ABS, MBS, and CDO Pricing Comparisons: *An Empirical Analysis*

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Securitization is a well-established technique developed to finance a collection of assets that by their very nature are non-tradable and therefore non-liquid. The central element of an asset securitization issue is the fact that repayment depends only or primarily on the assets and cash flows pledged as collateral to the issue, and not on the overall financial strengths of the originator (sponsor or parent company). In the context of this article, asset securitization is defined as the process in which assets are refinanced in the capital market by issuing securities sold to investors by a bankruptcy-remote special purpose vehicle (SPV). The primary objective of the SPV is to facilitate the securitization of the assets and to ensure that the SPV is established for bankruptcy purposes as a legal entity separate from the seller. Blum and DiAngelo [1997] and Choudhry and Fabozzi [2004] mention that the capital market in which these securities are issued and traded consists of three main classes: asset-backed securities (ABS), mortgage-backed securities (MBS), and collateralized debt obligations (CDO). As a rule of thumb, securitization issues backed by mortgages are called MBS, and securitization issues backed by debt obligations are called CDOs[1] (see Nomura [2004] and Fitch Ratings [2004]). Securitization issues backed by consumer-backed products—car loans, consumer loans and credit cards, among others—are called ABS (see Moody's Investors Service [2002]).

Securitization was first introduced on U.S. mortgage markets in the 1970s. The market for mortgage-backed securities was boosted by the government agencies that endorsed these securities. In 1985, securitization techniques that had been developed in the mortgage market were initially applied to a class of non-mortgage assets—car loans. After the success of this initial transaction, securitization issues were backed by an increasingly diverse and ever-expanding array of assets, including corporate assets such as lease receivables and bank assets such as payments associated with corporate loans. Since then, the securitization market has grown to become one of the most prominent fixed income sectors in the U.S. and in fact one of the fastest evolving sectors around the world. Securitization can be found both in developed and in emerging countries (Standard & Poor's [2006]).

Generally speaking, the asset securitization market is composed of asset-backed securities (ABS), mortgage-backed securities (MBS) and collateralized debt obligations (CDO). Due to the differences in the assets related to these securities, the relevant pricing factors for these securities should differ, too. This finding raises the following two questions: *How do common pricing factors compare for the main classes of securities?* And, *to what extent*

are the main classes of securities priced by common factors? The purpose of answering these questions is to provide extensive insight into the common pricing characteristics associated with these classes and to elaborate on any substantial differences between them.

We propose to test the following two hypotheses. The first hypothesis states that the common pricing factors differ significantly in value between the main classes of securities. The second hypothesis states that the primary market spreads associated with the main security classes are influenced differently by common pricing factors.[2] In testing the first hypothesis, we used a parametric test, Student's *t*-test, to compare whether the distribution of the reported values for the security classes are significantly different. In testing the second hypothesis, a structural change test was used. The Chow test is a special test for structural change, also defined as an econometric test, to determine whether the coefficients in a regression model are equal in separate subsamples (Chow [1960]). We concluded our analysis by examining the factors that affect the pricing of the securities. We used an ordinary least squares regression analysis to model the magnitude of the relationships between pricing variables and primary market spread, and we compared the results with the expectations.

BACKGROUND INFORMATION AND HYPOTHESES

Choudhry and Fabozzi [2004] mention that the capital market in which the securities are issued and traded is composed of three main, distinct categories: ABS, MBS, and CDOs. As a rule of thumb, securitization issues backed by mortgages are called MBS, securitization issues backed by debt obligations are called CDO, and securitization issues backed by consumer-backed products are called ABS.

Hypothesis 1: How do common pricing factors compare for the main classes of securities (ABS, MBS, CDOs)? Due to the differences in the assets related to these securities, the relevant pricing factors for these securities should differ, too. This finding raises the following question: *How do common pricing factors compare for the main classes of securities?* The purpose of answering this question is to provide extensive insight into the common pricing characteristics associated with these classes and to elaborate on any substantial differences between them. We hypothesize that the common pricing factors differ significantly in value between the main classes of securities. In testing Hypothesis 1 we used a parametric test, Student's *t*-test, to compare whether the distributions of the reported values for the security classes are significantly different.

Hypothesis 2: To what extent are the main classes of securities priced by common factors? The second research question is: *To what extent are the main classes of securities priced by common factors?* In pricing securities, the pricing characteristics may have a different impact on the primary market spread exhibited by the value of the coefficients. Also, the degree of the impact on the spread could differ per security class. Thus, for statistical analyses, the problem is twofold. Various different variables determine spreads, and it may well be that the impact of these variables on the spread is different among and between security classes. According to basic statistics, relevant pricing variables can be identified by their statistical significance, while the equality of the impact of each variable can be determined by comparing coefficient values. Overall, we hypothesize that the primary market spreads associated with the main security classes are influenced differently by common pricing factors.

A structural change test was used for Hypothesis 2. The Chow test is a special test for structural change, also defined as an econometric test to determine whether the coefficients in a regression model are equal in separate subsamples. In his article, G.C. Chow [1960] states that "the standard F-test for the equality of two sets of coefficients in linear regression models" is called a Chow test (see Davidson and MacKinnon [1993] for an explanation). In brief, the Chow test is an econometric test to determine whether the coefficients in two linear regressions on different data are equal.[3]

Having documented to what extent the pricing variables for the different classes of securities show significant differences, we concluded our empirical analyses by examining the factors that impact the pricing of the securities. We used an ordinary least squares regression analysis to model the magnitude of the relationships between pricing variables and the primary market spread, and we compared the results with the expectations as outlined in the following section, "Data Description." Should Hypothesis 2 be rejected, a regression test would have to be run on one sample only in order to determine the pricing variables. Should Hypothesis 2 be accepted, examining the coefficients will allow us to determine pricing variables for each security class separately.

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DATA DESCRIPTION

The principal data source used in this study is formed by the data provided in *Structured Finance International* magazine, published by Euromoney Institutional Investor. *Structured Finance International* (*SFI*) is recognized as one of the world's leading journals and news sources by the foremost market practitioners—issuers, investors, bankers, and other service providers. In particular, *SFI* provides data on the volume and nature of securitization activities, as well as accurate and transparent league tables on the global capital markets spanning Asia, the Middle East, Europe, Africa, and the Americas. This database contains detailed historical information on virtually the entire population of securitization of non-U.S. assets from January 1, 1999, through March 31, 2005.

Our sample contains information on 2,427 ABS issues (worth €363.19 billion), 3,650 MBS issues (worth €715.21 billion) and 2,504 CDO issues (worth €316.72 billion), and we refer to this as our "full sample." Because the unit of observation is a single issue (single loan tranche), multiple issues (multiple loan tranches) from the *same* transaction appear as separate observations in our database—765 ABS transactions (containing 2,427 issues), 760 MBS transactions (containing 3,650 issues), and 514 CDO transactions (containing 2,504 issues). Although it is comprehensive in many ways, our sample has two limitations for our current purposes. First, it provides detailed information on securitization transactions limited to non-U.S. assets and dated after 1998. Second, some issues may have incomplete loan characteristics, which, as a result, will reduce our sample in the univariate analysis (to answer Hypothesis 1) and in the regression analysis (to answer Hypothesis 2).

Since we wished *to compare the common pricing characteristics* associated with the main security classes and investigate to what extent the main classes of securities are priced by common factors, we selected from our sample those issues that have *comparable* pricing data expressed. This procedure has yielded a subsample of 3,467 loans (worth €548.85 billion) of which 1,102 (worth €163.90 billion) have been classified as ABS. MBS issues represent 1,783 issues (worth €320.83 billion), and 582 are CDO issues (worth €64.12 billion).[4] We refer to this set as our "*high-information sample*." Our high-information sample includes issues with four A) *default and recovery risk characteristics* (credit rating, loan to value, maturity, credit enhancement); seven B) *marketability characteristics* (size of the tranche, size of transaction, number of tranches, number of lead managers, number of credit rating agencies, whether the issue is retained or not, and finally type of interest rate), and one C) *systemic risk characteristic* (currency risk).

