, we run hazard models of mortgage prepayment and default, so as to assess the possibility that the estimated effect of securitization is sensitive to systematic differences in prepayment or default risk between portfolio and conduit loans that are not captured in our basic model specification. Results of that analysis suggest the robustness of our estimated results to possible omitted default and prepayment controls. Inclusion in the model of additional controls for specific originating institutions yields a slightly higher estimate of the rate reduction associated with securitization. We also estimate a simultaneous equations model to account for the possibility that the commercial mortgage-treasury rate spread is jointly determined with other loan underwriting terms such as LTV. Upon controls for simultaneity bias, our estimated securitization effect rises to 20 bps.

It is worth noting that our estimates here provide a lower bound to value creation through securitization. This is because the CMBS issuers, servicers, mortgage loan originators, and other parties participating in the securitization process may retain some of the gains associated with securitization, such that reductions in commercial mortgage rates on conduit loans may reflect only the portion of securitization benefits passed along to borrowers.

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