Rating Shopping in the CMBS Market

Andrew Cohen*

October 25, 2011

Abstract

Institutional features of many structured debt markets facilitate a practice in which the investment banks issuing and selling the securities can engage in "rating shopping" by hiring only those credit rating agencies (CRAs) that offer the most favorable ratings. This practice can induce upward ratings bias and may also distort CRAs' incentives to provide accurate credit opinions. This paper explores whether rating shopping can explain significant declines in observed AAA credit support levels for commercial mortgage-backed securities (CMBS) issued from 2001 to the end of 2007. Conditioning on ex-ante measures of credit risk used by the CRAs in determining AAA credit support levels for approximately $645 billion of conduit/fusion fixed-rate CMBS, I find significant relationships between variables that should not affect a CRA's view of the credit risk of a particular transaction but would affect issuers' and CRAs' incentives in an environment where rating shopping was present.

Keywords: Credit Ratings, Structured Finance, Commercial Real Estate, Commercial Mortgage-Backed Securities

*The Board of Governors of the Federal Reserve. Contact: andrew.m.cohen@frb.gov. The views expressed are those of the author and do not necessarily reflect the views of the Federal Reserve System or the Board of Governors.

1 Introduction

The behavior of the three major credit rating agencies (CRAs) — Moody's, Standard & Poor's (S&P), and Fitch — has been widely viewed as contributing to the recent financial crisis. Industry observers and policymakers have asserted that the CRAs' lax credit standards facilitated the issuance of structured debt that was highly rated but of questionable credit quality. Recently, Congress and other government agencies have taken steps to address perceived shortcomings in the rating process.[1] The practice of "rating shopping" in structured debt markets — whereby investment bank securities issuers hire only those CRAs that offer the most favorable credit ratings — has been cited as an underlying cause of inflated ratings leading up to the financial crisis. Others have argued that CRAs' reduced conservatism was entirely consistent with visions of a rosy future shared by most market participants.

This paper explores whether distortionary incentives created by rating shopping explain significant declines in observed AAA credit support levels for commercial mortgage-backed securities (CMBS) that were issued between 2001 and 2007.[2] Figure 1 documents the declines in credit support required for AAA-rated fixed-rate conduit/fusion CMBS over this period, and the cumulative delinquency rate for the mortgages backing these CMBS. Subordination levels decreased significantly through the end of 2004 and fluctuated somewhat but remained around 1200 bps from January 2005 through the end of 2007. Ex-post, mortgages that were originated from 2004 to 2007 have experienced higher delinquency rates, despite their shorter duration.[3] Against this backdrop, the CMBS market shut down for most of 2008 and the first half of 2009, and legacy CMBS experienced unprecedented ratings downgrades starting in the second half of 2009.[4]

[1] Title IX, Subtitle C of the Dodd-Frank Act requires the Securities and Exchange Commission (SEC) and a variety of other federal agencies to conduct studies or promulgate rules related to CRAs including: conflicts of interest; transparency; and reliance on ratings by government agencies. The Dodd-Frank Act also grants the SEC greater authority over CRAs. Prior to the passage of Dodd-Frank, the SEC engaged in several rulemakings related to CRA reform beginning in 2008. CRAs have also been the subject of civil lawsuits and investigations by several state attorneys general in the wake of the recent financial crisis.

[2] Credit support in the context of asset-backed securities refers to the amount of losses in the pool of assets backing the securities that would trigger a loss to a bondholder of a given seniority.

[3] Cumulative delinquencies are calculated through August 2011. A mortgage is considered to have been delinquent if it was ever 60 days past due, transferred to special servicing, foreclosed or liquidated.

[4] In the last half of 2009, for example, S&P downgraded more than than half of the junior AAA tranches for deals completed in 2006 and 2007.

To determine whether incentives related to rating shopping affected the ratings of CMBS, I attempt to explain observed AAA credit support levels for approximately $645 billion of conduit and fusion fixed-rate CMBS using the following two sets of variables:[5] (1) ex-ante measures of credit risk, which include novel hand-collected data on internal assessments of collateral quality made by the CRAs; and (2) variables that should not affect CRAs' views of the credit risk of a particular transaction but do affect issuers' incentives to shop for ratings and CRAs' incentives to inflate ratings when rating shopping is present.

The empirical results reveal that: (1) the relationship between ex-ante measures of credit risk and AAA subordination levels differed over time; (2) AAA subordination levels were affected by variables related to rating shopping incentives; and (3) these effects differed over time. Taken together, the evidence supports the claim that rating shopping contributed to the downward trend in credit support levels over the sample period. Identifying the specific channels whereby rating shopping affected AAA ratings is left for future work.

The remainder of the paper is organized as follows. Section 2 provides background on CMBS and CMBS-related research. Section 3 discusses research that is related to the incentives that are created by investor reliance on credit ratings and rating shopping. Section 4 describes the data and section 5 presents the regression results. Section 6 concludes.

2 Background

2.1 The CMBS Market

Over $800 billion of CMBS was issued from 2000 to 2007, accounting for about a quarter of all U.S. commercial real estate (CRE) lending.[6] The bonds sold in a given CMBS transaction differ by payment terms and seniority. The collateral pools for conduit/fusion deals have anywhere from 50 to 400 loans from different borrowers; fusion deals have a few loans with relatively larger balances, while conduit deals have a more equal distribution of balances. Conduit/fusion deals accounted

[5] Throughout the paper, I use the S&P and Fitch rating scale (e.g., AAA). Moody's ratings (e.g., Aaa) are mapped into their S&P/Fitch equivalents. The $645 billion represents about 85 percent of the CMBS issued during this period.

[6] Federal Reserve Flow of Funds.

for about 85 percent of the CMBS issued between 2003 and 2007. CMBS are among the most straightforward securitization structures: subordination is the only form of credit support for the bondholders (there is no retained excess spread or over-collateralization); each tranche is paid in order of seniority; and principal losses move from the bottom of the capital structure upwards.

The loans backing a given CMBS are established income-generating properties (loans on current construction and transitional properties are generally not securitized within CMBS) for which reasonably detailed historical accounting data are available. Given the availability of such data and the relatively small number of loans in a CMBS, CMBS ratings are much more dependent on a CRA's expertise in assessing the credit risk of specific loans than other types of asset-backed securities (ABS) such as residential mortgage-backed securities (RMBS). However, similar to ratings of RMBS, there is a significant degree of judgment about default and recovery correlations across loans.

