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The information content of three credit ratings: the case of European residential mortgage-backed securities

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We assess the information content of three credit ratings for tranches of newly issued European residential mortgage-backed securities. We find that tranches rated by three credit rating agencies where the rating by Standard & Poor's (S&P's) Ratings Service or Fitch is inferior to Moody's lead to higher funding costs and reflects what we refer to as rating risk. Our results suggest that market participants do not view credit ratings by Fitch and S&P's as redundant despite the fact that both employ the same rating approach.

Keywords: residential mortgage-backed securities; credit rating; credit rating agency

JEL Classification: G12; G14; G24

1. Introduction

It is widely acknowledged that credit rating agencies (CRAs) play a key role in global financial markets. As a November 2006 communication issued by the Commission on Credit Rating Agencies of the European Union states in its opening: 'Credit rating agencies play a vital role in global securities and banking markets'. Because of this key role, CRAs have been the subject of considerable scrutiny by lawmakers in the European Union.[1] However, following the subprime mortgage crisis that began in the summer of 2007, there appears to be some contradictory policies regarding the use of credit ratings and whether credit ratings produce reliable information about credit risk.[2] On the one hand, there is the view of regulators in Europe and the USA that one of the reasons for the subprime mortgage crisis was the excessive or exclusive reliance on ratings in the structured finance market (Coval, Jurek, and Stafford 2009).[3] The view is that for complex structured products such as residential mortgage-backed securities (RMBS), investors should rely less on credit ratings. On the other hand, there is the view of regulatory and supervisory bodies that due to the complexity of structured finance securities, multiple credit ratings would provide investors with a better perspective of the creditworthiness of these securities.[4] In support of that view, on 20 June 2013, a new European Union rule became effective that mandated that at issuance, structured finance securities must carry ratings by two different CRAs.

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Several papers have explained the demand for multiple ratings. No empirical work, however, has focused on how investors value the information provided by three ratings in the European structured finance market.[5] Although the three major CRAs operating in the European structured finance market – Moody's Investors Service (Moody's), Standard & Poor's Ratings Service (S&P), and Fitch Ratings (Fitch)[6] – analyze the same data sources, Moody's uses a different rating approach than the other two CRAs. Moody's uses an expected loss criterion whereas S&P and Fitch use a default probability criterion.[7] Accordingly, it is reasonable to expect that an investor considering a structured finance tranche rated by Moody's can benefit from the information that can be obtained from the addition of a rating by S&P or Fitch. Some market commentators refer to this as the information production role of ratings. For example, Güntay and Hackbarth (2010) describe how adding an additional rating can produce information to reduce uncertainty about a security's credit quality, and will decrease the funding cost associated with a security (Bongaerts, Cremers, and Goetzmann 2012). Despite these reasons for at least two ratings, this does not explain why given that S&P and Fitch employ the same rating approach, there would be three ratings assigned to a security.

In this paper, we empirically evaluate whether the ratings of those two CRAs would be viewed as redundant with respect to each other for the largest sector of the European structured finance market, the RMBS market. Our findings contribute to the policy debate in Europe as to how multiple credit ratings produce value-relevant information about credit risk for a complex structured security.

For our empirical analysis, we examine a sample of RMBS issued in the Euromarket in the years 1999 through 2006. Our decision to cut off our sample at the end of 2006 was because of the potential altered attitude toward credit ratings following the subprime mortgage crisis that began in mid-2007.

We use as our measure of funding cost the new issuance spread for assessing the impact of additional ratings. We first investigate the impact on the funding costs resulting from the addition of a Fitch rating for tranches rated jointly by Moody's and S&P. The analysis is then repeated for when the addition of an S&P rating is included for tranches rated jointly by Moody's and Fitch. In a final empirical test, we estimate the rating differential measured in terms of the number of notch differences for split ratings on tranches rated jointly by all three CRAs.

A major finding is that there is a highly significant increase in the funding cost (roughly 32–43 basis points) if the additional ratings are worse than that of Moody's rating for the medium-grade credit rating category only (between A1 and Baa3). Our findings point to investors perceiving an inferior rating as a signal for uncertainty about the ratings because of the tranche's complexity, and consequently is associated with a higher funding cost. This is what we refer to in this paper as rating risk. We do not find any significant impact on the funding costs if the additional credit rating (Fitch or S&P) is better than or equal to Moody's. We then show that when there is a split rating with Moody's, Fitch and S&P provide credit ratings that are similar.

Taken together, investors do not appear to perceive Fitch and S&P ratings as redundant when there are three ratings. Both ratings seem to contain price-relevant information for market participants, despite the fact that they utilize the same rating approach.

The rest of this paper is organized as follows. Section 2 describes the related literature on the demand for multiple credit ratings. Section 3 explains our data-set of European RMBS and our measure of funding cost. Summary statistics for our sample data are provided in Section 4. Section 5 details the methodology. In Sections 6 and 7, we present the empirical results. Section 8 concludes.

2. Related literature on demand for multiple ratings

Here, we briefly review the literature that addresses why an issuer might elect to have more than one credit rating for a debt obligation. Two obvious reasons can be given for the rating by at least two CRAs. First, the investment guidelines of some institutional investors and some regulators dictate that at least two ratings be obtained. Some market commentators refer to this as the regulatory certification role of ratings as it pertains to lower-rated securities. In the context of certification, an additional credit rating can potentially continue to support trading by reducing the uncertainty associated with the value of information (Gorton and Pennacchi 1990; Boot and Thakor 1993; Bongaerts, Cremers, and Goetzmann 2012).

Second, as explained in Section 1, Moody's uses a different criterion for assigning ratings than S&P and Fitch. Consequently, it is reasonable to expect that if a debt obligation is rated by Moody's, there may be relevant information that can be obtained from the addition of a rating by S&P or Fitch. In this context, an issuer (in consultation with its banker) feels that the addition of Fitch or S&P will provide further insight into a debt obligation's creditworthiness to warrant the incremental cost of obtaining a second rating (see, e.g. Güntay and Hackbarth 2010).

There is another possible reason for the existence of two ratings that is unique to structured products such as RMBS. The cash flow for a structured product is distributed based upon the prospectus rules to pay administrative fees and the obligations to the deal's tranches. There are no funds that can be used to obtain an additional rating after the tranches are issued. Yet, after obtaining a rating from a CRA, there is no assurance that the same CRA will continue to monitor the tranche's creditworthiness or that the rating-granting CRA will continue to exist. Consequently, if there is a tranche that is rated by only one CRA and that CRA decides not to continue monitoring that tranche (which it has no obligation to do) or if that rater goes out of business, then institutional investors may be forced (by prospectus or regulatory requirement) to dispose of their holding of that tranche. Hence, a second rating could be viewed as what we refer to as a form of 'rating availability insurance' in the sense that there is a decreased likelihood that a tranche will not be monitored nor rating revised in the future.

Despite these reasons for at least two ratings, this does not explain why given that S&P and Fitch both employ the same rating approach, there would be three ratings assigned to a debt obligation. In fact, the existence of three ratings for a single tranche where one of the ratings is inferior to the others flies in the face of what is popularly referred to as the rating shopping practice of issuers. The rating shopping hypothesis asserts that an issuer will only engage a CRA that offers the most favorable rating (see Poon and Firth 2005; Sangiorgi, Sokobin, and Spatt 2009; Skreta and Veldkamp 2009). An issuer following this practice of seeking more than one rating can select the best rating for a tranche within a RMBS transaction. However, what is key in understanding the rating process is that an issuer need not complete the rating process if a preliminary rating assigned by a particular CRA may be inferior to one already received.

The rating process is not one in which an issuer who engages a CRA obtains a rating that it is committed to report because if it is not satisfied with that rating it would be able to move on to engage another CRA. So if an issuer reports all three ratings where there is a rating split (i.e. different ratings), it must feel that there is information that might be helpful to potential investors to warrant the cost of a third rating. We hypothesize that the existence of three ratings where there is a rating split will lead to a higher funding cost for an RMBS tranche. The interpretation when the funding cost increases can mean that the market may perceive the addition of an inferior rating as a signal of uncertainty about the ratings because of the tranche's complexity, particularly for lower-rated tranches.[8] One might view this as an indication

of what we refer to as 'rating risk', which we define as the risk that a tranche was assigned an inflated rating.