On average, we document a relatively high survival rate from the full sample to the high-information sample (51.6% for ABS, 53.6% for MBS, and 36.0% for CDO). This is illustrated in Panels A, B, and C of Exhibit 1. Each panel represents the characteristics of the full sample compared with the high-information sample by security class.

A comparison between the common variables in the full sample and the high-information sample in Panels A, B, and C reveals that the high-information issues are not dissimilar to their counterparts in terms of loan spread, A) *default and recovery risk* (credit rating, loan to value, maturity, credit enhancement), B) *marketability* (size of the tranche, size of transaction, number of tranches, number of lead managers, number of credit rating agencies, retained interest, type of interest rate), and finally C) *systemic characteristic* (currency risk).[5] So, we assume that any empirical results derived from the high-information samples can be generalized to the larger population including all issues.

The following section includes a discussion of these common pricing characteristics (and expected impact on primary market).

Primary Market Spread

The loan spread (primary market spread) represents the price for the risk associated with the security on the basis of information at the time of issue. In our sample, the spread is defined as the difference between the margins yielded by the security at issue above a corresponding-currency treasury benchmark with a comparable maturity. The benchmark is presented in basis points.

Expected Default and Recovery Risk Characteristics

The first set of explanatory variables affecting loan spread consists of default and recovery risk (group A). The following factors used here represent default and recovery risk characteristics: credit rating, loan to value, time to maturity, and credit enhancement. A discussion

of these variables (and their expected impact on primary market) will follow below.

The credit rating of a loan issue is an evaluation of the likelihood of a borrower defaulting on a loan. By including credit rating in our analysis, we can analyze the impact of default on a securitization issue. A better bond rating should result in lower spreads.[6] Credit rating should capture the difference in both issuers' creditworthiness and bonds' seniority and security structures. Because we needed a consistent rating classification scheme, we used the ratings scales as shown in Exhibit 2. This classification scheme consists of 21 rating scales for three rating agencies: Fitch Ratings, Moody's Investors Service, and Standard and Poor's. As part of the process, we collected the credit rating class at the time of issuance.[7]

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EXHIBIT 1

Common Pricing Characteristics of Asset Securitization Issues in the Full Sample Compared with Those in the High-Information Sample

Panel A: ABS

(1) Variable of interest	(2) ABS full sample			(3) ABS high-information sample			(4) Surv. Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Primary market spread (bp)	1,472	99.2	133.1	1,102	94.1	115.3	74.9%
Credit rating class [1–21 weak]	1,939	3.9	3.5	1,102	4.1	3.4	56.8%
Loan to value (%)	1,556	18.0%	24.1%	1,102	20.3%	25.2%	70.8%
Time to maturity (years)	2,118	11.3	9.8	1,102	13.9	9.9	52.0%
Issues with credit enhancement	2,427	7.6%	–	1,102	9.0%	–	45.4%
Loan tranche size (Euro millions)	2,417	150.3	305.1	1,102	180.1	299.1	45.6%
Transaction size (Euro millions)	765	475.1	640.1	248	657.1	740.8	32.4%
Number of tranches	765	3.2	3.1	248	5.2	3.9	32.4%
Number of lead managers	2,417	1.4	0.7	1,102	1.5	0.7	45.6%
Number of credit rating agencies	2,207	3.8	0.8	1,102	4.0	0.7	49.9%
Retained interest	2,427	4.9%	–	1,102	1.7%	–	45.4%
Loans with fixed rate	2,034	41.4%	–	1,102	22.7%	–	54.2%
Loans with floating rate	2,034	58.6%	–	1,102	77.3%	–	54.2%
Loans with currency risk	2,234	13.3%	–	1,102	14.9%	–	49.3%

Panel B: MBS

(1) Variable of interest	(2) MBS full sample			(3) MBS high-information sample			(4) Surv. Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Primary market spread (bp)	2,370	73.90	82.36	1,783	73.5	78.1	75.2%
Credit rating class [1–21 weak]	2,892	4.0	3.4	1,783	3.9	3.3	61.7%
Loan to value (%)	2,718	13.2%	21.0%	1,783	14.1%	2.2%	65.6%
Time to maturity (years)	2,619	27.5	14.6	1,783	29.3	14.1	68.0%
Issues with credit enhancement	3,169	3.6%	–	1,783	0.4%	–	56.3%
Loan tranche size (Euro millions)	3,147	209.6	394.3	1,783	217.0	335.1	56.7%
Transaction size (Euro millions)	760	800.0	731.1	382	837.2	638.4	50.3%
Number of tranches	760	5.8	3.6	382	5.8	3.8	50.3%
Number of lead managers	3,136	1.6	0.8	1,783	1.6	0.8	49.3%
Number of credit rating agencies	2,951	4.1	0.7	1,783	4.3	0.6	60.4%
Retained interest	3,169	3.6%	–	1,783	1.7%	–	56.3%
Loans with fixed rate	2,570	13.7%	–	1,783	8.4%	–	69.4%
Loans with floating rate	2,570	86.3%	–	1,783	92.6%	–	69.4%
Loans with currency risk	3,100	15.9%	–	1,783	20.7%	–	57.5%

EXHIBIT 1 *(Continued)*

Panel C: CDO

(1) Variable of interest	(2) CDO full sample			(3) CDO high-information sample			(4) Surv. Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Primary market spread (bp)	1,453	162.4	167.6	582	163.7	176.9	40.1%
Credit rating class [1–21 weak]	1,900	4.6	3.7	582	5.3	3.9	30.6%
Loan to value (%)	1,953	17.8%	21.2%	582	18.4%	20.3%	29.9%
Time to maturity (years)	1,895	15.1	18.4	582	15.9	16.0	30.7%
Issues with credit enhancement	2,504	1.0%	–	582	1.2%	–	23.2%
Loan tranche size (Euro millions)	2,490	127.2	453.4	582	100.8	476.0	23.4%
Transaction size (Euro millions)	514	616.1	1,028.6	362	837.6	638.1	70.4%
Number of tranches	514	4.9	3.1	362	6.5	2.5	70.4%
Number of lead managers	2,469	1.2	0.7	582	1.3	0.5	23.6%
Number of credit rating agencies	2,086	3.7	0.7	582	4.1	0.7	27.9%
Retained interest	2,504	4.0%	–	582	1.0%	–	23.2%
Loans with fixed rate	1,836	26.1%	–	582	13.2	–	31.7%
Loans with floating rate	1,836	73.9%	–	582	86.8%	–	31.7%
Loans with currency risk	1,248	39.8%	–	582	40.4%	–	46.6%

Column 1 represents the common pricing variables. Column 2 gives number, mean, and standard deviation associated with each common pricing variable in the full sample. Column 3 presents number, mean, and standard deviation associated with each common pricing variable in the high-information sample. Column 4 presents the survival rate for each variable. The survival rate is calculated as the number of issues in the high-information sample divided by the number of issues in the full sample.

Needing a consistent rating classification, we used a set of 15 credit-rating dummy variables that correspond to the credit rating of the issue—CR = 1, CR = 2, CR = 3, CR = 4, CR = 5, CR = 6, …, CR = 15, which correspond to the credit ratings Aaa/AAA, Aa1/AA+, Aa2/AA, Aa3/AA–, A1/A+, A2/A, …, B2/B. Credit rating classifications above B2/B (CR > 15) are not available. A word of caution is needed here, as it is important to remember that the rating scales are inverse scales, so that spread *increases* as the rating decreases.