CMBS loans generally have the following common characteristics: (1) a principal balance between $2 million and $15 million; (2) a fixed interest rate; and (3) a 30-year amortization term with a balloon payment due within 5 to 10 years (interest-only loans became more prevalent by 2006 and 2007). CRE is broadly classified into 6 categories: retail, office, industrial, multifamily, hotel, and healthcare. Individual mortgages are non-recourse; and, in the event of default, the mortgage is turned over to a CMBS special servicer for workout with the borrower or liquidation.[7] Importantly, there is virtually no prepayment risk associated with mortgages that back a CMBS; borrowers that wish to pre-pay are typically constrained to do so through some form of yield maintenance.[8]

2.2 CMBS Ratings

CMBS tranches are generally rated by two or three CRAs at issuance since regulatory requirements as well as public and private investment mandates have historically required two credit ratings to

[7] The special servicer often holds the first loss position, or B-piece, of the transaction. See Gan and Mayer (2007) for evidence on how special servicers resolve agency conflicts when they also hold the B-piece of a transaction.

[8] For example, defeasance, the most common prepayment practice, requires the borrower to deposit treasuries into the trust that mimic the terms of the underlying mortgage. As a result of the significant property appreciation that had occurred by 2006 and 2007, many commercial borrowers accepted refinancing penalties in order to cash out equity.

count toward portfolio-level rating targets.[9] Investment bank issuers size the tranches in a manner that is consistent with the CRAs' requirements.[10] Thus, if the CRAs that rate a particular deal both require 15 percent subordination for a tranche to receive an AAA rating, an issuer would never extend that tranche's subordination to be below 15 percent, since the entire tranche would then be rated less than AAA. Furthermore, at the AAA level, tranches are sized to the most conservative of the CRAs hired to rate the deal. For example, if an issuer hired Moody's and Fitch to rate a deal and their required AAA credit support levels were 14 and 15 percent, respectively, the issuer would size the junior AAA tranche to Fitch's required level of 15 percent to avoid a split rating (split ratings occasionally occur at the lower end of the capital structure).[11]

CMBS rating groups are run more or less independently of other structured product groups in CRAs due to the specialized knowledge required to rate commercial real estate.[12] The bulk of fees and resources go into ratings of CMBS at issuance, though part of the fees that are paid at issuance are for continuing surveillance. According to industry accounts, CRAs were compensated anywhere between 2 and 9 bps for deals completed in 2006 and 2007, with fewer bps paid for larger deals. The average amount of compensation per deal varied across the CRAs from about $1.25

[9] The term "CRAs" is used to refer to Moody's, S&P, and Fitch who are often collectively referred to as the "major CRAs." There are now three other Nationally Recognized Statistical Rating Organizations (NRSROs) that currently rate CMBS. Realpoint, whose fees are, for the most part, paid by a subscriber base composed of CMBS investors became an NRSRO after the sample period, in 2008. Kroll Bond ratings began rating CMBS in June 2011. DBRS, who was not included in the analysis, rated less than 5 percent of the CMBS issued during the sample and always did so in combination with at least two of the major CRAs.

[10] The size of the unrated bonds at the bottom of the capital structure is determined by negotiation between the issuer and the bond purchaser, or B-piece buyer.

[11] Through 2004, most CMBS transactions did not tranche the AAA bonds. That is, all of the AAA bonds had the same subordination level. In 2005, CMBS issuers began to tranche the bonds within the AAA rating category. In particular, issuers offered: (1) "super-senior" AAA bonds, which typically had 30 percent subordination; (2) "mezzanine" AAA bonds, which typically had 20 percent subordination; and (3) "junior" AAA bonds, which typically had credit support between 10 and 15 percent. Junior AAA bonds attracted investors that were interested in holding AAA-rated debt with a relatively long term (up to 10 years). Whereas the CRAs' effective sizing of the AAA portion of a transaction determined the subordination of all of the AAA bonds prior to 2005, the advent of within-AAA tranching implied that the CRAs were now effectively determining the size of the junior AAA tranche. (It is certainly possible that a CRA could have sized the AAA tranches to a subordination level greater than 20 percent thereby reducing the size of the mezzanine AAA tranche and leaving no junior AAA bonds; however, this did not occur between 2005 and 2007). A junior AAA bond would have the same probability of default as an untranched AAA bond with identical collateral and credit support, but a much greater loss given default since losses would be shared over a smaller group, thereby increasing the bond's expected loss; this would have been accounted for in Moody's rating model, but not S&P's or Fitch's, which were based solely on the probability of default.

[12] The instructor of a course in structured finance given by Moody's characterized the differences between rating CMBS and other ABS by relating how CMBS analysts were interviewed. The first question they were asked during the interview was to estimate the current market value of the Moody's building based on their observations from the short time they had been inside.

million to almost $2 million.

Each of the three CRAs uses a different quantitative model to determine AAA subordination levels. Across the models, however, there is a common over-arching methodology based upon: (1) "re-underwriting" the loans in the collateral pool to reflect the CRA's view of each property's stable cash flows, which are used to derive the debt-service coverage ratio (DSCR) and loan-to-value ratio (LTV) for each loan[13]; (2) subjecting the loans to a stressed default and recovery model based upon the CRA's re-underwritten DSCR and LTV; and (3) accounting for concentration risks within the collateral pool. The numerical outputs of the rating model may then be adjusted by the CRAs to account for risks that they believe were not captured by the model.[14]

2.2.1 CRA Participation Shares

Prior to an issuer's hiring two or three CRAs to rate a transaction, all three CRAs receive financial information about the mortgages in the collateral pool and, after discussions with the issuer, indicate what credit support levels would hypothetically be required for different tranches to obtain particular letter ratings. While these levels may change slightly after CRAs are hired, industry sources have indicated that there is an unspoken expectation that credit support requirements would not increase substantially from the reported preliminary levels.

While one might expect issuers to hire the CRAs that offer the most generous ratings, there are reasons why this might not be the case. First, industry accounts suggest that investors held heterogenous beliefs about CRA quality. Second, if the issuer placing any of the lower-rated tranches of the CMBS into a collateralized debt obligation (CDO), it could avoid having those tranches "notched", by hiring the same CRAs to rate the CMBS as it expected to rate the CDO.[15]

Table 1 shows how issuers split their total U.S. CMBS originations among the CRAs from 2000 to 2007. Of the $800 billion in CMBS that was issued during this period, which accounted for

[13] The common method for valuing commercial real estate is to divide a property's stabilized net operating income by a measure of the market rate of return for commercial real estate (known as a capitalization, or "cap," rate).