3. Sample construction

In this paper, we collected pricing data for tranches of newly issued European RMBS transactions between 1 January 1999 and 31 December 2006 as reported in *Structured Finance International* (SFI), a publication of Euromoney Institutional Investor Plc. The cut off date for the study is one year prior to the subprime mortgage crisis that began in 2007. As explained in this section, we did not use all tranches for all of the RMBS issued during our study period.

SFI reports the spread at which each tranche is issued. There are two reasons why we prefer to use new issuance spreads than secondary market spreads. The first is that secondary market spreads reflect actual performance of the collateral. That is, after issuance, secondary market spreads will be impacted by not only the rating but also the actual performance of the collateral (defaults and recoveries). Consequently, a secondary market spread may reflect more than the credit risk if the credit rating is not changed continuously. Thus, at the time a secondary market spread is obtained, the risk is that the credit rating may not be updated to reflect historical collateral performance. This problem does not exist when using new issuance spreads.

The second reason for preferring to use new issuance spreads is the difficulty of obtaining reliable secondary market spreads since such spreads are typically derived from pricing matrices or dealer indicative quotes. That is, although secondary market trades provide a cross-sectional snapshot of where tranches trade in the market at a given point in time, no reliable secondary market spread data exist due to the lack of active trading in the structured finance sector. Moreover, unlike new issuance spreads when tranches are sold at par, in the secondary market tranches do not necessarily trade at par. Consequently, a secondary market spread would reflect any favorable or unfavorable impact (tax and/or financial accounting) associated with non-par traded securities.

For these reasons, new issuance spreads are a more accurate measure not only of the actual yield offered on tranches, but also of the risk premium demanded by investors. Accordingly, one requirement for the selection of tranches to be included in this study is that the tranche must have been issued at par.

There are tranches that are both fixed rate and floating rate. Ultimately, we want to have a consistent benchmark for assessing the new issuance spread which we then use as a measure of funding cost. If a fixed-rate tranche is selected, then it is necessary to determine the appropriate benchmark yield curve for each tranche in the sample. By restricting the tranches in our sample to floating-rate tranches where the reference rate is the same interest rate benchmark, we avoid this problem. The coupon reset formula for a floating-rate security is the reference rate plus the quoted margin. The quoted margin for a floating-rate tranche is the additional compensation risk above the reference rate for a tranche issued at par, reflecting three risk elements: (1) credit risk, (2) liquidity risk, and (3) optionality risk. For a floating-rate tranche, the new issuance spread as reported by SFI is the quoted margin. In our study, we used only floating-rate tranches benchmarked off the European interbank offered rate (EURIBOR) and trading at par.[9] All our tranches with the EURIBOR benchmark were placed in the Euromarket.[10] Optionality risk is minimal for floating-rate tranches because at reset dates, they are close to market rates. Hence, the new issuance spread reflects the compensation for credit risk above EURIBOR and the tranche's liquidity risk.

Furthermore, we removed those tranches that do not have a rating from Moody's at issuance because we include Moody's rating as the benchmark in our analysis.[11]

Our final sample consists of 913 tranches (81% of all EURIBOR-based tranches issued in 1999–2006) with a total par value of € 233.33 billion (88% of all EURIBOR-based tranches issued in 1999–2006) from 106 deals.

4. Comparison of ratings for jointly rated tranches

It is necessary in our study to quantify the differential in the ratings assigned by two rating agencies using Moody's as the benchmark rating agency. To do so, we follow convention which involves calculating an 'average' rating differential. First, each rating is converted to a number (e.g. Aaa = AAA = 1; Aa1 = AA+ = 2; and so on). Note that the rating scales are inverse scales, so that new issuance spread (simply 'spread' hereafter) is hypothesized to increase as the credit rating decreases. Then the numerical equivalent of the Moody's rating is subtracted from the numerical equivalent of the S&P or Fitch rating. So, for example, suppose the average rating differential between Moody's and S&P is sought. If the tranche is rated AA+ = 2 by S&P, and Aaa = 1 by Moody's, the numerical equivalent of the Moody's rating is subtracted from the numerical equivalent of the S&P rating, and the difference is defined as 1 rating notch. A positive number means that S&P assigned a worse rating for a tranche, while a negative number means that S&P assigned a better rating than Moody's.

The distribution of jointly rated tranches by credit rating is shown in Table 1. A jointly rated tranche means that the tranche is rated by Moody's and one or both of the other CRAs (Fitch and S&P). Note that for each tranche the actual rating of Fitch or S&P may be different from that of Moody's as explained above.

The sample includes 643 tranches rated by Moody's and S&P (198 tranches rated by both Moody's and S&P plus 445 rated by all three CRAs), and 715 rated by Moody's and Fitch (270 tranches rated by both Moody's and Fitch plus 445 tranches rated by all three CRAs). Note that the smallest number of tranches have a non-investment grade speculative rating by Moody's (tranches rated between Ba1 and Ba3) with about 3–4% in both samples. We do not find any multiple rated tranches with a rating below non-investment grade speculative rating.

Table 2 presents average rating differentials between Moody's and S&P (panel A) and Moody's and Fitch (panel B). In both panels of the table, we show the results for our final sample. Also shown in the table is the average rating differential by four credit quality categories: prime (tranches rated Aaa), high quality (tranches rated between Aa1 and Aa3), medium quality (tranches rated between A1 and Baa3), and non-investment grade speculative (tranches rated between Ba1 and Ba3). We partitioned the sample in that way because there are important distinctions in rating differentials for jointly rated tranches depending on the credit rating level.

Panels A and B in Table 1 show that the largest set of tranches has a triple A rating compared to those below that top rating (roughly 40% of the tranches in both samples). In Table 2, columns (4) and (9) show that in our sample we have virtually no split ratings for triple A rated tranches. Column (6) in both panels of Table 2 indicates that the ratings of S&P and Fitch are the same as Moody's for a relatively low proportion of high grade (Aa1–Aa3 ratings) – around 35% for S&P and 33% for Fitch – but the frequency with which S&P and Fitch ratings match that of Moody's at the medium grade (A1–Baa3 level) increases to about 66% for S&P and 56% for Fitch. Furthermore, we see in column (10) in both panels that the average rating gaps 'if S&P and Fitch are worse than Moody's' tend to decrease as the Moody's rating falls. Also, column (5) shows that 'if S&P and Fitch are better than Moody's', rating gaps tend to increase as the Moody's rating falls. We can augment this picture by considering not just the average rating differential, but the distribution of rating differentials with respect to both S&P

Table 1. Count of jointly rated tranches by rating level.

Credit rating (1)	Jointly rated by Moody's and S&P (2)	Jointly rated by Moody's, Fitch, and S&P (3)	Total pairs Moody's with S&P (4)	
Panel A: Moody's and S&P				
Aaa	85	175	260	Prime grade
Aa1	3	8	11	
Aa2	9	26	35	High grade
Aa3	11	52	63	
A1	8	23	31	
A2	42	47	89	Upper medium grade
A3	1	8	9	
Baa1	3	9	12	
Baa2	18	74	92	Lower medium grade
Baa3	10	12	22	
Ba1	2	3	5	
Ba2	5	7	12	Non-investment grade speculative
Ba3	1	1	2	
Total	198	445	643	
Credit rating (1)	Jointly rated by Moody's and Fitch (2)	Jointly rated by Moody's, Fitch, and S&P (3)	Total pairs Moody's with Fitch (4)	
Panel B: Moody's and Fitch				
Aaa	104	175	279	Prime grade
Aa1	5	8	13	
Aa2	11	26	37	High grade
Aa3	8	52	60	
A1	21	23	44	
A2	41	47	88	Upper medium grade
A3	6	8	14	
Baa1	17	9	26	
Baa2	33	74	107	Lower medium grade
Baa3	9	12	21	
Ba1	4	3	7	
Ba2	11	7	18	Non-investment grade speculative
Ba3	0	1	1	
Total	270	445	715	

Notes: Panels A and B show the number of jointly rated tranches by Moody's/S&P and Moody's/Fitch across credit ratings issued during the period 1999–2006 for tranches of European RMBS placed in the Euromarket. We used only floating-rate tranches benchmarked off of the EURIBOR and trading at par. Our sample consists of 81% of all EURIBOR-based tranches issued in the period 1 January 1999–31 December 2006. The number of jointly rated tranches for each rating category is reported. Note that we have distinguished between double- and triple-rated securities in columns (2) and (3) in each panel, respectively.

vs. Moody's and Fitch vs. Moody's. These results are shown in Figure 1, which again demonstrates that differences in ratings are greater for high-grade tranches than for medium-quality grade tranches.