Given our desire to control for credit protection of all positions subordinate to a loan tranche, we included the *loan-to-value* ratio (cumulative level of subordination) in our analysis. In an asset securitization transaction, the senior-subordinated structure splits cash flows into many classes of notes, with each class, or loan tranche, having absolute priority in the cash flow over the more junior classes. This structure is layered, so that each position benefits from the credit protection of all the positions subordinated to it. Typical subordination levels are expressed as a percentage of the transaction's initial principal balance.

We shall illustrate this with the following example. Using a capital structure of two tranches, Class B Junior

EXHIBIT 2
Credit Rating Scales

	Rating agency		
Value	Moody's	Standard & Poor's	Fitch
1	Aaa	AAA	AAA
2	Aa1	AA+	AA+
3	Aa2	AA	AA
4	Aa3	AA–	AA–
5	A1	A+	A+
6	A2	A	A
7	A3	A–	A–
8	Baa1	BBB+	BBB+
9	Baa2	BBB	BBB
10	Baa3	BBB–	BBB–
11	Ba1	BB+	BB+
12	Ba2	BB	BB
13	Ba3	BB–	BB–
14	B1	B+	B+
15	B2	B	B
16	B3	B–	B–
17	Caa1	CCC+	CCC+
18	Caa2	CCC+	CCC+
19	Caa3	CCC–	CCC–
20	–	CC	CC
21	–	D	D

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of €40 million and Class A Senior of €60 million, the originator might sell only the Class A tranche. The investor would bear the risk that losses on the underlying portfolio exceed the cumulative subordination level of 40% (€40 million divided by a total of €100 million). If losses reached 40%, the Class B Junior tranche would be wiped out. Between 40% and 100%, each euro loss on the underlying portfolio translates into an equal euro loss for the holder of the Class A Senior tranche.

To compute the subordination levels, we manually calculated the subordination level for each loan tranche in each transaction that contains more than one tranche. If a transaction contains one tranche only, the cumulative subordination level is 100% and no subordination exists.[8] Also, the size of all tranches in a transaction had to be available; otherwise the subordination level could not be calculated. We, finally, calculated the loan-to-value ratio as the value of a loan cumulated according to the priority structure divided by the total issue amount of the transaction. The expected coefficient sign is negative, as loans with a lower loan-to-value ratio (junior tranches) have a lower expected recovery rate in case of default than loans with a higher loan-to-value ratio (senior tranches) and therefore require a higher return.

Time to maturity is measured in years and affects the bond's default risk premium (Merton [1974]).[9] We calculated the time to maturity as the difference between the legal maturity date of the issue and the launch date.[10] Three maturity dummy variables were constructed based on the maturity of the issue: "lowmaturity," "medmaturity," and "highmaturity." *Lowmaturity* is 1 if the issue matures in less than 5 years, *medmaturity* is 1 if the issue matures between 5 and 15 years, *highmaturity* is 1 if the loan matures after 15 years. The variables' expected signs cannot be determined clearly from either the theoretical or the empirical literature.[11]

In our sample, issues with *credit enhancement* refer to issues with a third-party guarantee in the form of an insurance policy issued by one of the monoline insurance companies. Dummy variables take the value of 1 if a loan is guaranteed and zero otherwise. These providers guarantee (or wrap) the principal and interest payments of an issue. For each issue, we collected information whether or not the issue is guaranteed. According to Fabozzi and Roever [2003], for each class of securities in a given structure, the issuer evaluates the trade-off associated with the cost of enhancement versus the reduction in yield required to sell the security. Thus, a negative coefficient is expected.

Expected Marketability Characteristics

The second set of explanatory variables affecting loan spread is marketability of the loan (group B). The following factors used here represent marketability: *loan size, transaction size, number of tranches, number of lead managers, number of credit rating agencies, whether or not the issue is retained, and finally type of interest rate*.

The *loan size* is the natural log of the face value of the loan tranche.[12] A higher issue amount is generally believed to improve, ceteris paribus, secondary market liquidity. Larger issues are likely to be associated with less uncertainty, to be more liquid, and to have more public information available about them than smaller offerings. Hence, we would expect larger issues to have lower spreads. Thus, we would also expect to find a negative impact of *transaction size* (the natural log of the transaction issue euro-equivalent amount) on the spread.[13]

Each transaction is divided into one or more tranches. For every issue in a given transaction, we documented the *number of tranches* for each transaction. We included number of tranches to analyze the impact of tranching on the spread. Tranching could allow the issuer to take advantage of market factors such as greater investor sophistication and heterogeneous screening skills related to asymmetric information. Thus, a negative coefficient of number of tranches is expected.[14]

The *number of lead managers* represents the number of financial institutions participating in the loan issuance management group. These include the lead manager, any co-lead manager, book runners and co-managers. We collected this information in order to analyze any differences in syndicate. A negative coefficient sign is expected, as this would indicate that a larger syndicate is able to achieve, ceteris paribus, a better result or lower loan spread.

The *number of rating agencies* represents the number of rating agencies involved in rating the issue. Since many larger credit rating agencies offer credit rating advisory services, this could create a potential conflict of interest, as the credit rating agency may feel obligated to provide the issuer with that given rating if the issuer follows its advice on structuring the offering (The Bond

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Market Association [2002]). Many institutional investors now prefer a debt issuance to have at least three ratings. Thus, a negative coefficient sign is expected, as this would indicate that a larger number of credit rating agencies involved in rating the issue is able to achieve, *ceteris paribus*, a more accurate rating, thereby reducing the potential conflict of interest and lowering the loan spread.

The *retained subordinated interest* is a beneficial interest in a securitization transaction set up by the originator. It absorbs the first losses on the whole loan and is inferior or in secondary position with regard to collection in the event of default (Childs, Ott and Riddiough [1996]). In theory, it should make no difference whether or not the junior tranche is retained by the originator, as it shouldn't affect the probability of loss. However, the interest retained by the originator may signal a good quality associated with the underlying assets, leading to "investor comfort." Nevertheless, no clear theoretical *a priori* conclusion can be drawn as far as the expected coefficient sign of this variable is concerned. Other elements remaining equal, a negative sign would indicate that the originator is able to translate original ownership through a lower spread. On the other hand, a positive coefficient would indicate that the issue retained by the originator is related to an increase in spread.

We included *type of interest rate* to analyze the impact of fixed and floating interest rates on the spread. We collected information on whether the issue had a rate fixed for the life of the issue or whether it had an interest rate that fluctuated depending on the base interest rate (floating rate issue). We constructed two dummy variables based on the type of interest rate. *Fixed* is a dummy variable taking the value of 1 if a loan is fixed price and zero otherwise. *Floating* is a dummy variable taking the value of 1 if a loan is floating price and zero otherwise. Because the interest rate on a fixed-rate issue does not change during the life of the loan, these notes do not fluctuate and are typically protected to avoid the risk of rising interest rates. We expect borrowers to raise funds at a higher spread through fixed-priced issues than through floating-priced issues. For this reason, a positive sign is expected for a fixed-rate issue. Floating is the omitted category. However, statistical significance could be poor as the risk inherent to rising interest rates is already reflected in the rating of the loan issue.

Expected Systemic Characteristics

Systemic risk should control for the risk presented by a country where the assets are located and to pierce the local currency of a specific country that is not already incorporated into an issue rating. *Currency risk* is defined as the risk that is run if the currency in which the loan is repaid differs from the borrower's home country currency. The dummy variable takes the value of 1 if a loan is exposed to currency risk and zero otherwise. We should expect issues exposed to currency risk to have higher spreads than issues not exposed to currency risk.

All independent variables are discrete, with the exception of loan to value, maturity, loan tranche size, and transaction size, all of which are continuous. The univariate analysis is presented in the next section.

UNIVARIATE ANALYSIS

This section investigates how common pricing factors compare for the main classes of securities. The purpose is to provide extensive insight into the common pricing characteristics associated with these classes and to elaborate on any substantial differences between them. We hypothesize that the common pricing factors differ significantly in value between the main classes of securities. We used a parametric test (Student's *t*-test) to compare whether the distribution of the values reported for the security classes are significantly different and thus whether the common pricing factors do in fact significantly differ in value between them.