[14] See FCIC Report, page 121 for a discussion of the role that out-of-model adjustments played in determining subordination levels for mortgage-backed securities rated by Moody's.

[15] When determining credit support levels for CDOs, CRAs used models based on the ratings of the bonds in the CDO pool. A bond that was not rated by the same CRA rating the CDO would be notched, that is, treated as if it had been rated by the CRA rating the CDO, but that it had received a lower rating.

about a quarter of all U.S. commercial real estate originations, 85 percent, by balance, was from the fixed rate conduit/fusion transactions. The distribution of rating business across the CRAs shows that Moody's-plus-S&P was the most frequently observed CRA combination over the period. The share of CMBS rated by all three CRAs generally increased over the period as well.

The market shares across the different CRA combinations are used to derive "participation shares" that represent the share of transactions for which each CRA was hired to issue a credit rating counting back three months from two weeks prior to the observed transaction. The maximum for each CRA is 100 percent, but the shares over most periods add up to more than 200 percent since some of the deals were rated by three CRAs. Participation shares at a given point in time may capture a variety of factors including investor acceptance of a particular CRA as well as historical relationships between CRAs and the issuers engaged in recent transactions.

Figures 2A-C plot three-month participation shares for the three CRAs as well as points at which each CRA had the lowest participation share. In calculating participation share measures, I use all of CMBS transactions and not just fixed-rate fusion/conduit deals. Thus, the measures should provide a sense of the state of competition over the universe of CMBS transactions.

Figures 2A-C reveal two interesting patterns. First, the participation shares of S&P and, to a somewhat lesser extent, Moody's, suggest that the two firms were the "market leaders" over the course of the sample in the sense of having consistently higher market shares than Fitch. However, although Fitch spent most of this period with the lowest participation share and S&P spent most of this period with the highest participation, both Moody's and S&P experienced periods in which they had the lowest participation shares. Based solely on the observed participation shares, and without any specific knowledge of the CRA industry, one might infer that the state of competition fluctuated over the period, as evidenced by periods in which the market leaders and market followers leapfrogged one another in terms of participation shares.

2.2.2 Sources of Variation in Participation Shares

The variation in participation shares over time may reflect many factors, including equilibrium effects due to rating-shopping behavior. While the purpose of this paper is not to explicitly model

the CRA selection process, it will be useful, as a descriptive exercise, to get some sense of potential sources of variation in CRA participation shares that may not be directly due to rating shopping. Table 2 provides the results of a series of regressions that relate Fitch's three-month participation share to CMBS-related market outcomes as well as the identity of the investment banks that were bringing CMBS to deals to market in a given timeframe. Each observation represents a three-month moving average, computed for each month in the sample.

The secondary market (on-the-run) spread between BBB-rated and AAA-rated CMBS is generally associated with an increase in Fitch's participation share in three of the four specifications. This suggests that Fitch was more likely to be hired during periods in which the premium for AAA-rated CMBS was relatively large. The amount of deal flow measured by the number of deals in a given month was also associated with an incerase in Fitch's participation share in one of the four specifications, possibly suggesting that capacity constraints at the other CRAs benefitted Fitch. Finally, a one standard deviation increase in the ratio of CRE_CDO volume to CMBS volume is associated with about a 2.5 percent decrease in Fitch's particpation share. Given the relative dominance of Moody's and S&P in rating CDOs, investment banks would likely find it advantageous to obtain ratings from Moody's and S&P to the extent that they expected any tranches of a CMBS to be resecuritized.

In addition to market activity that might be unrelated to rating shopping, per se, idiosynchratic investment bank preferences may have generated variation in Fitch's participation share over time to the extent that investment banks did not bring deals to market at uniform intervals. Riddiough and Zhu (2009) provide some evidence that relationships between investment bank issuers of CMBS and CRAs affect which CRAs are hired to rate particular deals. The estimates on the bottom panel of Table 2 provide additional support for this finding. Fitch had larger participation shares in periods where Bear Stearns, Credit Suisse, JP Morgan Chase, Merrill Lynch, and Morgan Stanley accounted for a relatively high proportion of CMBS issuance. Thus, exogenous variation in the timing of investment bank issuers can also explain some of the variation in Fitch's participation share.

2.2.3 Possible Effects of Competitive Environment on Rating Shopping

To understand how the competitive environment, at a given point in time, relates to rating shopping incentives an equilibrium model of CRA selection reflecting heterogeneity of both investor and issuer preferences for different CRAs, and how those preferences interact with subordination levels to determine issuers' profits. For example, a more equal division of participation shares among the CRAs may suggest a period in which "prices" have effectively leveled out the effects of investor and issuer preferences.[16] At such points, issuers may have greater scope for rating shopping if the three CRAs are viewed by investors as close substitutes, whether or not the CRAs issued biased ratings.[17] In this type of environment, rating shopping distortions could arise from a *selection effect*, to the extent that the issuer chooses to hire the two rating agencies with the lowest AAA subordination levels, as well as *competitive laxity*, if the CRAs respond to competitive pressures by relaxing their credit standards.

Whether the competitive environment affects competitive laxity depends not only upon whether CRAs were willing to provide biased ratings, but also upon inferences about how the current state of competition affects the likelihood of each CRA's being hired as a function of the preliminary subordination levels it reports to the issuer. Such equilibrium inferences are likely to be complicated and different across the CRAs. For example, a relatively large participation share for Fitch could signal that it is more likely to be hired, all else being equal, putting less pressure on it to reduce subordination levels. However, Moody's and S&P would be less likely to be hired resulting in more pressure to reduce subordination levels. It is therefore difficult to predict how these differing incentives might be reflected in the equilibrium quantity — the observed subordination level determined by the maximum subordination level required from the two or three CRAs hired by the issuer.

[16] "Prices" incurred by issuers refers to both rating fees, for which there is little evidence of competition prior to the crisis, as well as CRAs' subordination level requirements, which can be construed as shadow prices paid by issuers.

[17] Without any rating bias on the part of the CRAs, heterogeneity across CRA rating models, if it were not systematic, could result in a more even distribution of participation shares because it gives issuers greater scope to shop for ratings as long as investor preferences over CRAs are not too dispersed; this is similar in spirit to observations made by Sangiori, Sokobin, and Spatt (2009) and Skreta and Velkamp (2009).