Table 2. Comparison of ratings for jointly rated tranches.

Pairs with S&P									
Credit rating (1)	total *N* (2)	S&P is better (3)	% of total (4)	Average differential if S&P is better (5)	S&P equals to Moody's (6)	% of total (7)	S&P is worse (8)	% of total (9)	Average differential if S&P is worse (10)
Panel A: pairs Moody's with S&P									
All ratings	643	103	16.0	−1.23	479	74.50	61	9.5	1.48
Aaa	260	0	0.0	0.00	259	99.6	1	0.4	3.00
Aa1–Aa3	109	56	51.4	−1.09	38	34.9	15	13.8	1.88
A1–Baa3	255	44	17.3	−1.43	169	66.3	42	16.5	1.36
Ba1-below	19	3	15.8	−1.00	13	68.4	3	15.8	1.00
N	643	103			479		61		
Pairs with Fitch									
Credit rating (1)	total N (2)	Fitch is better (3)	% of total (4)	Average differential if Fitch is better (5)	Fitch equals to Moody's (6)	% of total (7)	Fitch is worse (8)	% of total (9)	Average differential if Fitch is worse (10)
Panel B: pairs Moody's with Fitch									
All ratings	715	127	17.8	−1.28	495	69.2	93	13.0	1.34
Aaa	279	0	0.0	0.00	278	99.6	1	0.4	3.00
Aa1–Aa3	110	52	47.3	−1.06	36	32.7	22	20.0	1.65
A1–Baa3	300	67	22.3	−1.36	167	55.7	66	22.0	1.26
Ba1-below	26	8	30.8	−2.00	14	53.9	4	15.4	1.00
N	715	127			495		93		

Notes: This table shows the number of tranches that were simultaneously rated by Moody's/S&P (panel A) and Moody's/Fitch (panel B). Note that we have not distinguished between double- and triple-rated securities. For the purpose of the 'average' differential calculation, each rating is converted to a number (e.g. Aaa = AAA = 1, Aa1 = AA+ = 2, etc.) and the numerical equivalent of the Moody's rating is subtracted from the numerical equivalent of the S&P or Fitch rating. A negative number means that the Fitch (or S&P) gives, on average, a better rating than Moody's. The time period spans 1 January 1999–31 December 2006.

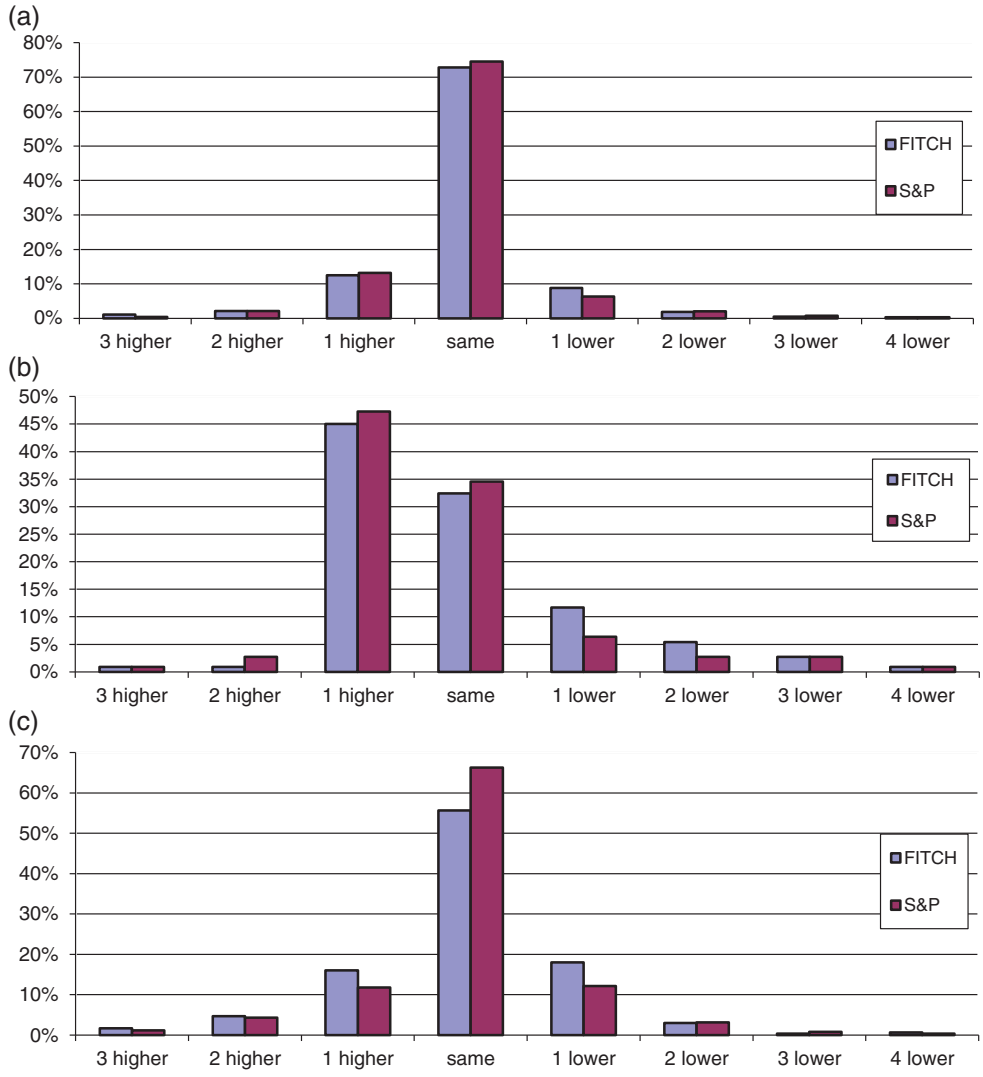

Figure 1. Rating differential distribution for jointly rated RMBS tranches. Figure 1 shows the distribution of rating differentials for jointly tranches with respect to both Fitch vs. Moody's, and S&P vs. Moody's ratings. The time period spans 1 January 1999–31 December 2006. (a) RMBS rating differentials – all rating levels (Fitch and S&P ratings are lower, same, or higher in notches compared with Moody's), (b) RMBS rating differentials – Aa1–Aa3 rating levels (Fitch and S&P ratings are lower, same, or higher in notches compared with Moody's), and (c) RMBS rating differentials – A1–Ba3 rating levels (Fitch and S&P ratings are lower, same, or higher in notches compared with Moody's).

5. Methodology

We regressed spreads for tranches that are rated by Moody's on rating additions from one of the other CRAs (S&P and Fitch) separately. This approach allows us to investigate the addition of S&P and Fitch separately for tranches rated by two rating agencies with Moody's being the

benchmark. Our baseline specification is:

$$\text{spread}_{it} = \beta_j + \sum(\beta_j \text{ directional}_{jit}) + \sum(\beta_j \text{ directional}_{jit} \times \text{distance}_{it}) + \sum(\beta_j \text{ credit rating}_{jit}) + \text{controls} + \varepsilon_{it},$$

where spread_{it} represents the new issuance spread of tranche i at time t. Credit rating_{jit} stands for a set of credit rating dummy variables and corresponds to Moody's rating between Aaa through Ba3. We incorporated into our regression analysis explanatory variables that can be used to gauge rating dispersion. The first, directional_{jit}, represents a set of dummy variables for a particular rating agency (Fitch or S&P) indicating whether the additional rating agency gave a rating equal to, above, or below the Moody's rating for that tranche. The second, $\text{directional}_{jit} \times \text{distance}_{it}$, stands for the interaction of these directional dummy variables with the distance to the Moody's rating as measured by the number of notches the additional agency's rating deviated from the rating assigned by the control rating agency (Moody's). The specific definitions for both directional_{jit} and $\text{directional}_{jit} \times \text{distance}_{it}$ are provided in Table 3.