The numbers in Panel C of Exhibit 3 are *t*-statistics, and almost all of the pair-wise comparisons indicate statistically significant differences between the common pricing variables associated with the security classes ABS, MBS, and CDO. These differences may explain why the capital market distinguishes between these classes of securities. Below, we shall discuss the main findings included in Exhibit 3.[15]

The relative pricing of asset securitization issues shows that average (median) *spreads* are statistically and significantly lower for MBS, with 73.9 bps (45.0 bps) than they are for ABS, with 99.2 bps (50.0 bps), and CDOs, with 162.4 bps (95.0 bps). Furthermore, CDOs are more than twice as likely to have *currency risk* involved as are MBS (39.8% versus 15.9%), and more than three times as likely as ABS (39.8% versus 13.3%).

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This finding suggests that CDOs more frequently contain a mismatch between the originators' home country currencies and the currency of loan repayment. One obvious interpretation is that the collateral of CDOs is more diverse, as compared with the underlying assets related to ABS and MBS, and is frequently originated in multiple countries.

MBS and ABS, on average, tend to be less risky than their CDO counterparts. This is also confirmed by the *credit rating class*. Since credit rating and spread tend to have an inverse relationship, it is obvious that the average credit rating class for MBS (4.0) and for ABS (3.9) is significantly lower than the credit rating for CDOs (4.6). Most observers would have predicted that MBS loans have lower spreads, because loan repayment is frequently backed by large amounts of commercial or residential properties that are relatively liquid and make the issue less risky. CDO collaterals, however, consist of bonds, loans, or similar assets, and are considered to be relatively illiquid. Additionally, if we compare the average spread exhibited by ABS, MBS, and CDOs in our study with the average spread exhibited by all syndicated loans in the study by Kleimeier and Megginson [2001], we notice that ABS (99.2 bps) and MBS (73.9 bps) have a lower average spread in comparison with the spread for all syndicated loans (134 bps).[16] CDOs (162.4 bps) have a higher

EXHIBIT 3
Univariate Statistics—Pricing Features Associated with the Main Security Classes Compared

Panel A: Univariate analysis—continuous variables

(1) Variable of interest		(2) Security class		
		ABS	MBS	CDO
Primary market spread (bp)				
	Number	1,472	2,370	1,453
	Mean	99.2	73.90	162.4
	Median	50.0	45.0	95.0
	Min.	–55	–5	–2
	Max.	1,400.0	700.00	875.0
	Std.dev.	133.1	82.36	167.6
Credit rating class [1–21 weak]				
	Number	1,939	2,892	1,900
	Mean	3.9	4.0	4.6
	Median	1.0	3.0	3.0
	Min.	1.0	1.0	1.0
	Max.	16.0	15.0	16.0
	Std.dev.	3.5	3.4	3.7
Loan to value (%)				
	Number	1,556	2,718	1,953
	Mean	18.0%	13.2%	17.8%
	Median	6.7%	4.0%	10.0%
	Min.	0.0%	0.0%	0.0%
	Max.	97.3%	99.9%	100.0%
	Std.dev.	24.1%	21.0%	21.2%
Time to maturity (years)				
	Number	2,118	2,619	1,895
	Mean	11.3	27.5	15.1
	Median	7.2	31.0	9.1
	Min.	0.04	0.90	0.05
	Max.	61.0	90.1	99.1
	Std.dev.	9.8	14.6	18.4
Loan tranche size (Euro millions)				
	Number	2,417	3,147	2,490
	Mean	150.3	209.6	127.2
	Median	40.5	48.2	25.0
	Min.	0.07	0.01	0.10
	Max.	6,413.7	4,750.0	10,812.0
	Std.dev.	305.1	394.3	453.4

EXHIBIT 3 *(Continued)*

(1) Variable of interest		(2) Security class		
		ABS	MBS	CDO
Transaction size (Euro millions)				
	Number	765	760	514
	Mean	475.1	800.0	616.1
	Median	331.4	600.5	358.8
	Min.	0.0	2.3	0.0
	Max.	7,307.0	6,637.2	10,812.4
	Std.dev.	640.1	731.1	1,028.6
Number of tranches				
	Number	765	760	514
	Mean	3.2	5.8	4.9
	Median	2.0	5.0	5.0
	Min.	1.0	1.0	1.0
	Max.	21.0	19.0	28.0
	Std.dev.	3.1	3.6	3.1
Number of lead managers				
	Number	2,417	3,136	2,469
	Mean	1.4	1.6	1.2
	Median	1.0	1.0	1.0
	Min.	1.0	1.0	1.0
	Max.	5.0	7.0	8.0
	Std.dev.	0.7	0.8	0.7
Number of credit rating agencies				
	Number	2,207	2,951	2,086
	Mean	3.8	4.1	3.7
	Median	3.0	4.0	3.0
	Min.	1.0	2.0	2.0
	Max.	6.0	6.0	6.0
	Std.dev.	0.8	0.7	0.7

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EXHIBIT 3 *(Continued)*

Panel B: Univariate analysis—dummy variables

(1) Variable of interest	(2) Security class		
	ABS	MBS	CDO
Credit enhancement			
N. of issues for which data are available	2,427	3,169	2,504
N. of issues for which dummy = 1	185	19	25
% of total available data	7.6%	0.6%	1.0%
Retained issue			
N. of issues for which data are available	2,427	3,169	2,504
N. of issues for which dummy = 1	119	114	99
% of total available data	4.9%	3.6%	4.0%
Fixed rate issue			
N. of issues for which data are available	2,034	2,570	1,836
N. of issues for which dummy = 1	843	351	479
% of total available data	41.4%	13.7%	26.1%
Currency risk			
N. of issues for which data are available	2,234	3,100	1,248
N. of issues for which dummy = 1	298	493	497
% of total available data	13.3%	15.9%	39.8%

Panel C: Two-sample *t*-tests assuming unequal variances

(1) Variable of interest	(2) Security class		
	ABS versus MBS	ABS versus CDO	MBS versus CDO
Primary market spread (bp)	6.56	–11.27	–18.78
Credit rating class [1–21 weak]	–1.43#	–6.17	–5.41
Loan to value (%)	6.55	0.43#	–7.16
Time to maturity (years)	–45.33	–7.99	24.29
Credit enhancement (0/1)	–12.60	11.54	–1.65#
Loan tranche size (Euro millions)	–6.31	2.13	7.17
Transaction size (Euro millions)	–5.37	–1.58#	2.49
Number of tranches	42.30	–9.52	–10.81
Number of lead managers	–6.80	11.20	17.79
Number of credit rating agencies	–17.25	–6.11	22.41
Retained interest (0/1)	2.38	1.62#	–0.69#
Fixed rate issue (0/1)	21.61	10.25	–10.11
Currency risk (0/1)	–2.63	–16.96	–15.59

Panel A provides a univariate analysis for the full sample of asset securitization issues categorized by security class (continuous variables). Column 1 represents the common pricing variables. Column 2 presents the values associated with each variable.

Panel B provides a univariate analysis for the full sample of asset securitization issues categorized by security class (dummy variables). Column 1 represents the common pricing variables. Column 2 presents the values associated with each variable.

Panel C presents significance tests for the differences in values between security classes. # indicates that the common pricing variables do not differ significantly between the two security classes at the 5% significance level. All other common pricing values are statistically and significantly different at the 5% level or higher.

average spread in comparison with the average of all syndicated loans, and reflect higher perceived risk. On the one hand, spread level and credit rating class provide direct evidence of the riskiness of an asset securitization issue, but on the other hand, the number of rating agencies and the number of managers involved also provide (indirect) evidence of the riskiness of the loan—or at least an indication of the difficulty of underwriting the issue. The average number (median) of participating lead managers for MBS is 1.6 (1) and is significantly larger than the average of 1.4 (1) for ABS and 1.2 (1) for CDOs. CDOs have the lowest average number of

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arranging banks, which could be explained by the fact that a number of CDOs exclusively involve their own active asset managers with the purpose of managing the underlying portfolio.[17] The need for a higher number of arranging banks would thus be lower.