3 Related Literature

Part of the earlier literature on CRAs focused on reputational incentives for CRAs. White (2002) argues that the incentives of the CRAs to provide accurate ratings to market participants have been distorted by (1) rents that accrue to the CRAs as a result of the widespread use of ratings in regulatory requirements for financial firms and (2) the issuer-pay business model in which the CRAs are compensated by debt issuers rather than investors. Other papers have hypothesized that CRAs are subject to reputational concerns that are sufficient to keep their incentives aligned with those of investors (see, for example, Smith and Walter (2002)).

Covitz and Harrison (2003) provide empirical evidence supporting the reputation hypothesis for the corporate bond market. Distortionary incentives associated with the issuer-pay model, however, are likely to be more pronounced for securitizations than more traditional debt markets such as corporate bonds, commercial paper, or municipal bonds for several reasons. First, the average securitization is significantly larger, with larger associated rating fees, than traditional debt offerings. Second, there are also fewer investment bank issuers of structured debt than other forms of debt, consistent with greater monopsony power vis-a-vis the CRAs.[18] Third, the practice of having all interested CRAs provide an issuer with preliminary subordination levels prior to the issuer's hiring decision provides an explicit opportunity for issuers to shop for ratings. Fourth, it is not economical for CRAs to provide unsolicited ratings at the time of issuance for structured debt, which further solidifies the issuers' ability to shop.

White's (2010) review of the evolution of CRA market structure and Mason and Rosner's (2007) review of features of RMBS and CDO ratings provide important institutional context for understanding a variety of recent theoretical papers on credit ratings. Opp, Opp, and Harris (2011) suggest that ratings create opportunities for regulatory arbitrage. Beatriz (2010) studies the determinants of CRAs' decision about how much of their private information to reveal through ratings, and how this decision is affected by the state of competition. This paper addresses questions related to some of the earlier papers in the industrial organization literature on information inter-

[18] For example, the top five investment bank issuers/underwriters of CMBS from 2003-2007 accounted for 56 percent of deal volume, with seven other banks comprising substantially all of the remaining 44 percent.

mediaries.[19] Skreta and Veldkamp (2009), Sangiorgi, Sokobin, and Spatt (2009) and Sangiorgi and Spatt (2011) consider how rating shopping by issues, without any competitive response from the CRAs, affects security design and information revelation and aggregation. Bolton, Freixas, and Shapiro (forthcoming) and Mathis, McAndrews, and Rochet (2009) explicitly model strategic CRAs who can inflate ratings to secure issuers' business or increase their fees by facilitating larger transaction volume. Bolton, Freixas, and Shapiro et al find that competition exacerbates this distortion. Both papers discuss policy options to, among other things, mandate that CRAs be selected by an entity other than the issue.

Empirical work on structured finance ratings has had to address the difficulty in separating out the following factors that determine observed ratings: (1) the resources devoted by the CRAs to assessing credit quality; (2) a CRA's conceptual approach to analyzing credit quality; (3) rating inflation by the CRAs induced by competition for issuers' business; and, (4) selection effects caused rating shopping by issuers, which can persist without rating inflation. This challenge is apparent in the following industry perspective on an alleged episode of ratings inflation in the MBS market. It is notable that the article, which appeared in the *Paine Webber Mortgage Strategist*, was written in *1997*.

> In the early 1990s, however, the ratings "monopoly" was shattered by the entrance of Fitch and Duff & Phelps into the whole-loan rating business. Investors were willing to accept a Fitch or Duff & Phelps rating as long as either S&P or Moody's also rated the deal. This gave issuers the opportunity to play S&P and Moody's off against each other.... This strategy cut deeply into both Moody's and S&P's earnings.... Fitch picked up virtually all the slack. Pressure began to build at both Moody's and, particularly, S&P to recapture lost revenues.
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> In December 1993, S&P made the first move to stem the hemorrhaging in their whole-loan business by announcing new research.... At first glance, the change appeared rating neutral, but in fact, the change caused a significant drop in credit support requirements. Moody's reaction to S&P's move was immediate, but unexpected and

[19] See, for example, Lizzeri (1999) and Ely and Valimaki (2003).

truly misunderstood in the market. They simply started to rate new issues regardless of whether the issuer asked them.... The approach failed to turn Moody's fortunes around. In November 1996, Moody's decided it was time for a change.... They released new research...the net impact of the change, however, was a dramatic drop in credit support levels...This alternative response to S&P worked extremely well.... Moody's paid market share jumped 20 points...the month after the change [October 1996].

S&P's counter-response to Moody's new approach was swift. In January 1997 S&P launched their new model named Levels 5.0a.... The net effect of the change was a drop in credit support requirements, and...the issuers responded to the change almost immediately. S&P's paid market share jumped 33 points in the month of the change, most of which was at Moody's expense.

— *Paine Webber Mortgage Strategist, June 1997*

Researchers studying CMBS and other ABS markets since the crisis have been sensitive to the difficulty caused by the fact that positive contemporaneous data and beliefs about the future could have been used to justify lower subordination levels.[20] Against this backdrop, Stanton and Wallace (2011) and Riddiough and Zhu (2009) investigate the causes and pricing implications for the decline in AAA subordination levels for CMBS and focus on regulatory arbitrage and issuer-CRA relationships, respectively. Both papers are similar in spirit in that they explain CMBS subordination using a combination of credit-relevant variables and also look for causes of unexplained variation that might be attributable to variables that are not necessarily credit relevant.

Stanton and Wallace examine a variety of possible credit-driven explanations for declining subordination levels and find that none adequately explains changes in subordination levels. Their conclusion was that the CRAs simply rated CMBS differently. They suggest that ratings-capital arbitrage, consistent with theoretical findings from Opp, Opp, and Harris (2010), for AAA-rated CMBS was introduced at the beginning of 2002 by more favorable risk-based capital weights specific to AAA-rated CMBS. Stanton and Wallace, along the lines of Opp, Opp, and Harris, argue that the presence of ratings-capital arbitrage may have reduced the incentives of CRAs to ob-

[20] See, for example, Nomura Fixed Income Research, March 15, 2005.

tain information. In addition, they show that, subsequent to the regulatory change, AAA CMBS spreads tightened relative to other rating categories and asset classes not affected by the new capital treatment, consistent with theoretical predictions under ratings-capital arbitrage.