We are primarily interested in the directional_{jit} coefficient and in the coefficient on the interaction of $\text{directional}_{jit} \times \text{distance}_{it}$, which captures the average impact on spreads by the addition of Fitch or S&P. Given the nature of our data, we had to take into account several controls to deal with two potential econometric issues. First, to remove systematic heterogeneity from the error term, we used a heteroskedasticity-consistent variance–covariance matrix as suggested by White (1980). Second, we had to investigate the potential problem of multicollinearity because the ordinary least squares assumption of independent errors is unlikely to be satisfied given that our data-set is a pooled time-series and cross-sectional panel. The violation of this assumption could potentially result in the overstating of the computed t-statistics, compelling us to consider two types of correlations present in panel data.

First, observations in the aggregate may be affected by the same macroeconomic conditions, making it necessary to control for the time effect. To deal with the potential error-dependence problem, we follow Petersen (2009) and use dummy variables that correspond to different quarters. Each dummy variable is equal to one if the tranche was issued during the corresponding quarter, and zero otherwise. Because of the use of time dummies, we do not include any other macroeconomic variables in our analysis.

Second, when bond metrics such as spreads are the unit of observation, a problem arises when there are multiple observations for the same issuer. As a result, the observations cannot be treated as independent of each other. Therefore, we take into account issuer fixed effects in our analysis and control for all the time-invariant characteristics at the deal level such as underlying collateral quality.

On the tranche level, we also correct for size (log of tranche amount), internal, and external credit enhancement (such as third-party guarantees). Next, we describe credit enhancement and the relationship it has with the spread.

One of the primary tasks of CRAs is to determine the appropriate level of credit enhancement necessary for a tranche to obtain a specific credit rating. The enhancement can come from external and/or internal sources. Prior to the US subprime mortgage crisis, the most common form of external credit enhancement was an insurance policy issued by one of the monoline insurers (i.e. an insurance company that provides only financial guarantees). Because monoline insurers guarantee a tranche's principal and interest payments, tranches that have an insurance wrap typically carry a triple A rating if the insurer carries that rating. For all of the tranches in our sample where there is

Table 3. Summary statistics.

Variable		*N*	Mean	Min	Max	S.D.	Correlation 1	2	3	4	5	6	7	8	9	10	11
Panel A: continuous variables statistics																	
Moody's rating	1	913	4.41	1.000	13.000	3.42	1.000	−0.474	0.718	−0.746	0.971	0.053	0.076	−0.120	0.973	0.008	0.169
Internal credit enhancement (in %)	2	913	0.112	0.000	0.996	0.207	−0.474	1.000	−0.322	0.343	−0.463	−0.080	−0.162	0.047	−0.466	−0.125	−0.141
Spread (in basis points)	3	913	62.693	1.000	625.000	73.643	0.718	−0.322	1.000	−0.500	0.711	0.043	0.091	−0.027	0.727	0.113	−0.021
Log of tranche size	4	913	7.854	5.397	9.490	0.726	−0.746	0.343	−0.500	1.000	−0.719	−0.164	−0.355	0.112	−0.724	−0.212	−0.298
Fitch rating	5	715	4.408	1.000	12.000	3.418	0.971	−0.463	0.711	−0.719	1.000	0.237	0.076	0.116	0.988	0.825	0.040
Fitch added, # notches worse than Moody's	6	715	0.130	0.000	4.000	0.445	0.053	−0.080	0.043	−0.164	0.237	1.000	−0.130	0.776	0.199	0.825	−0.093
Fitch added, # notches better than Moody's	7	715	0.178	0.000	3.000	0.472	0.248	−0.162	0.091	−0.355	0.076	−0.130	1.000	−0.726	0.119	−0.107	0.749
Fitch minus Moody's	8	715	−0.057	−5.000	4.000	0.749	−0.120	0.047	−0.027	0.112	0.116	0.776	−0.726	1.000	0.062	0.640	−0.541
S&P rating	9	643	4.235	1.000	12.000	3.397	0.973	−0.466	0.727	−0.724	0.988	0.199	0.119	0.062	1.000	0.267	0.001
S&P added, # notches worse than Moody's	10	643	0.089	0.000	4.000	0.401	0.088	−0.125	0.113	−0.212	0.240	0.825	−0.107	0.640	0.267	1.000	−0.128
S&P added, # notches better than Moody's	11	643	0.095	0.000	3.000	0.419	0.169	−0.141	−0.021	−0.298	0.040	−0.093	0.749	−0.541	0.001	−0.128	1.000
S&P minus Moody's	12	643	−0.057	−3.000	4.000	0.805	−0.043	0.000	0.094	0.036	0.143	0.640	−0.543	0.789	0.187	0.785	−0.715

Variable	(1)	(2)	(3)
Panel B: dummy variables statistics			
Fitch added, worse than Moody's	715	93	13.0
Fitch added, equals Moody's	715	495	69.2
Fitch added, better than Moody's	715	127	17.8
S&P added, worse than Moody's	643	61	9.5
S&P added, equals Moody's	643	479	74.5
S&P added, better than Moody's	643	103	16.0

Notes: Panel A reports the statistics for the continuous variables. The first four rows in panel A present the summary statistics for the entire sample of 913 tranches that have a Moody's rating (between 1 January 1999 and 31 December 2006) that consists of 198 tranches rated exclusively by Moody's and S&P, 270 tranches rated exclusively by Moody's and Fitch, and 445 tranches rated jointly by Moody's, S&P, and Fitch. Rows 5–8 present the sample of tranches rated by Moody's and Fitch (715 tranches, see also Table 2). Rows 9–12 presents the sample rated by Moody's and S&P (643 tranches, see also Table 2). Moody's rating is the average numerical value corresponding to each credit rating Moody's assigned to each tranche, where Aaa stands for 1, and Aa1 stands for 2, etc. Internal credit enhancement is the cumulative subordination level of each tranche in a securitization structure. Spread is the tranche's spread above EURIBOR for a tranche issued at par. Tranche size is the log of the tranche size in euro millions. Fitch rating is the average numerical value corresponding to each credit rating Fitch assigned to each tranche. Fitch added, # notches worse than Moody's is the number of notches Fitch is worse than Moody's. Fitch added, # notches better than Moody's is the number of notches Fitch is better than Moody's. Fitch minus Moody's is Fitch minus Moody's rating. S&P rating is the average numerical value corresponding to each credit rating S&P assigned to each tranche. S&P added, # notches worse than Moody's is the number of notches S&P is worse than Moody's. S&P added, # notches better than Moody's is the number of notches S&P is better than Moody's. S&P minus Moody's is S&P minus Moody's rating. Panel B report the statistics for the dummy variables. Column (1) reports the number of tranches in the entire sample. Column (2) in panel B presents the number of tranches where dummy variable takes the value of 1. Column (3) in panel B reports for each row the number in column (2) as a percentage of the column (1). Fitch added, worse than Moody's is a dummy indicating that the Fitch rating is worse than Moody's. Fitch added, equals Moody's is a dummy indicating that the Fitch rating is equal to Moody's. Fitch added, better than Moody's is a dummy indicating that Fitch rating is better than Moody's. S&P added, worse than Moody's is a dummy indicating that the S&P rating is worse than Moody's. S&P added, equals Moody's is a dummy indicating that the S&P rating is equal to Moody's. S&P added, better than Moody's is a dummy indicating that S&P rating is better than Moody's.

external credit enhancement, it is in the form of monoline insurance. In our regressions, external credit enhancement is represented by a dummy variable that takes the value of one if the tranche is guaranteed by a monoline insurer and zero otherwise.

There are various forms of internal credit enhancement with the most common being the senior-subordinate structure as measured by a tranche's subordination level. The deal's waterfall sets forth how cash flows and collateral losses are to be distributed among the tranches with a securitization structure. From this, one can determine how much subordination each tranche has within a deal's capital structure. To compute the subordination levels for the tranches in our sample, we first divided the par value of each tranche by the total amount of the transaction's liabilities. We then calculated a tranche's subordination level ratio which is defined as the percentage of the total liabilities subordinate to that tranche. The tranche will not suffer any losses until after that percentage of the liabilities has been lost.