MBS have an average of 4.1 (median 4.0) rating agencies involved, which is significantly higher than the 3.8 (3.0) agencies for ABS and 3.7 (3.0) agencies for CDOs. It is difficult to explain why MBS issues have such a relatively high number of agencies involved, since these account for a large share of the capital markets (Nomura [2006]). One possible explanation could be the prepayment risk related to the underlying collateral. Because of this risk, MBS issues tend to be more difficult to rate, and more rating agencies need to be involved to convince investors to participate in an MBS.

The MBS class exhibits the largest average (median) transaction size of €800.0 million (€600.5 million) followed by CDO and ABS with an average (median) transaction size of €616.1 million (€358.8 million) and €475.1 million (€331.4 million) respectively. The cumulative subordination level in each transaction is layered, so that each position benefits from the credit protection of all the positions subordinated to it. We found that ABS has the highest average (median) loan-to-value level with 18.0% (6.7%), followed by CDO with 17.8% (10.0%), and MBS with 13.2% (4.0%). Additionally, we found that the average of the cumulative subordination level is higher compared with the median across all classes. This could mean that tranching (splitting cash flows into separate loan tranches) is more extensive at the senior level of a securitization structure.

MBS exhibit the largest average (median) loan tranche size, amounting to €209.6 million (€48.2 million)—an average €82.4 million more than the average tranche size exhibited by CDOs and €59.3 million more than the average loan tranche size exhibited by ABS. All are significantly different. Average MBS tranche size, however, is relatively large, similar in size to an average loan tranche of all syndicated credits. Kleimeier and Megginson [2001] report that all syndicated loans have an average (median) tranche size of $203 million ($70 million). Because ABS and CDOs report an average (median) tranche size of €150.3 (€40.5 million) and €127.2 (€25.0 million) respectively, these tranche sizes tend to be substantially smaller than the average of all syndicated credits. This is reinforced by the observation that in a typical securitization transaction more classes of tranches are issued. They participate differently in the asset cash flows and thus reduce the size of each loan tranche. In a typical ABS transaction, for example, the average *number* (median) *of tranches per transaction* is 3.2 (2.0), which is higher than the average number of 1.7 tranches for all syndicated credits. Closer analysis reveals that the assets underlying an asset securitization transaction may benefit from tranching to a larger degree, because of the screening ability inherent to a more homogeneous asset pool (DeMarzo [2005]); the more information-sensitive (regarding screening ability) the underlying assets are, the greater the benefits become (see Riddiough [1997]).

An MBS tranche of average size matures just over 27.5 years, which is a long period if we compare this with the average 11.3 and 15.1 years for ABS and CDOs, respectively. Still, the asset securitization issues, as indicated by the standard deviation, exhibit significant heterogeneity with respect to maturity. For example, average standard deviation for maturity of MBS is 14.6 years; for ABS, this is 9.8 years, and for CDOs, the standard deviation reports 18.4 years. Mortgages in general are considered to have a long maturity. For instance, the most common type of residential mortgage loan is a 30-year loan. The difference can be explained by the fact that certain types of assets underlying an asset securitization structure lend themselves more easily for issues with longer maturity levels. In general, the payoff profile of the underlying assets is closely related to the maturity of the issues.

Finally, ABS are almost four times more likely to be fixed-rate credits than MBS (41.4% versus 13.7%) and almost twice as likely to be fixed-rate credits compared to CDOs (41.4% versus 26.1%). Locking in a specific rate, in general, eliminates a major source of cash flow uncertainty. In particular, one would expect MBS to have a relatively higher percentage of fixed-rate issues because MBS report the highest average maturity (27.5 years) and the issuance of fixed-rate securities would eliminate a major source of cash flow uncertainty inherent to a longer maturity. Nevertheless, floating-rate issues tend to offer more flexibility due to the prepayment option in most mortgage loans: Mortgage loan borrowers generally have the right to prepay their loans at any time without penalty. For example, when interest rates increase, mortgage loan borrowers may be given an incentive to prepay their loan. The originator is able to use these loan repayments to redeem the principal of

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the outstanding securities, thereby eliminating a major source of cash flow uncertainty. As a result, the need is reduced to issue fixed-rate securities in the first place.

Before proceeding to the next section, in which we analyze the impact of the common pricing features on primary market spread by security class, we should briefly summarize the results of our univariate comparison. This section investigates how common pricing factors compare for the main classes of securities. The purpose is to provide insight into the common pricing characteristics associated with these classes and to elaborate on any substantial differences between them. We found that most of the common pricing characteristics between ABS, MBS, and CDOs in fact differ significantly, and therefore we accept the hypothesis that states that the common pricing factors among the main classes of securities do differ significantly in value.[18] Taking the classes as a whole, we have documented that the assets attached as collateral for the securities differ between security classes, but that there are also important univariate differences to consider. We documented, for example, that:

1. ABS and MBS on average tend to be less risky than their CDO counterparts. Both MBS and ABS have a significantly lower spread, a significantly higher credit rating, and a significantly lower currency risk in comparison with CDOs;
2. MBS are far more likely to be floating-rate rather than fixed-rate credits than are ABS and CDOs;
3. MBS show a significantly larger transaction size than ABS and CDOs;
4. MBS have significantly longer maturity levels than ABS and CDOs.

The payoff profile of the mortgages lends itself more easily to issues with longer maturity, and therefore MBS report almost twice the average maturity in comparison with ABS and CDOs. In addition, we also found support for the assumption that assets underlying an asset securitization transaction may benefit from tranching to a larger degree in comparison with all syndicated credits. This could be explained by the screening ability inherent to a more homogeneous asset pool. Nevertheless, this result merits future study. Overall, our results indicate that the common pricing characteristics differ significantly in value between the main security classes, and therefore we would expect the impact on pricing to be security-specific. A natural follow-up of this study would be an investigation into the *extent* to which the main security classes are priced by common factors.

REGRESSION ANALYSIS

This section investigates to what extent the main classes of securities are priced by common factors. Its purpose is to analyze the impact of the common pricing features on primary market spread by security class. We hypothesized that the primary market spreads associated with the main security classes are influenced differently by common pricing factors. To test Hypothesis 2, we analyzed the Chow statistics, which we shall briefly explain in four steps. First, one ordinary least squares regression was run on the common pricing variables (independent variables) and the primary market spread (dependent variable), under the assumption that all security classes have the same explanatory variables. We adjusted for heteroscedasticity using the methodology proposed by White [1980].[19] Second, coefficients from separate regressions were obtained for each security class, and thus we ran three regressions: one for ABS, one for MBS, and one for CDOs. Three, based on the residual sum of changes of each regression, an F-test of structural change could then be computed (also called a Chow test). In step four, Hypothesis 2 was to be rejected if the computed F value remained smaller than its critical level, and it was to be accepted if the F value exceeded the critical level. Should Hypothesis 2 be rejected, then only one regression will be run to determine the impact of the pricing variables on the primary market spread. Should Hypothesis 2 be accepted, we shall examine the relationship between the pricing variables and the spread for each security class separately for comparison.