Riddiough and Zhu come to a similar conclusion about the ability to fully explain changes to CMBS subordination levels using only credit-relevant covariates. They find that unexplained differences in subordination levels can be partially attributed to different types of issuer-CRA relationships. Certain issuers appear to use long-term relationships in order to cultivate more favorable ratings, while other issuers appear to switch to different CRAs in an effort to obtain the most favorable rating while possibly establishing a credible threat that they will shop for ratings in the future. Interestingly, Riddiough and Zhu find that while AAA CMBS prices account for observable credit-relevant covariates over and above the AAA rating, prices do not appear to account for issuer-CRA match effects that led to differences in predicted subordination levels.

This paper takes a similar approach to Stanton and Wallace as well as Riddiough and Zhu in the sense that the first attempt to explain subordination levels is by appealing to credit relevant characteristics at the time of origination. It is also quite similar in spirit to Ashcraft, Goldsmith-Pinkham, and Vickery's (2010) study of subprime and Alt-A RMBS subordination levels. Their main explanatory variable is a constructed expected default rate that that is based on the performance of mortgages in their sample up through the date of each RMBS transaction. I use a similar variable, and have generally tried to use explanatory variables that appear in descriptions of the CRAs' rating models made by the CRAs themselves. To be clear, this paper does not attempt to replicate the CRAs' rating models, but rather to include, to the extent possible, the same information used by the CRAs to rate each issue.

The identification strategy in this paper is similar to Becker and Milbourn (2010). They are able to infer reductions in rating quality using variation in the level of Fitch's market acceptance across different industry segments of the corporate bond market. Becker and Milbourn exploit the fact that Fitch's relative competitive position within the different industry segments of the corporate bond market did not increase uniformly. In particular, in the industries in which Fitch had made substantial gains in market share, Becker and Milbourn find that Moody's and S&P's

ratings appeared to be of lower quality to investors, as evidenced by wider spreads, than comparable ratings in industry segments where Fitch was relatively weak. In this paper, I show that when competition among the CRAs, measured by a variety of metrics including Fitch's market share, was greater, subordination levels were lower, all else being equal.

4 Data

Most of the data used in this paper, except as otherwise noted, came from Morningstar, Inc.'s Realpoint subsidiary, which maintains a comprehensive database of loan and deal-level information covering substantially all outstanding CMBS.[21] I have tried, as much as possible, to select variables similar to what the CRAs reported to have used as inputs into their rating models and to construct those variables based only on data that would have been available to the CRAs at the time of each transaction.,

4.1 Credit-Relevant Explanatory Variables

In order to best re-create the credit-relevant information available to the CRAs at the time of each transaction, I construct three sets of variables that are explicitly or implicitly present in CRAs stated rating guidelines: (1) the underwriting characteristics of the loans in the collateral pool; (2) public signals correlated with expected pool performance at the time of securitization; and (3) measures of the diversification of the collateral pool.

4.1.1 Loan characteristics

DSCR and LTV are the key drivers in each of the CRAs' ratings models as they determine the probability of default and losses given default. The CRAs have different approaches in how their models treat term default — which is associated with insufficient DSCR to cover payments during the term of the loan — and balloon default, which is typically associated with an LTV that makes it impossible to refinance. Losses in the event of a default are determined by the LTV.

[21] Realpoint provides CMBS data and analysis to investors, and became a NRSRO in 2009. Realpoint rates all legacy CMBS and RMBS as a service to its subscribers and also provides issuer-solicited ratings for new CMBS.

In addition to the LTV, I have included a variable that quantifies the amount of equity in the pool built through amortization. This equity measure is the proportion of the pool's initial principal balance that has been paid down in each loan and would not need to be repaid when the loan's the balloon payment is due. I have also included a measure of cross-collaterlization (i.e., having different properties on the same loan) since the CRAs have referred to cross-collateralization as a form of diversification. Specifically, I compute the loan balance per property for each loan in the pool. I then take the difference between the total pool balance and the sum of each loan's per-property balance (i.e., the loan balance divided by the number of separate properties in the loan), as a percent of the total pool. Thus, a pool where each loan is collateralized by a single property would have zero cross collateralization, while a pool where each loan was collateralized by two properties would have 50 percent cross collateralization.

4.1.2 Contemporaneous expectations of performance

Through the early 2000s, CMBS was considered to be a relatively immature type of security. As more performance data continued to be observed, industry observers reported that market participants and the CRAs generally became more comfortable with the credit quality of CMBS, as discussed in Section 2. Along the same lines, to the extent that delinquency rates were declining over the sample period, the CRAs may have had greater confidence in the performance of the underlying collateral, although this effect could have been reflected in underwriting measures such as LTVs and DSCR. To account for this effect, I construct a measure of the pool-level delinquency rate that the CRAs might have expected for each transaction by matching observed contemporaneous delinquency rates by property type to the distribution of property types within the collateral pool.[22] Changes to this variable over time could reflect either changes in delinquency rates or changes in the composition of property types within transactions, or both.

I have also included the three-month moving average secondary market spread for CMBS that were rated AA (as reported by Citibank) as an explanatory variable. While the CRAs do not claim to use market prices in their rating models, it is possible that market prices could reflect

[22] Delinquency rates, reported by Citibank, are for loans that have already been securitized into a CMBS and are measured one month prior to the transaction.

current information about CRE used by the CRAs and not otherwise captured by the explanatory variables. Using spreads for AA-rated CMBS is appropriate because AA-rated bonds are most likely to capture changes in market perception of risk in the CRE sector as a whole. AAA-rated CMBS is likely to be less responsive to changes in CRE fundamentals due to the additional credit support given to AAA-rated tranches. Information about the CRE sector present in lower-rated spreads may be being confounded by technical considerations such as derived demand from CDOs; bonds rated A or below were often re-securitized into CDOs, making spreads on these bonds largely dependent on CDO spreads.[23]

4.1.3 Diversification measures

CRA rating criteria include measures of concentration based on loan balances, originators, geographic locations, and property types. CRAs' methodologies either treat concentration risk by explicitly modeling default correlations or by making ex-post adjustments to the subordination that are implied by stressed default and recovery models.[24] The CRAs may use different measures of concentration for each category, including: top 5 share; top 10 share; and the Herfindahl Hirschman index (HHI), that is, the sum of the squared shares. For the sake of brevity, I have reported results that use the HHI, though, results using top 5 or top 10 shares are substantially similar.