6. How adding another rating influences issuance spreads

Table 4 investigates the impact of an additional Fitch rating on the spread for a tranche that is rated jointly by Moody's and S&P (Moody's is the control rating agency). The entire sample includes 198 tranches jointly rated by Moody's and S&P plus 445 tranches rated jointly by all three rating agencies (in total 643 tranches). Regressions (1) and (2) indicate that the addition of Fitch has a significant impact on the spread. The addition of a Fitch rating that is lower than Moody's significantly increases the spread by 15.56 basis points on average (t-statistic of 1.99) as seen for regression (1), and increases the spread by 11.53 basis points (t-statistic of 3.40) when the Moody's/Fitch differential exceeds one notch as seen in regression (3).

We reran regressions (1) and (3) to control for the ranking of the S&P rating relative to Fitch rating for the same tranche. We created a directional dummy indicating whether S&P assigned a rating above or below the Fitch rating for that tranche. When we reran the regressions shown in columns (2) and (4), our results remain consistent and strongly significant. Hence, we believe investors do not appear to view the ratings of Fitch and S&P as being redundant despite the use of the same rating approach. We also find the coefficient for 'S&P better than Fitch' highly significant with the correct sign. If the S&P rating is above that of Fitch, the spread decreases by 13.76 basis points on average (regression (2), t-statistic of -2.19). From regression (4), it can be seen that the spread decreases by 14.28 basis points per notch (t-statistic -2.60), so the spread decreases if the S&P/Fitch gap tends to be larger.

Now let's look at the regression results for the high-grade and medium-grade categories. For the high-grade category in Table 4, the only significant finding is a weakly significant impact with the incorrect sign when the rating by Fitch equals that of Moody's (see regressions (7) and (8)). We find no significant impact when Fitch's rating is worse than or better than Moody's rating for this category. In contrast, for the medium-grade category (regressions (9)–(12)), a Fitch rating seems to contain relevant information. Again, we find a highly significant impact when Fitch is worse than Moody's but no significant impact when a Fitch rating is better or equal to Moody's. The results are robust after controlling for the ranking of S&P relative to Fitch rating for the same tranche. After controlling for other factors, these results suggest that an investor demands a higher spread, on average, for jointly rated tranches by Moody's and S&P in which the addition of a Fitch rating is lower than Moody's, but only for medium-grade rated tranches.

Table 5 reports the effects of the addition of S&P rating on the spread, but now for a tranche that is rated jointly by Moody's and Fitch (Moody's again being the control rating agency). The

Table 4. Regressions estimating credit spreads on Fitch rating additions for tranches rated by Moody's and S&P.

	Full sample				Includes Aaa/Aa3 credit rating (prime and high grade)				Includes A1/Baa3 credit rating (medium grade)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Internal credit enhancement	−10.87* (−1.76)	−10.76* (−1.70)	−11.84** (−1.99)	−11.66** (−1.95)	−15.67*** (−6.12)	−15.64*** (−6.09)	−16.26*** (−6.38)	−16.20*** (−6.33)	−11.52 (−0.45)	−7.96 (−0.28)	−36.94 (−1.44)	−34.89 (−1.33)
External credit enhancement	−37.24** (−2.24)	−37.58** (−2.24)	−37.31** (−2.25)	−37.85** (−2.26)	−6.31** (−2.53)	−6.36 (−2.56)	−6.49*** (−2.59)	−6.56*** (−2.62)	N.A.	N.A.	N.A.	N.A.
Size of tranche	−1.34 (−0.27)	−0.55 (−0.11)	−1.95 (−0.41)	−1.18 (−0.25)	−3.90 (−1.48)	−3.68 (−1.38)	−4.38* (−1.67)	−4.21 (−1.58)	−18.82 (−1.13)	−15.98 (−1.03)	−19.60 (−1.17)	−16.91 (−1.08)
Fitch added, worse than Moody's	15.56** (1.99)	18.15** (2.19)	– –	– –	5.89 (0.86)	6.59 (0.88)	5.66 (1.51)	– –	32.59*** (2.82)	33.88*** (2.77)	– –	– –
Fitch added, equals Moody's	5.25 (1.27)	5.12 (1.24)	6.37 (1.55)	5.65 (1.37)	1.84 (1.11)	1.77 (1.06)	3.32** (2.11)	3.10* (1.93)	6.95 (0.79)	6.51 (0.73)	9.45 (1.09)	9.78 (1.10)
Fitch added, better than Moody's	−7.50 (−1.14)	−8.55 (−0.96)	– –	– –	−9.71 (−1.55)	−9.71 (−1.53)	−4.86 (−1.10)	– –	−12.47 (−1.08)	−19.40 (−1.21)	– –	– –
Fitch added, # notches worse than Moody's	– –	– –	11.53*** (3.40)	12.40*** (3.41)	– –	– –	– –	5.61 (1.44)	– –	– –	21.49*** (3.67)	23.34*** (3.76)
Fitch added, # notches Fitch better than Moody's	– –	– –	−4.98 (−1.30)	−6.97 (−1.18)	– –	– –	– –	−5.21 (−1.12)	– –	– –	−7.94 (−1.19)	−12.59 (−1.37)

(*Continued*).

Table 4. Continued.

	Full sample				Includes Aaa/Aa3 credit rating (prime and high grade)				Includes A1/Baa3 credit rating (medium grade)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S&P worse than Fitch	–	5.53	–	6.99	–	1.92		2.24	–	15.92	–	15.74
	–	(0.39)	–	(0.46)	–	(0.55)		(−0.46)	–	(0.84)	–	(0.85)
S&P better than Fitch	–	−13.76**	–	−14.28***	–	−4.78		−3.85	–	−11.94	–	−14.83
	–	(−2.19)	–	(−2.60)	–	(−0.97)		(−0.99)	–	(−1.07)	–	(−1.43)
Moody's credit rating FE	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
Issuer FE	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
N	643	643	643	643	369	369	369	369	255	255	255	255
Rated jointly by Moody's and S&P	198	198	198	198	108	108	108	108	82	82	82	82
Rated jointly by Moody's, S&P, and Fitch	445	445	445	445	261	261	261	261	173	173	173	173
Adjusted R^2	0.80	0.80	0.80	0.80	0.72	0.72	0.72	0.72	0.60	0.60	0.60	0.60
$F-$test	26.75	26.3	27.00	26.59	11.81	11.55	11.97	11.68	6.94	6.79	7.00	6.87

Notes: This table shows the results of regressing a tranche's new issuance spread for a tranche that is jointly rated by Moody's and S&P on rating additions from Fitch, its ranking of those additions relative to Moody's rating, the distance of Fitch to the Moody's rating as measured by the number of notches, internal credit enhancement, external credit enhancement, and log of size of tranche. See Table 3 for descriptions. The following control variables are included but are not shown in the tables: dummies for Moody's credit rating (the control rating agency), time fixed effects, and issuer fixed effects. The regression results reported in this table are based on a sample of 643 RMBS tranches issued (at par) between 1 January 1999 and 31 December 2006 rated only by Moody's and S&P (198 tranches) plus tranches rated jointly by both Moody's, S&P, and Fitch (445). The table shows the coefficient and *t*-statistic, corrected for heteroskedasticity, in brackets using robust standard errors clustered by time and issuer. Regressions (1)–(4) include the entire sample; regressions (1) and (3) differ in the treatment of the additional rating by Fitch, and regressions (2) and (4) repeat regressions (1) and (3) but include controls for the ranking of S&P relative to Fitch rating. Similarly, regressions (5)–(8) include tranches assigned a Moody's prime and high-grade credit rating between Aaa and Aa3, and regressions (9)–(12) include tranches assigned a Moody's medium-grade credit rating between A1 and Baa3. N.A. means none of the tranches have an external credit enhancement. The symbol '−' indicates that an explanatory variable is not included in the regression.