The specification of the initial model is:

$$\begin{aligned} SPREAD_i = {} & \alpha + \beta_1\ CREDIT\ RATING_i + \beta_2 \\ & LOAN\ TO\ VALUE_i + \beta_3\ MATURITY_i \\ & + \beta_4\ ENHANCEMENT_i + \beta_5 \\ & LOAN\ SIZE_i + \beta_6\ TRANSACTION \\ & SIZE_i + \beta_7\ \#\ TRANCHES_i + \beta_8\ \# \\ & LEAD\ MANAGERS_i + \beta_9\ \#\ RATING \\ & AGENCIES_i + \beta_{10}\ RETAINED_i \\ & + \beta_{11}\ TYPE\ INTEREST\ RATE_i + \beta_{12} \\ & CURRENCY\ RISK_i + \beta_{13}\ YEAR\ OF \\ & ISSUE_i + \beta_{14}\ CURRENCY_i + \varepsilon_i \end{aligned} \quad (1)$$

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The following control variables have been included as additional independent variables in the regressions.

CURRENCY dummies are included because loan issues in our sample are denominated in several currencies: British pound, U.S. dollar, euro, Japanese yen, and Australian dollar. Each dummy variable is 1 if the loan issue is denominated in the corresponding currency and zero otherwise. These variables should capture two aspects: one, the different degrees of credit standing and liquidity of the different national treasury securities, and two, investors' currency preferences.

YEAR OF ISSUE: An increase in marketability over time would increase an issue's liquidity. Thus, market deepening would imply a narrowing of spreads over time. We constructed seven dummy variables based on the year of the issue: YEAR = 1, YEAR = 2, YEAR = 3, YEAR = 4, YEAR = 5, YEAR = 6 and YEAR = 7, which correspond to 1999, 2000, 2001, 2002, 2003, 2004, 2005. Their value is 1 if the loan was issued in the corresponding year, zero if not.

Chow Test

We used a Chow test to investigate whether the primary market spreads associated with the main security classes are influenced differently by common pricing factors. The Chow test is a particular test for structural change, also defined as an econometric test, to determine whether the coefficients in a regression model are the same in separate subsamples. Exhibit 4 shows to what extent the main classes of securities are priced by common factors.

Hypothesis 2 can be rejected when the computed F value remains smaller than its critical level and will be accepted when the F value exceeds the critical value. The Chow test statistics in Exhibit 4 are all higher than the critical levels, so we must accept Hypothesis 2. Thus, the primary market spreads associated with the main security classes are influenced differently by common pricing factors.[20] Following our analysis, we may conclude here that our results confirm current market views: namely, that ABS, MBS, and CDOs are distinct financial instruments.

In the following section, we discuss the relationship between pricing variables and primary market spread for each security class separately for comparison.

Regression Results

In this subsection, we examine the determinants of primary market spreads using an ordinary least squares regression framework, with spread as the dependent variable and the common pricing factors as the independent variables. Initial regression results of the three models are reported in Exhibit 5. F-statistics on whether coefficients are jointly different from zero as well as adjusted R^2 are reported at the bottom of the exhibit.

Overall, the model performs relatively well. The adjusted R^2 is just over 0.76 for our ABS sample, 0.82 for MBS, and 0.82 for the CDO sample. This indicates that the model explains a significant proportion of the spread over the sample period.

Exhibit 5 shows that almost all RATING dummies (2–13) are statistically significant, most frequently at the 1% level. The pattern of most credit rating dummy variables indicates that spreads rise when ratings worsen. These results are as predicted and make intuitive sense. However, the impact of a typical credit rating on the spread differs substantially from security class to security class. For example, the average spread increase for CDOs relative to MBS is substantially lower across the higher rating categories (2, 3, and 4), and dramatically higher across the lower rating categories (5–13) in Regressions 2 and 3. One interpretation of this finding is that CDOs may be more exposed to higher levels of distressed assets, dramatically increasing the risk from the higher to the lower rating categories. Overall, almost all rating dummies are statistically significant with the expected sign but do not report very similar coefficients for the three subsamples. Clearly, credit rating does not provide an unbiased estimate to determine spreads. The lesson to be learned here is that it remains extremely difficult to compare credit ratings and the associated additional premiums for the different security classes. For instance, regression analysis shows that an average CDO that has been rated Aa2 has its premium lying 22.98 bps higher than a similar issue rated AAA, while an average ABS rated Aa2 has its premium lying 38.57 bps higher. In fact, it turns out that these differences become bigger as credit ratings deteriorate.

We included two types of credit enhancement in our regression analysis: *external* provided by one of the monocline insurance companies and *internal* through a retained interest by the originator. The credit enhancement dummy variable is significant and positive for MBS

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EXHIBIT 4
Chow Test for Differences in Pricing Factor Coefficients

	ABS	MBS	CDO
ABS	–	–	–
MBS	8.21	–	–
CDO	10.48	29.51	–

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issues only, which is a highly surprising result. Apparently, investors associate an additional risk premium with MBS if the transaction includes credit enhancement, as opposed to similar issues without enhancement. While finding a consistently insignificant, negative relationship between the RETAINED dummy variable and the spread is not surprising, the dispersion in coefficient values definitely is. CDOs exhibit the highest spread differentials as a result of this guarantee. We found that CDOs are the most sensitive to the retained dummy variable, reducing the spread by an average of 104 bps, be it insignificant. ABS and MBS both report small and insignificant values. One interpretation is that CDOs take advantage of the yield differential between the assets in a CDO portfolio and the cost of funding the CDO. These structures typically use a much wider range of collateral in comparison with ABS and MBS, including, for example, a combination of leveraged loans, high-yield bonds, and investment-grade corporate bonds. Because these assets are often already in default or are traded at prices that are considered distressed levels (particularly in the past couple of years), the increased market volatility of these assets produces structures with greater credit enhancement potential for the long-term investor. As a result, the impact of credit enhancement on the primary market spread tends to be higher for CDOs than for ABS and MBS, after controlling for credit rating. In other words, CDOs should benefit to a larger degree from the additional credit enhancement, because of the riskiness of the underlying assets.

LOAN SIZE behaves differently in our samples. Whereas loan spread and loan size are significantly and positively related for ABS issues, they have an insignificant negative relationship for CDO issues and an insignificant positive relationship for MBS issues. This result could explain why large and small MBS issues are close substitutes. However, for ABS, this evidence may support illiquidity in the form of a downward-sloping demand curve. The negative relationship between loan size and spread for CDOs means that, on average, larger issues are associated with a price discount. These findings also merit greater in-depth analysis than we can provide here, considering the fact that ABS and CDOs exhibit a wide variety of assets attached as collateral for the security. Nevertheless, these results are still surprising.

TRANSACTION SIZE has a significantly negative relationship with spreads for ABS and MBS regressions at the 1% level, and an insignificant positive relationship for CDOs. One could interpret a significant negative relationship between transaction size and spread as evidence of a positive price liquidity effect related to the size of the entire issue.

TRANCHES (the number of tranches) has an insignificant relationship with spread across MBS and CDO, but is significant for ABS. Thus, we did not find any support that allows the issuers to exploit market factors to their advantage via tranching for MBS and CDO; or at least no advantage exists that would include a lower spread differential. The significant and positive spread for ABS poses a puzzle: Investors associate more tranches with an increase in spread. It may be argued that tranches have a positive relationship with default so that an originator would benefit from more tranches in the transaction, especially in the situation of a higher degree of information asymmetry between originator and investors concerning underlying collateral. Thus, investors could associate an increase in the number of tranches with an additional increase in risk, something for which they would require an extra premium. This is an important result that merits more detailed research.