4.1.4 CRA-specific credit assessments

This is the first paper to address the fact that the DSCR and LTV data that are available to researchers are not the DSCRs and LTVs used by the CRAs in determining subordination levels. Each of the CRAs re-underwrites the loans in a CMBS pool to determine DSCRs and LTVs that reflect their particular view of each loan's credit quality.[25] These re-underwritten loan variables

[23] While the inclusion of AA on-the-run spreads is significant in many of the specifications, not including it does not qualitatively change the estimates of the other explanatory variables.

[24] The approaches are not mutually exclusive. Moody's and Fitch, both of which make use of explicit default correlation models, also may make ex-post adjustments to default and recovery model implied subordination levels based on concentrations in areas that are not explicitly accounted for in the correlated default and recovery model.

[25] The CRAs typically undertake a detailed re-underwriting exercise for anywhere from 50 to 80 percent of the loans in a pool and impute haircuts for the other loans. Realpoint claims to re-underwrite every loan in any new issue that they rate.

are then subjected to a stress scenario with an associated default and recovery for each loan that is aggregated to determine pool-level losses for each stress. In order to reconstruct the information used by the CRAs as closely as possible, I collected over 750 pre-sale reports that were written by the CRAs and were provided to investors as part of each deal prospectus. For each transaction in the dataset, I extracted the CRA-adjusted weighted average DSCR and LTV for the transaction, as reported by the CRA.

Figure 4 provides a graphical representation of the differences between the loan originators' underwritten DSCRs and those of each CRA.[26] The inset at the bottom right of the figure describes the weighted average haircuts, as a percent of the originator-underwritten DSCR values, applied by each of the CRAs. The larger originator-underwritten DSCRs in the graphs reveal a greater level of optimism than is true for the CRAs about the income-generating potential of the properties. The DSCRs as underwritten by the CRAs generally trended downward from 2004 to 2007, though the average haircuts do not appear to have a discernible pattern within or across CRAs.

Figure 5 provides a graphical representation of the differences between the loan originators' underwritten LTVs and those of each CRA. Originator-reported LTVs remained around 70 percent on a weighted average basis throughout the period. The CRA-adjusted LTVs trended upward to over 100 by 2006 and 2007, which is generally regarded to be the peak of aggressive loan underwriting. The increasing adjustments to the LTV may reflect increasing cash flow haircuts (which are most easily seen in DSCRs) or less aggressive assumptions about the capitalization rates that are used to value properties.

In interpreting these figures, it is important to remember that, even though there are differences in the haircuts imposed by the CRAs, it is not possible to infer the magnitude for how these differences will be reflected in ratings. Each of the CRAs will treat its re-underwritten DSCR and LTV differently within its quantitative model. Thus, the CRA-underwritten variables may be most useful in identifying how a *given CRA* evaluated the credit worthiness of the collateral in one transaction relative to other transactions that it has rated. To obtain a measure of how much the CRAs' views of a deal's credit quality differed from that of the loan originators (whose reported

[26] Differences in the originator LTV (and DSCR in the following figure) across the CRAs reflect differences in the transactions that each CRA was hired to rate.

DSCRs and LTVs are already included in the regression), I measure the extent to which each CRA haircut the originators' DSCR and LTV, relative to how that CRA haircut DSCRs and LTVs for the other deals in the sample. The measures for each CRA are standardized, and I then compute the maximum relative haircut across the CRAs for each deal.[27]

4.1.5 Other explanatory variables

The identification of rating shopping and potentially other important non-credit factors that affected ratings is based upon identifying explanatory variables that one would not expect to reflect the credit quality of a particular transaction, but could affect subordination levels. The main rating shopping related variables are: (1) the participation shares of Fitch, defined as the share of transactions for which Fitch was hired to issue a credit rating counting back three months from two weeks prior to the observed transaction; and (2) dummy variables for whether Moody's and S&P had the lowest participation shares over the same three-month window. These were chosen because based on the observed participation shares, Fitch could be characterized as a market follower while both Moody's and S&P could be characterized as market leaders. The competitive measures are intended to capture periods in which issuers might have had greater scope for rating shopping and when CRAs faced greater competitive pressures to issue less conservative ratings. These measures, however, do not allow one to separate potential effects of issuer selection from competitive laxity by the CRAs.

The number of deals that occurred in the month during which each transaction went to market is included as an additional explanatory variable. It has been suggested by market participants that issuers placed greater weight on investors' preferences among the CRAs when issuers faced greater competition from other transactions. On the other hand, capacity constraints at the CRAs during peak times could result in lower effort to ascertain information about potentially problematic deal characteristics.[28] I have also included the log of deal size as a non-credit-relevant explanatory

[27] Thus, a value of 100 means that one of the CRAs applied a haircut that was one standard deviation larger than its average haircut, while any other CRA that rated the deal applied a haircut less than or equal to one standard deviation larger than its average haircut.

[28] See, for example, http://www.marketwatch.com/story/competition-lack-of-data-drove-flawed-ratings-2010-04-23 for a discussion of concerns about capacity constraints at the CRAs.

variable since, conditional on pool-level concentrations, the effect of deal size on pool losses is likely to be of second order importance.[29]

Finally, I include dummy variables for deals that were rated by all three CRAs as well as deals that were rated by Fitch and either Moody's or S&P — the reference group comprises deals rated by Moody's and S&P. Deals that were rated by three CRAs could be associated with higher subordination if the choice to hire three CRAs was exogenously given, such as a situation where a large investor required it. However, issuers might choose to hire all three CRAs only when the marginal effect on subordination that is associated with hiring the third CRA is minimal. Deals that were rated by Fitch and only one other CRA could indicate rating shopping to the extent that Fitch was less preferred by investors than Moody's and S&P. In this case, issuers (holding fixed any idiosyncratic preferences) would find it in their interests to hire Fitch only when doing so resulted in substantially lower AAA subordination — regardless of whether or not CRAs reported biased ratings.

4.2 Vintage Breakdown

The earlier discussion of Figure 1 showed the presence of significant declines in AAA-rated CMBS subordination levels over the sample period. Possible explanations, absent rating shopping, include: (1) an increase in the credit quality of CMBS as measured by underwriting variables or pool diversification measures; (2) updated beliefs on the part of the CRAs about the expected performance of collateral with given observed characteristics; and (3) a belief on the part of the CRAs that less conservatism was appropriate as CMBS, a relatively new asset class in the early 2000s, became better understood by market participants,[30] and continued to experience positive performance and gained investor acceptance (as evidenced by increased issuance and tightening spreads).