***Parameter estimates for which zero falls outside the 99% posterior confidence intervals.

**Parameter estimates for which zero falls outside the 95% posterior confidence intervals.

*Parameter estimates for which zero falls outside the 90% posterior confidence intervals.

Table 5. Regressions estimating credit spreads on S&P rating additions for tranches rated by Moody's and Fitch.

	Full sample				Includes Aaa/Aa3 credit rating (prime and high grade)				Includes A1/Baa3 credit rating (medium grade)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Internal credit enhancement	−10.65	−10.46	9.54	−9.48	−12.22***	−12.24***	−12.52***	−12.56***	−27.49	−31.79	−14.29	−17.24
	(−1.23)	(−1.26)	(−1.09)	(−1.12)	(−6.95)	(−6.98)	(−7.00)	(−7.06)	(−1.18)	(−1.35)	(−0.62)	(−0.75)
External credit enhancement	−42.84***	−42.57***	−44.66***	−44.53***	−7.90***	−7.95***	−7.91***	−7.92***	N.A.	N.A.	N.A.	N.A.
	(−2.83)	(−2.85)	(−2.81)	(−2.84)	(−2.87)	(−2.91)	(−2.93)	(−2.98)				
Size of tranche	−0.63	−0.18	0.21	0.43	0.83	0.98	0.51	0.57	−4.38	−4.36	−0.92	−1.18
	(−0.08)	(−0.02)	(0.03)	(0.06)	(0.55)	(0.63)	(0.34)	(0.37)	(−0.47)	(−0.49)	(−0.12)	(−0.15)
S&P added, worse than Moody's	33.65***	33.05***	–	–	7.37	7.38	–	–	42.54***	42.01***	–	–
	(3.52)	(3.72)	–	–	(1.49)	(1.42)	–	–	(3.51)	(3.93)	–	–
S&P added, equals Moody's	7.48	7.40	5.74	5.88	0.97	0.95	1.54	1.60	−4.66	−4.87	−2.41	−2.17
	(1.54)	(1.52)	(1.22)	(1.25)	(0.59)	(0.58)	(0.85)	(0.89)	(−0.70)	(−0.66)	(−0.40)	(−0.36)
S&P added, better than Moody's	9.32	10.55	–	–	−4.83	−4.75	–	–	−6.69	−8.65	–	–
	(0.92)	(1.04)	–	–	(−0.89)	(−0.86)	–	–	(−0.65)	(−0.78)	–	–
S&P added, # notches worse than Moody's	–	–	21.37***	21.46***	–	–	4.30	4.51*	–	–	33.17***	34.14***
	–	–	(3.32)	(3.40)	–	–	(1.73)	(1.66)	–	–	(3.42)	(3.46)
S&P added, # notches Fitch better than Moody's	–	–	2.88	4.26	–	–	−2.30	−1.92	–	–	−1.47	−3.05
	–	–	(0.52)	(0.69)	–	–	(−0.73)	(−0.56)	–	–	(−0.21)	(−0.41)

(*Continued*).

Table 5. Continued.

Fitch worse than	–	2.25	–	−0.83	–	−1.75	–	−3.24	–	2.67	–	–
S&P	–	(0.17)	–	(−0.07)	–	(−0.35)	–	(−0.60)	–	(0.20)	–	–
Fitch better than	–	−8.49	–	−6.68	–	−3.69	–	−2.57	–	8.56	–	–
S&P	–	(−1.20)	–	(−0.88)	–	(−1.65)	–	(−0.91)	–	(0.78)	–	–
Moody's credit rating FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Issuer FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	715	715	715	715	389	389	389	389	300	300	300	300
Rated jointly by Moody's and Fitch	270	270	270	270	128	128	128	128	127	127	127	127
Rated jointly by Moody's, S&P, and Fitch	445	445	445	445	261	261	261	261	173	173	173	173
Adjusted R^2	0.82	0.82	0.82	0.82	0.72	0.73	0.72	0.72	0.69	0.69	0.72	0.72
F-test	31.55	30.91	32.39	31.70	11.80	11.54	13.38	11.56	7.87	8.42	8.43	9.62

Notes: This table shows the results of regressing a tranche's new issuance spread for a tranche that is jointly rated by Moody's and Fitch on rating additions from S&P, its ranking of those additions relative to Moody's rating, the distance of S&P to the Moody's rating as measured by the number of notches, internal credit enhancement, external credit enhancement, and log size of tranche. See Table 3 for descriptions. The following control variables are included but are not shown in the tables: dummies for Moody's credit rating (the control rating agency), time fixed effects, and issuer fixed effects. The regression results reported in this table are based on a sample of 715 RMBS tranches issued (at par) between 1 January 1999 and 31 December 2006 rated only by Moody's and Fitch (270 tranches) plus tranches rated jointly by Moody's, Fitch, and S&P (445). The table shows that the coefficient and*t*-statistic, corrected for heteroskedasticity, are in brackets using robust standard errors clustered by time and issuer. Regressions (1)–(4) include the entire sample; regressions (1) and (3) differ in the treatment of the additional rating by S&P, and regressions (2) and (4) repeat regressions (1) and (3) but include controls for the ranking of Fitch relative to S&P rating. Similarly, regressions (5)–(8) include tranches assigned a Moody's prime and high-grade credit rating between Aaa and Aa3, and regressions (9)–(12) include tranches assigned a Moody's medium-grade credit rating between A1 and Baa3. N.A. means none of the tranches have an external credit enhancement. The symbol '–' indicates that an explanatory variable is not included in the regression.

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*Parameter estimates for which zero falls outside the 90% posterior confidence intervals.

entire sample includes 270 tranches jointly rated by Moody's and Fitch plus 445 tranches rated jointly by the three CRAs (in total 715 tranches).

Taken as a whole, the results suggest that S&P ratings, just like Fitch as reported in Table 4, affect the spread when its rating is worse than Moody's for medium-grade rated tranches. The addition of an S&P rating below that of Moody's significantly increases the spread by 42.54 basis points (regression (9), *t*-statistic of 3.51). This result remains highly significant with a coefficient of 42.01 after controlling for the ranking of Fitch relative to the S&P rating for the same tranche (regression (10), *t*-statistic of 3.93). These results suggest again that investors do not appear to view the ratings of S&P and Fitch as being redundant. Consistent with these findings, we also see evidence that the spread for positive rating differentials increases with the credit rating. For example, if the average differential between S&P and Moody's exceeds one notch, the spread significantly increases by 34.14 basis points for medium-grade rated tranches (regression (12), *t*-statistic of 3.46).

As a final test, we repeated the analysis in Tables 4 and 5 using a sample of tranches exclusively rated by all three CRAs. Table 6 reveals similar results with highly significant coefficients that have the correct sign when S&P and Fitch assign a rating that is lower than Moody's rating (regressions (1)–(4)). If S&P and Fitch assign a rating that is better than Moody's rating, then there is no significant impact on the spread.

In summary, our analysis reveals that additional ratings (Fitch or S&P) that are worse than Moody's rating, on average lead to higher funding costs for the issuer. We find a positive highly significant increase in the funding cost (roughly 15–43 basis points) if the additional rating (S&P or Fitch) is below that of the Moody's rating, but only for tranches with a medium-grade credit rating between A1 and Baa3. We believe that Fitch and S&P are not viewed as redundant with respect to each other and argue that three ratings for lower-rated tranches reflect what we referred to earlier as rating risk that calls for a higher funding cost at issuance.

7. Adding a Fitch or S&P rating for tranches with split ratings

Regressions (1)–(6) in Table 7 present our results that estimate split ratings on tranches rated jointly by all three CRAs. Our baseline specification for Fitch is:

$$\text{Fitch rating gap}_{it} = \beta_j + \sum(\beta_j \text{ S\&P directional}_{jit}) + \sum(\beta_j \text{ S\&P directional}_{jit} \times \text{distance}_{it}) + \sum(\beta_j \text{ credit rating}_{jit}) + \text{controls} + \varepsilon_{it},$$

where Fitch rating gap_{it} represents Fitch rating (in notches, i.e. '1' corresponds to AAA, '2' to AA+, and so on) minus the Moody's rating (the first three regressions in Table 7). Therefore, a negative value means that Fitch provides a better rating than Moody's for the same tranche. We repeat this analysis for S&P in the last three regressions reported in Table 7. Our baseline specification for S&P is:

$$\text{S\&P rating gap}_{it} = \beta_j + \sum(\beta_j \text{ Fitch directional}_{jit}) + \sum(\beta_j \text{ Fitch directional}_{jit} \times \text{distance}_{it}) + \sum(\beta_j \text{ credit rating}_{jit}) + \text{controls} + \varepsilon_{it},$$

where S&P rating gap_{it} represents S&P rating (in notches, i.e. '1' corresponds to AAA, '2' to AA+, and so on) minus the Moody's rating. In those regressions, a negative value means that S&P provides a better rating than Moody's for the same tranche. Fitch directional dummies indicate

Table 6. Regressions estimating credit spreads on split ratings for tranches rated jointly by Moody's, S&P, and Fitch.