The dummy variables # LEAD MANAGERS and # RATING AGENCIES behave differently for ABS and MBS than for CDO. Whereas spread and number of lead managers are insignificantly and *negatively* related for ABS and significantly for MBS, they have an insignificant *positive* relationship for CDOs. While a clear interpretation of these contrasting results is difficult to provide, one explanation could be found in the difference between the evaluation criteria used by investors and capital markets for CDOs in comparison with ABS and MBS. CDOs exclusively have their own active asset managers involved with the purpose of managing the underlying portfolio, whereas CDOs on average are exposed to higher risk and may be more subject to temporary imbalances between cash inflows and outflows. The need for a higher number of banks in arranging

EXHIBIT 5

Determinants of Asset Securitization Issues—ABS, MBS, and CDO Compared

Variable	ABS issues Reg. #1	MBS issues Reg. #2	CDO issues Reg. #3
CONSTANT	124.92*	139.11*	143.66
	(2.81)	(5.65)	(1.26)
RATING = 2	18.69**	18.62*	7.36
	(2.14)	(4.78)	(0.59)
RATING = 3	38.57*	29.71*	22.98**
	(5.52)	(8.83)	(2.31)
RATING = 4	38.59*	38.98*	33.54
	(3.29)	(10.73)	(1.65)
RATING = 5	58.34*	45.54*	70.70*
	(5.69)	(10.02)	(4.56)
RATING = 6	69.34*	52.75*	64.48*
	(10.64)	(15.28)	(5.06)
RATING = 7	117.32*	73.12*	89.30*
	(6.87)	(3.09)	(6.48)
RATING = 8	153.00*	118.64*	157.39*
	(4.57)	(8.62)	(7.09)
RATING = 9	178.32*	126.05*	167.77*
	(20.07)	(28.56)	(11.17)
RATING = 10	202.52*	132.78*	222.44*
	(11.02)	(9.47)	(8.52)
RATING = 11	479.67*	327.74*	481.29*
	(8.59)	(6.60)	(8.77)
RATING = 12	427.23*	386.05*	429.15*
	(12.94)	(24.42)	(15.16)
RATING = 13	429.53*	437.06*	552.07*
	(4.05)	(107.03)	(23.03)
LOAN TO VALUE	4.69	–3.71	23.08
	(0.66)	(–1.32)	(1.21)
LOWMATURITY	–4.44	–6.47	–38.29**
	(–0.52)	(–1.28)	(–2.50)
HIGHMATURITY	6.73	–5.02**	0.03
	(1.34)	(–2.00)	(0.01)
ENHANCEMENT	–5.79	47.07*	–16.98
	(–0.98)	(5.98)	(–1.13)
LOAN SIZE	21.51*	5.79	–17.93
	(3.69)	(2.51)	(–1.62)
TRANSACTION SIZE	–29.38*	–16.29*	1.33
	(–3.73)	(–5.21)	(0.10)
# TRANCHES	2.79*	0.26	1.88
	(3.75)	(0.92)	(1.23)
# LEAD MANAGERS	–2.39	–3.79*	7.00
	(–0.86)	(–3.55)	(0.91)
# RATING AGENCIES	–0.57	2.26	–11.69**
	(–0.16)	(1.58)	(–2.16)

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EXHIBIT 5 *(Continued)*

Variable	ABS issues Reg. #1	MBS issues Reg. #2	CDO issues Reg. #3
FIXED	52.69*	24.80*	14.32
	(8.08)	(5.20)	(1.25)
RETAINED	5.67	–10.19	–103.88
	(0.39)	(–1.39)	(–1.29)
CURRENCY RISK	34.03*	11.20*	15.00**
	(3.19)	(3.57)	(2.17)
Number of observations	1,102	1,783	582
Adjusted R^2	0.76	0.82	0.82
F	107.52	239.10	82.48

The dependent variable is defined as the difference between the margins yielded by the security at issue above a corresponding currency-benchmark with a comparable maturity in basis points. The independent variables are as follows: set of thirteen credit-rating dummy variables: CR=1, CR=2, CR=3, CR=4, CR = 5, CR = 6, .., CR = 13, correspond to credit rating: Aaa/AAA, Aa1/AA+, Aa2/AA, Aa3/AA–, A1/A+, A2/A, …, Ba3/BB–; LOAN TO VALUE is the subordination level expressed as a percentage of the transaction's initial principal balance; LOWMATURITY is 1 if the issue matures in less than 5 years; HIGHMATURITY is 1 if the loan matures after 15 years; ENHANCEMENT as dummy variable takes the value of 1 if the issue has a third-party guarantee in the form of an insurance policy issued by one of the monoline insurance companies; LOAN SIZE is the natural log of the issue amount in millions of euros; TRANSACTION SIZE is the natural log of the size of the transaction in euro millions; # TRANCHES is the number of tranches per transaction; # LEAD MANAGERS is the number of managers representing the number of financial institutions participating in the loan issuance management group; # RATING AGENCIES is the number of rating agencies involved in rating the loan at the time of issuance; FIXED has a dummy of 1 if the loan issue has a rate that is fixed for the life of the loan, zero if the loan has an interest rate that fluctuates depending on the base interest rate (floating rate issue); RETAINED is the retained subordinated interest as a beneficial interest in a securitization transaction by the originator; CURRENCY RISK is a dummy variable that takes the value of 1 if currency risk occurs. The exhibit shows the coefficient and t-statistic, corrected for heteroscedasticity, in parentheses. All dummy variables are zero otherwise; CURRENCY dummy variables and YEAR dummy variables are included but not reported in the exhibit.

** Significant at the 1% level.*

*** Significant at the 5%.*

**** Significant at the 10% level.*

a CDO would be smaller (see Exhibit 3), with investors possibly associating an increase in the number of banks involved in a CDO with increased risk—and extra premium to boot. Nevertheless, results for CDOs have proven to be insignificant.

However, particularly in the case of CDOs, a potential conflict of interest between asset managers and investors could arise. As a result, the number of credit rating agencies involved in rating CDOs would be able to achieve, *ceteris paribus*, a more accurate rating, thereby reducing the potential conflict of interest and lowering the spread. This is true in our analysis, as the coefficient value for the number of credit rating agencies indicates that booking a loan tranche with one additional credit rating agency involved decreases average spread by 11.7 for CDOs. The average ABS and MBS coefficient is not significant.

The LOWMATURITY dummy showed a significant, negative relationship with spread for CDOs, while we found a negative and insignificant relationship for ABS and MBS. No other security category has anything near this sensitivity to short-term debt. This finding suggests that CDOs with a maturity of less than 5 years reduce the spread significantly, with 38.3 bps, in comparison with an issue with a maturity between 5 to 15 years. Since, on average, collateral of CDOs is considered more risky, lenders could prefer short-term debt to control for the increased collateral volatility, thereby demanding a lower premium than what was implied in the credit rating of the particular issue.

HIGHMATURITY has an insignificant, positive relationship with spread for ABS issues, a negative, significant relationship for MBS, and is insignificant for CDOs. One obvious interpretation is that investors in MBS demand a lower premium for issues with a

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maturity longer than 15 years as compared to ABS and CDOs. Thus, long-tenor MBS are less expensive. This finding also merits greater in-depth analysis into the nature of the assets than we can provide here.

Of the remaining variables, the LOAN TO VALUE is insignificant and negative for MBS and insignificant and positive for ABS and CDOs. The expected coefficient sign of loan to value is negative, as loans with a lower loan-to-value ratio (lower tranches) have a lower expected recovery rate in case of default than loans with a higher loan-to-value ratio (higher tranches) and therefore require a higher return. Although CDOs present insignificant results, they do demonstrate the largest coefficient compared with ABS and MBS. Apparently, investors associate an increase in the loan-to-value ratio with an additional risk premium for CDOs. However, statistical significance across security classes is poor, as loan to value is most likely already reflected in the rating of a loan issue.

The CURRENCY RISK dummy has a significant, positive relationship with the spread for ABS, MBS, and CDOs after controlling for credit rating. This finding suggests that issues exposed to currency risk have higher spreads than other issues not exposed to currency risk, higher by 34 bps for ABS, 11 bps for MBS, and by up to 15 bps for CDOs.