As discussed earlier, Stanton and Wallace (2011) provide evidence that changes to the collateral

[29] Larger transactions with similiar HHIs would likely be associated with larger-sized loans. If the CRAs believed that larger-sized loans performed differently, but had not otherwise accounted for this effect in their DSCR and LTV adjustments, it is possible that larger deals could be associated with different subordination based on credit quality. Evidence from Black, Chu, Cohen, and Nichols (forthcoming), as well as Yildirim (2008) suggests that larger CMBS loans have higher observed default probabilities.

[30] See Riddiough and Chiang (2004) as well as Nomura Fixed Income Research, March 15, 2005.

backing CMBS did not suggest increasing credit quality. Figures 4 and 5, which describe the CRAs' adjustments to originator-underwritten DSCRs and LTVs reveal that, if anything, the CRAs held a dimmer view of the underwriting of the individual mortgages comprising new-issue CMBS. Taken together, the evidence strongly suggests that something changed in the CRAs' approach to rating CMBS over the sample period. In particular, it seems reasonable to assume that the CRAs revised their views about *the fundamental relationship between credit characteristics and pool performance*, as translated through subordination levels.

To address this possibility, I have split the sample into three vintages: 2001-03, 2004-05, and 2006-07. Table 3 provides summary statistics for all explanatory variables in each of the time periods, which reveal some interesting patterns:

Originator-reported LTVs stayed reasonably constant between 68 and 69 percent. CRA haircuts to LTVs, however, increased markedly over the period. Relative to the average haircut during the period, the CRAs haircuts to originator LTVs were 70 percent lower than the sample average during 2001-03 and 126 percent higher during 2006 and 2007, indicating a declining view of originators' underwriting. Expected delinquency rates based on current delinquencies was the highest, 125 bps, over the 2004-05 period, and significantly lower, 55 bps for the 2006-07 period, which would be consistent with a rosier view of overall credit quality, notwithstanding changes in CRA adjustments to originators' underwriting variables.

Not surprisingly, loans made in 2004 through 2007 had less equity built in due to the prominence of interest-only or partial interest-only mortgages. Cross-collateralization, cited as a source of loan-level diversification, increase markedly during the period. Collateral pools appeared to become somewhat more concentrated according to the Herfindahl measures during the 2004-05 period, and then became somewhat more diversified during 2006 and 2007. In addition, more transactions and larger transaction sizes were observed in the later period.

Fitch's participation share increased from about 57 percent in 2001-03 and 2004-05 to 65 percent in 2006-07. Moody's spent around 16 percent of the 2001-03 and 2004-05 periods with the lowest participation share, but around 25 percent of the 2006-07 periods with the lowest partici-

pation share.[31] S&P spent around 16 percent of the 2001-03 and 2004-05 periods with the lowest participation share, but did not ever have the lowest share during the 2004-05 period. Finally, transactions that were rated by all three CRAs became more prevalent over time, increasing from 3.6 percent during 2001-03 to 7.4 percent and 10.7 percent in 2004-05 and 2006-07, respectively.

5 Results

Table 4a reports estimates from the baseline model. Because the estimates from that model are substantially similar to the other specifications (in Tables 4b-d), the main discussion will refer to Table 4a. The other tables will be discussed briefly at the end of this section.

The bottom portion of each table shows the results of hypothesis tests regarding differences in the parameter vectors across the three subsamples. Specifically, I test whether: $\widehat{\beta}_{2001-03} = \widehat{\beta}_{2004-05}$, $\widehat{\beta}_{2001-03} = \widehat{\beta}_{2006-07}$, $\widehat{\beta}_{2004-05} = \widehat{\beta}_{2006-07}$ and $\widehat{\beta}_{2001-03} = \widehat{\beta}_{2004-05} = \widehat{\beta}_{2006-07}$. Chow-test statistics and associated p-values are presented for each test described above. All of the test statistics show significant differences in the relationship between the explanatory variables and observed AAA subordination across all vintages; the 2004-05 and 2006-07 vintages are the most similar, but the differences are still significant at the 1 percent level. The table reports results for the pooled regression, but most of the discussion focuses on the three time periods.

5.1 Credit-Relevant Explanatory Variables

Most studies of CMBS subordination levels have found statistically insignificant effects associated with greater DSCRs. I found similar results for both the 2001-03 and 2004-05 subsamples, but a negative and statistically significant effect of higher DSCRs on subordination for the 2006-07 vintage. Haircuts applied to the originators' DSCRs were not significant in any of the time periods.

The effect of LTV on subordination was significant throughout the sample, with higher weighted average (WA) LTVs being associated with greater subordination, but the effects decreased markedly

[31] Moody's lost substantial market share in the middle of 2007 after it revised its rating model and began requiring higher subordination levels. See "CMBS Issuers Mull Value of Moody's Rating," Commercial Mortgage Alert, December 7, 2007, or "Moody's in another hit on mortgage woes, ratings," Reuters, July 18, 2007.

from 2001-03 to 2004-05 and 2006-07. While a 1 percent increase in WA LTV would have been associated with 45 to 47 additional bps of AAA subordination in the early period, it was associated with increased subordination of 14 to 17 bps in 2004-05 and only 7 or 8 bps in 2006-07. More significant adjustments to originator-reported WA LTVs were associated with significantly more subordination in 2001-03, but not during the latter periods.

During the 2001-03 subsample, more expected delinquencies were, if anything, associated with lower subordination, while the effects for the 2004-05 and 2006-07 subsamples were negative and significant. Greater built-in equity was associated with lower subordination during the 2001-03 period, but had no significant effects on subordination during the latter two periods. Cross-collateralization was not significant for any of the time periods, although it is possible that the effects of cross-collateralization might be picked up in the DSCR and LTV measures for individual loans. Finally, wider AA on-the-run spreads were associated with significantly greater subordination levels in the early period, modest increases in subordination in the 2006-07 period, and no significant change in subordination for the 2004-05 vintage, perhaps due to the tight range of AA spreads during that period.

Loan size and originator concentrations resulted in greater subordination in all three periods. Property-type concentration was not associated with any significant change in subordination, and geographic concentration was actually associated with lower subordination during the latter two periods.

5.2 Other Explanatory Variables

Larger transactions were associated with significantly lower subordination levels during the 2001-03 and 2006-07 periods. For the 2001-03 vintage, a one standard deviation change in deal size, or $260 million, was associated with a decrease in subordination of between 75 and 84 bps. For the 2006-07 vintage, a one standard deviation change in deal size, or $1.3 billion, was associated with a decrease in subordination of between 15 and 21 bps.