	(1)	(2)	(3)	(4)
Fitch worse than Moody's	19.02**	–	–	–
	(2.07)	–	–	–
Fitch better than Moody's	−11.32	–	–	–
	(−0.77)	–	–	–
# notches Fitch worse than Moody's	–	10.54***	–	–
	–	(2.71)	–	–
# notches Fitch better than Moody's	–	−6.24	–	–
	–	(−0.79)	–	–
S&P worse than Moody's	–	–	38.59***	–
	–	–	(3.07)	–
S&P better than Moody's	–	–	17.39	–
	–	–	(1.15)	–
# notches S&P worse than Moody's	–	–	–	21.23***
	–	–	–	(3.03)
# notches S&P better than Moody's	–	–	–	6.53
	–	–	–	(0.75)
S&P worse than Fitch	10.13	10.02	–	–
	(0.60)	(0.62)	–	–
S&P better than Fitch	−16.27**	−14.36**	–	–
	(−2.51)	(−2.42)	–	–
Fitch worse than S&P	–	–	−7.70	−9.09
	–	–	(−1.03)	(−0.65)
Fitch better than S&P	–	–	−5.40	−6.90
	–	–	(−0.43)	(−0.86)
Moody's credit rating FE	yes	yes	yes	yes
Time FE	yes	yes	yes	yes
Issuer FE	yes	yes	yes	yes
Other controls	yes	yes	yes	yes
N	445	445	445	445
Rated jointly by Moody's, S&P, and Fitch	445	445	445	445
Adjusted R^2	0.82	0.82	0.82	0.83
F-test	25.30	25.97	26.26	26.94

Notes: The regression results reported in this table are based on a sample of 445 RMBS tranches issued (at par) during the period 1 January 1999–31 December 2006 that were rated jointly by Moody's, S&P, and Fitch. In regressions (1) and (2), we regress the tranche's new issuance spread on rating additions from Fitch and its ranking of those additions relative to Moody's rating, the distance of Fitch to the Moody's rating as measured by the number of notches, and the ranking of S&P relative to Fitch rating. In regressions (3) and (4), we regress the tranche's new issuance spread on rating additions from S&P and its ranking of those additions relative to Moody's rating, the distance of S&P to the Moody's rating as measured by the number of notches, and the ranking of Fitch relative to S&P rating. See Table 3 for descriptions. The following control variables are included but not shown: internal credit enhancement, external credit enhancement, log tranche size, dummies for Moody's credit rating (the control rating agency), time fixed effects, and issuer fixed effects. The symbol '–' indicates that an explanatory variable is not included in the regression. The table shows the coefficient and*t*-statistic, corrected for heteroskedasticity, in parentheses.

***Parameter estimates for which zero falls outside the 99% posterior confidence intervals.

**Parameter estimates for which zero falls outside the 95% posterior confidence intervals.

*Parameter estimates for which zero falls outside the 90% posterior confidence intervals.

whether the rating of Fitch is better than, equal to, or worse than that of Moody's. The interaction of Fitch directional dummy variables with the distance to the Moody's rating is measured in the number of notches. The specific definitions for the other explanatory variables were provided in Section 5.

Table 7. Regressions estimating split ratings on tranches rated jointly by Moody's, S&P, and Fitch.

	Fitch–Moody's			S&P–Moody's		
	(1)	(2)	(3)	(4)	(5)	(6)
Aa1	0.85**	0.55*	0.58***	0.27	−0.30	−0.52***
	(2.51)	(1.79)	(2.80)	(0.72)	(−0.84)	(−2.62)
Aa2	0.35	0.44**	0.35**	−0.03	−0.17	−0.31**
	(1.39)	(2.58)	(2.46)	(−0.12)	(−0.92)	(−2.40)
Aa3	−0.85***	−0.006	−0.19	−1.13***	−0.46**	−0.72***
	(−4.80)	(−0.03)	(−0.85)	(−6.47)	(−2.52)	(−4.62)
A1	0.63**	0.19	0.48**	0.08	−0.60*	−0.57***
	(2.02)	(0.68)	(2.02)	(0.30)	(−2.25)	(−2.67)
A2	−0.01	0.27*	0.23*	−0.36*	−0.20	−0.34**
	(−0.07)	(1.86)	(1.66)	(−1.91)	(−1.29)	(−2.47)
A3	−0.54*	−0.03	−0.16	−0.76	−0.35	−0.57*
	(−1.46)	(−0.13)	(−0.69)	(−1.62)	(−1.18)	(−1.91)
Baa1	0.51*	−0.002	0.40*	0.09	−0.41	−0.35
	(1.66)	(−0.01)	(1.80)	(0.28)	(−1.58)	(−1.62)
Baa2	−0.07	0.17	0.14	−0.31*	−0.12	−0.27*
	(−0.39)	(1.16)	(1.05)	(−1.87)	(−0.87)	(−2.11)
Baa3	−1.00***	−0.11	−0.22	−1.32***	−0.58**	−0.80*
	(−3.74)	(−0.44)	(−0.81)	(−4.24)	(−2.28)	(−3.07)
Ba1	−0.38	−0.52	−0.42	0.05	0.07	0.16
	(−0.51)	(−0.94)	(−0.71)	(0.17)	(0.18)	(0.51)
Ba2	−0.52	−0.15	−0.21	−0.44*	−0.07	−0.14
	(−1.16)	(−0.33)	(−0.45)	(−1.85)	(−0.30)	(−0.51)
Ba3	−2.12***	−0.73**	−1.03***	−1.69***	−0.52*	−0.50
	(−6.37)	(−2.37)	(3.58)	(−5.00)	(−1.90)	(−1.54)
Internal credit enhancement	−0.08	0.11	0.11	−0.24*	−0.07	−0.15
	(−0.51)	(0.88)	(0.88)	(−1.84)	(−0.71)	(−1.28)
External credit enhancement	0.55**	0.21	0.23*	0.47*	0.15	0.12
	(2.40)	(1.43)	(1.77)	(1.86)	(1.07)	(0.78)
Size of tranche	−0.03	0.18*	0.17*	−0.27**	−0.14	−0.23**
	(−0.24)	(1.90)	(1.85)	(−2.20)	(−1.31)	(−2.40)
Fitch worse than Moody's	–	–	–	–	1.34***	–
	–	–	–	–	(6.26)	–
Fitch better than Moody's	–	–	–	–	−0.67***	–
	–	–	–	–	(−4.19)	–
S&P worse than Moody's	–	1.34***	–	–	–	–
	–	(5.74)	–	–	–	–
S&P better than Moody's	–	−0.81***	–	–	–	–
	–	(−4.00)	–	–	–	–
# notches Fitch is worse than Moody's	–	–	–	–	–	0.88***
	–	–	–	–	–	(9.77)
# notches Fitch is better than Moody's	–	–	–	–	–	−0.50***
	–	–	–	–	–	(−4.21)
# notches S&P is worse than Moody's	–	–	0.78***	–	–	–
	–	–	(7.67)	–	–	–

(*Continued*).

Table 7. Continued.