FIXED has a strong positive relationship with spread for ABS and MBS and an insignificant relationship for CDO. This result can easily be explained since the interest rates on these notes do not fluctuate and the notes are typically protected to avoid the risk of rising interest rates. This indicates that ABS and MBS borrowers on average have to pay an extra risk premium through fixed-price issues in comparison with floating-price issues—by almost 53 bps for ABS and 25 bps for MBS.

The insignificant relationship for CDOs may be explained in two ways. First, it could result from the fact that CDOs are especially attractive for fixed-income investors who want diversified high-yield bonds without any interest sensitivity. Second, the performance of a typical CDO, in comparison with ABS and MBS, depends to a greater degree on its manager's trading ability. Therefore, fixed-rate investors prefer to hold a fixed-rate bond with no interest rate sensitivity, because the market value of the security is driven solely by collateral performance.

Regression Results: Conclusions

Previous subsections investigated the extent to which the main classes of securities are priced by common factors. Our purpose was to analyze the impact of common pricing features on primary market spread by security class. We saw that all Chow test statistics were higher than the critical levels, and therefore we accepted the hypothesis that the primary market spreads associated with the main security classes are influenced differently by common pricing factors. The regression analyses we performed suggest that ABS, MBS, and CDOs are in fact different instruments, as implied by the differences in impact of the pricing factors on the loan spread between these security classes.

Applying the same pricing estimation model to each security class revealed that the common pricing characteristics associated with these classes have a different impact on the primary market spread exhibited by the value of the coefficients. We documented, for example, that:

1. the impact of a typical credit rating on the spread differs substantially from security class to security class, and these differences become bigger as credit ratings deteriorate;
2. credit rating does not provide an unbiased estimate in the determination of spreads;
3. CDOs tend to be more exposed to higher levels of distressed assets, thereby dramatically increasing risk from the higher to the lower rating categories;
4. lenders demand lower spreads for MBS with a longer maturity as compared to ABS and CDOs;
5. CDOs are much more sensitive to third-party guarantees in comparison with ABS and MBS;
6. lenders tend to offer a higher discount for short-term CDOs in comparison with short-term ABS and MBS, after controlling for credit rating.

A major contribution of our research lies in the fact that the existence of substantial differences between security classes in the impact of common pricing variables on the spread could indicate that these securities are priced differently. Investment banks in charge of structuring the technical features of certain issues may find the estimates a useful tool concerning the size of each variable's impact on the issuance spread by security class.

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CONCLUSION

Choudhry and Fabozzi [2004] mention that the capital market in which the securities are issued and traded is composed of three main, distinct categories: ABS, MBS, and CDOs. Due to differences in assets related to these securities, the relevant pricing factors for these securities should differ, too. We were able to examine a total of 3,467 loans (worth €548.85 billion) of which 1,102 (worth €163.90 billion) were classified as ABS. MBS issues represent 1,783 issues (worth €320.83 billion), and 582 are CDO issues (worth €64.12 billion).

We have investigated how common pricing factors compare for the main classes of securities. We found that most of the common pricing characteristics exhibited by ABS, MBS, and CDOs differ significantly, and therefore we accepted the hypothesis that the common pricing factors do in fact differ significantly in value between the main classes of securities. Taking these classes as a whole, we have documented that the assets attached as collateral for the securities differ between security classes, but that there are also important univariate differences to consider. Furthermore, we saw that all Chow test statistics were higher than the critical levels, and therefore we accepted the hypothesis that the primary market spreads associated with the main security classes are influenced differently by common pricing factors. Applying the same pricing estimation model to each security class revealed that most of the common pricing characteristics associated with these classes have a different impact on the primary market spread exhibited by the value of the coefficients. The regression analyses we performed suggest that ABS, MBS, and CDOs are in fact different instruments, as implied by the differences in impact of the pricing factors on the loan spread between these security classes.

The substantial differences we found between security classes regarding the impact of common pricing variables on the spread indicate that these securities are indeed priced differently. As such, our results form an important contribution to current research and to activities in the work field, as the estimates concerning the size of each variable's impact on the issuance spread by security class may stand investment banks in good stead in structuring the technical features of certain issues.

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ENDNOTES

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[1]Ultimately, all debt obligations in a CDO portfolio can be classified as bonds or loans, although both types of debt come in various forms with their own unique characteristics. Generally speaking, *bonds* are fixed income, tradable, and relatively liquid debt obligations issued by an entity seeking external capital in debt markets, or a sovereign, corporate, or financial institution. *Loans* are less fungible instruments in comparison with bonds because they are generally less liquid and therefore less tradable, and will usually be held by a smaller group of investors (lenders) than is the case with bonds (see Fitch Ratings [2004]).

[2]It is important to note that this study is based on *issuance spreads*. Secondary market spreads are not preferred because it is loan spreads at issuance that reflect actual loan prices rather than estimations derived from pricing matrices or dealers' quotes. Issuance spreads are a more accurate measure not only of the actual cost of debt but also of the risk premium demanded by investors.

[3]The issue of the variance of μ being equal in the two groups is a subtle one since the assumption of equality of variances manifests itself only in how the pooled coefficient estimates are manufactured.

[4]We excluded all issues associated to subprime mortgages in our sample.

[5]For transaction size and number of tranches, we calculated the average and standard deviation, taking into account transaction size and number of tranches for each transaction individually.

[6]This notion is empirically supported by Elton, Gruber, Agrawal, and Mann [2001], and also by John, Lynch, and Puri [2003], among others, who all find credit rating statistically significant.

[7]If a loan tranche had multiple ratings, we calculated the average of the given values as the rating classification, rounding off to the nearest absolute value.

[8]If the securitization is structured as a "pass-through," there is only one class of bonds and all investors participate proportionally in the net cash flows from the assets.

[9]One should not confuse time to maturity of the issue with weighted average life because weighted average life deals in particular with the sensitivity of the value of

the loan towards changes in interest rates. Unfortunately, because weighted average life is based on assumptions specified at issuance concerning prepayments defaults and other relevant variables, this variable was unavailable in our sample.

[10]Legal maturity is defined as the date before which a specific tranche of securities must be repaid in order not be in default.

[11]Helwege and Turner [1999] argue that a positive coefficient is expected as longer maturity bonds require, ceteris paribus, a higher spread. On the other hand, Sarig and Warga [1989] find a negative relationship between maturity and loan spread.

[12]The currency of the issue has to be analyzed carefully since the value of a securitization issue is often stated in foreign currency. In order to include the issues denominated in different currencies in the analysis, we converted them into euros. The exchange rate used is the average rate of the year the issue was launched. This information was obtained from the Nederlandsche Bank.

[13]Transaction size is the face value sum of all tranches for a given transaction.

[14]Firla-Cuchra and Jenkinson [2006] found a consistent and significant negative relationship between the number of tranches and the launch spread after controlling for credit rating.

[15]Because data are available for only a limited number of observations, sample sizes occasionally drop for some variables.

[16]Kleimeier and Megginson [2001] compare the characteristics of a sample of 4,956 project finance loans (worth $634 billion) to comparable samples of non-project finance loans, all of which are drawn from a comprehensive sample of 90,784 syndicated loans (worth $13.2 trillion). All syndicated loans include project finance loans, corporate control loans, capital structure loans, fixed asset-based loans, and general corporate purpose loans.

[17]Some CDOs, however, have no portfolio manager and no substitution or trading of the underlying assets. For example, in a static CDO deal the collateral manager is not allowed to trade the securities in the asset pool.

[18]Exhibit 3, Panel C, shows that all of the pair-wise comparisons indicate statistically significant differences at the 5% level, except credit rating class between ABS and MBS, loan to value between ABS and CDO, credit enhancement between MBS and CDO, transaction size between ABS and CDO, and finally, retained interest between ABS and CDO and MBS and CDO.

[19]The Chow test assumes well-behaved error terms to test significant differences in the estimated equations.

[20]The test statistic follows the F distribution with k and $N_1 + N_2 - 2k$ degrees of freedom.

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