	Fitch–Moody's			S&P–Moody's		
	(1)	(2)	(3)	(4)	(5)	(6)
# notches S&P is better than Moody's	–	–	−0.56***	–	–	–
	–	–	(−3.76)	–	–	–
Time FE	yes	yes	yes	Yes	yes	yes
Issuer FE	yes	yes	yes	Yes	yes	yes
N	445	445	445	445	445	445
Rated jointly by Moody's, S&P, and Fitch	445	445	445	445	445	445
Adjusted R^2	0.39	0.66	0.71	0.36	0.61	0.70
$F-$test	4.62	11.51	14.18	4.16	9.45	13.86
R^2change	–	0.26	0.32	–	0.26	0.34
F change	–	20.33	28.61	–	17.13	27.30
p change	–	0.00	0.00	–	0.00	0.00

Notes: The regression results reported in this table are based on a sample of 445 MBS tranches issued (at par) during the period 1 January 1999–31 December 2006 rated jointly by Moody's, S&P, and Fitch. In regressions (1)–(6), we regress the dependent variable on Moody's rating category dummies (the control rating agency), external credit enhancement, and internal credit enhancement. Other controls that are included but are not shown are time and issuer fixed effects. The dependent variable in regressions (1), (2), and (3) is the Fitch rating minus the Moody's rating. The dependent variable in regressions (4), (5), and (6) is the S&P rating minus the Moody's rating. Regressions (2) and (5) include directional dummies. Regression (2) includes dummies indicating whether the rating of S&P is better than or worse than that of Moody's. Regression (5) includes dummies indicating whether the rating of Fitch is better, equal to, or lower than that of Moody's. Regressions (3) and (6) include rating dispersion (absolute value of the notches difference between Moody's and S&P in regression (3), and absolute value of notches difference between Moody's and Fitch in regression (6)). See Table 3 for descriptions. The symbol '–' indicates that an explanatory variable is not included in the regression. The table shows the coefficient and *t*-statistic, corrected for heteroskedasticity, in parentheses.

***Parameter estimates for which zero falls outside the 99% posterior confidence intervals.

**Parameter estimates for which zero falls outside the 95% posterior confidence intervals.

*Parameter estimates for which zero falls outside the 90% posterior confidence intervals.

For regressions (1) and (4) in Table 7, all coefficients that are statistically significant at the 1% level have a negative sign for both Fitch and S&P. Note that the rating dispersion between Moody's and the other CRAs – measured in terms of the number of notches – tends to increase as ratings get worse. This finding is consistent with the results reported in Table 2 where we find that the rating differentials between Moody's and the CRAs increase down the rating scale. For example, in Table 7 a tranche that is rated Aa3 by Moody's, Fitch, and S&P provides, on average, a credit rating that is better with 0.85 notches (regression (1)) and 1.13 notches (regression (4)) for the same tranche. For Ba3, this difference has increased with 2.12 and 1.69 for Fitch and S&P, respectively.

Turning to regression (2), our results suggest that an S&P rating that is different than Moody's has a significant impact on the size of the difference and direction of the Moody's/Fitch gap. For example, when the S&P rating is lower than that of Moody's, Fitch provides a lower rating as well for the same tranche with, on average, a difference of 1.34 notches compared to a Moody's rating. If S&P provides a better rating than Moody's, then Fitch also provides a rating for the same tranche that is better with an average of 0.81 notches compared to Moody's. We find similar results when we investigate the difference between S&P and Moody's in regressions (5) and (6), only here we include a Fitch rating that is different than Moody's. It appears that a Fitch rating

that is different than Moody's has a significant impact on the size of the difference and direction of the Moody's/S&P gap. We interpret these results as evidence that in a split with Moody's, both Fitch and S&P provide credit ratings that are similar.

The importance of these results holds true in terms of the addition to the adjusted R^2. For example, including the size of the difference between Moody's and S&P into the Fitch equation (regression (3)), the R^2 increases significantly by 32% compared to the equation that does not take into account these differences (i.e. the first regression in the table). Repeating this exercise for S&P in regression (6), the addition of the Moody's/Fitch difference adds 34% to the R^2 compared with regression (4).

8. Conclusion

The information content of multiple credit ratings plays an important role in the policy debate regarding the role of ratings for structured finance securities. Given that the rating approach employed by S&P and Fitch are the same but differ from that of Moody's, we assess whether both ratings may produce redundant information for tranches that carry three credit ratings. We explain that the view of rating shopping would not be consistent with three ratings for a tranche where the rating assigned by Fitch or S&P is inferior to that of Moody's. We argue that adding an inferior rating where there are already two ratings would be a manifestation of rating risk which we define as the risk that a tranche was assigned a superior rating when in fact the rating should have been lower. Our regression results show no significant impact on a tranche's funding cost (as measured by the new issuance spread), if the additional credit rating (Fitch or S&P) is better than, or equal to Moody's. However, for both additional Fitch and S&P ratings that are lower than Moody's, we do find a highly significant increase in the funding cost for tranches that are rated within the medium-grade credit rating category only (between A1 and Baa3). The increase in funding cost associated with the addition of a Fitch rating is about 33 basis points on average and for S&P the increase is about 42 basis points. This is consistent with our view of rating risk, where investors view the addition of an inferior rating as a signal of uncertainty about the ratings because of the tranche's complexity. Furthermore, we find evidence suggesting that Fitch and S&P provide credit ratings that are identical in a split rating with Moody's.

Taken together, the evidence suggests that investors do not appear to perceive Fitch and S&P ratings as redundant when there are three ratings. Our evidence suggests that investors are concerned about ratings being wrong, especially for the more subordinated tranches that carry a lower credit rating and are typically more complicated to analyze from a credit perspective. This finding suggests that multiple ratings will produce useful information to the market about a tranche's credit risk and therefore supports the European Union's new rule of requiring at least two ratings to deal with reducing rating risk.

Notes

1. Much of the policy debate in the European Union regarding the CRAs has focused on four concerns: the quality of ratings, the need for independence and objectivity in the determination of ratings, the importance of transparency of the methodology used to assign a rating, and the potential anticompetitive effects in the credit rating industry due to the presence of only a few firms (see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2006:059:0002:0006:EN:PDF). There is an even more extensive and longer legislative history dealing with CRAs in the USA but because of space limitations, we do not summarize that here as it is not the focus of our paper.

2. For detailed discussions on the concerns with credit ratings for structured finance securities, see, for example, Mathis, McAndrews, and Rochet (2009), Ashcraft, Goldsmith-Pinkham, and Vickery (2010), Bolton, Freixas, and Shapiro (2012), and Opp, Opp, and Harris (2013).
3. Blankfein, CEO of Goldman Sachs, wrote: 'Too many financial institutions and investors simply outsourced their risk management. Rather than undertake their own analysis, they relied on the rating agencies to do the essential work of risk analysis for them'. (2009, 7).
4. Quoting the Bank for International Settlements report: 'Yet, the rating agencies' activities have the potential of being especially valuable in situations where investors face relatively high costs in assessing the structure and riskiness of a given instruments – that is, in structured finance' (Committee on the Global Financial System 2005, 34).
5. As we discuss in Section 2, recent examples include those focused on the demand for multiple ratings: Güntay and Hackbarth (2010) describe how adding an additional rating can produce information to reduce the uncertainty regarding the creditworthiness of a debt issue, Poon and Firth (2005), Skreta and Veldkamp (2009), and Sangiorgi, Sokobin, and Spatt (2009) explain that issuers shop for an additional rating in the hope of receiving a better rating.
6. For a list of all European CRAs already registered under the CRA Regulation, see http://www.esma.europa.eu/page/List-registered-and-certified-CRAs.
7. See also Moody's Investors Service (2007) on comparing ratings among the three major CRAs.
8. Investors in lower-rated instruments are less likely to be regulated than those who purchase higher-rated tranches (Moody's Investors Service 2007). Thus, in this market there is no regulatory obligation that issuers report three credit ratings. In that case, only weaker issuers in this market report an additional inferior rating to market the tranche, and consequently be associated with higher funding costs.
9. EURIBOR reflects the rate at which highly credit rated banks can borrow on an unsecured basis.
10. The Euromarket comprises the members of the European Union and includes countries that follow the monetary policy set by the European Central Bank.
11. Cantor, Gwilym, and Thomas (2007) investigated the results of a unique survey of 200 pension plan sponsors and investment managers in the USA and Europe regarding the use of credit ratings, and found that nearly all respondents used Moody's ratings according to their internal guidelines.

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