The number of deals in a given month was significant, at the 10 percent level, during the two early vintages in some, but not all of the specifications. While some have suggested that lower

subordination levels may have been due to CRA staffs' being overworked (see *New York Times*, April 24, 2010, Page A1), the results do not provide strong evidence of such an effect.

The participation shares for Fitch are economically and statistically significant during the two latter vintages. During the 2004-05 period, a one standard deviation change in Fitch's participation share, about 10 percentage points, was associated with a reduction in AAA subordination of about 30 bps. During the 2006-07 period, a one standard deviation change in Fitch's participation share, 10.6 percentage points, was associated with a reduction in AAA subordination of about 24 bps.

The dummy variables capturing the effect of Moody's and S&P having the lowest participation share reveal some interesting patterns over the course of the sample. During the 2001-03 period, periods where Moody's had the lowest participation share were associated with a reduction in AAA subordination between 87 and 120 bps. There was no such effect for the 2004-05 vintage for Moody's or S&P (S&P never had the lowest participation share during this period). During the 2006-07 vintage, periods in which Moody's and S&P had the lowest participation shares were associated with a reduction in AAA subordination levels of between were about 27 bps and 41 bps, respectively, but these effects go away once one conditions on Fitch's participation share.[32]

Taken together, the patterns in the variables reflecting the state of competition indicate that changes to the competitive environment were associated with significant changes in subordination levels, conditional on a comprehensive set of control variables. Consistent with the anecdotal accounts cited in Section 3, a higher market share for Fitch could have represented a more credible threat to Moody's and S&P that issuers were willing to hire one, but not necessarily both traditional market leaders. It is interesting that this effect is significant only from 2004 onward, which was a period where subordination levels showed significantly less variation than during 2001-03. The fact that the effect of Moody's having the lowest participation share is significant for the 2001-03 period could suggest that Moody's competitive position, as evidenced by the difference in sensitivity of subordination levels to its market position over time, differed over the sample period.

The bottom two rows of Table 4a also show that the combination of CRAs that provided ratings

[32] In the pooled regression, the effect of S&P's having the lowest participation share is positive and significant. This is likely due to the fact that the periods in which S&P had the lowest participation share were concentrated in the 2001-03 period when subordination levels were much higher than those seen after 2003. Unlike the vintage-specific regressions, the pooled regression will pick up this effect.

appears to have had some effect on subordination levels. Deals rated by Fitch and either Moody's or S&P were consistently associated with lower subordination levels ranging from about 48-58 bps. This is consistent with an environment in which issuers hired Fitch primarily when doing so resulted in significantly lower subordination. It is worth noting, however, that this story only makes sense if the subordination that would have been required by Moody's and S&P were significantly different from one another.[33]

Deals rated by all three CRAs were associated with an increase in AAA subordination between 38 bps and 41 bps during the 2006-07 period, although this effect is not significant at the 5 percent level. It is unclear why issuers would have hired three CRAs if doing so increased subordination levels. It is possible that investors may have required all three CRAs to provide ratings for deals that had problematic features that may not have been captured by the control variables. In addition, subordination levels required by all three CRAs may have been similar enough that issuers believed that the additional revenue from obtaining a third rating would exceed the cost.

5.3 Alternative Specifications

Table 4b presents an alternative specification that does not include the dummy variables denoting the combinations of CRAs that rated each transaction. The statistical significance and magnitudes of the coefficients are substantially similar. Tables 4c and 3d are parallel to 3a and 3b but, in this case, I have not included any CRA-DSCR and CRA-LTV haircut variables. The results for the rating-shopping-related variables remain quite similar, as does the pattern in the explanatory variables. These results are as expected since the CRA haircuts are only significant for the 2001-03 vintage, which is the time period over which changes in the competitive environment were not associated with changes to AAA subordination levels.

[33] For example, if Moody's and S&P each required the same level of AAA subordination, and Fitch required less, hiring Fitch to rate the transaction with either Moody's or S&P would not change the ultimate AAA subordination level relative to hiring Moody's and S&P.

6 Conclusion

This paper contributes to our understanding of CMBS ratings and the possible role of rating shopping from 2001 to 2007. First, this paper documents the changing relationship between measures of credit risk and AAA credit support over time. This study adds to the existing body of work studying CMBS subordination by including variables that capture the CRAs' internal assessments of a transaction's credit quality. The documented changes to the manner in which characteristics of collateral pools translated into AAA subordination levels are generally consistent with less conservatism in rating CMBS. Second, this paper adds to the literature trying to identify non-credit relevant determinants of ratings, be they rating shopping, investments in quality, excessive workloads, or something else. The evidence suggests that the state of competition affected ratings from 2004 onward, which is consistent with rating shopping behavior on the part of issuers that may have been responded to by competitive laxity on the part of the CRAs. The methods employed in this paper, however, do not separately identify these two effects. That is left for later work.

The evidence provided in this paper may be useful in evaluating policy options that have been suggested to address shortcomings in the rating of structured debt. Notwithstanding the strong evidence about the effects of rating shopping, regulatory interventions into the ratings market must balance several considerations. First, investment banks and originators incur non-trivial sunk costs that are associated with bringing a securitization to market *before* they observe the final credit ratings of the CRAs.[34] Well-functioning securitization markets require some certainty about whether a particular transaction makes economic sense, and as a result, investment banks need to communicate with the CRAs early on, but this early communication is one of the very mechanisms that enables rating shopping. Second, retail institutional investors may not have sufficient bargaining power with investment banks and affect change in the industry unilaterally.[35] And third, many institutional investors may lack the resources needed to assess the risks associated

[34] See "Goldman-Citi Offering Is Pulled Over Ratings," *Wall Street Journal,* Markets Section, July 29, 2011, for a description of the consequences of a recent situation in which S&P pulled out of rating two transactions just prior to their going to market.

[35] This may be changing, as industry accounts suggest that AAA investors have recently been requiring concessions from issuers, such as removing specific loans from the collateral pool and even higher subordination levels than required by the CRAs. See, for example, "Investor Protections Beefed Up in Latest CMBS Offering," *Wall Street Journal*, Real Estate Section, August 12, 2011.

with each transaction that comes to market. Without these institutional investors, the prospects for securitization markets going forward would be severely impaired. Thus, there is a strong public good component to improving the quality of information and analysis available to participants in structured debt markets. Government policy with respect to the issuer-pay business model may well determine whether such information and analysis is provided by CRAs or perhaps some other source.

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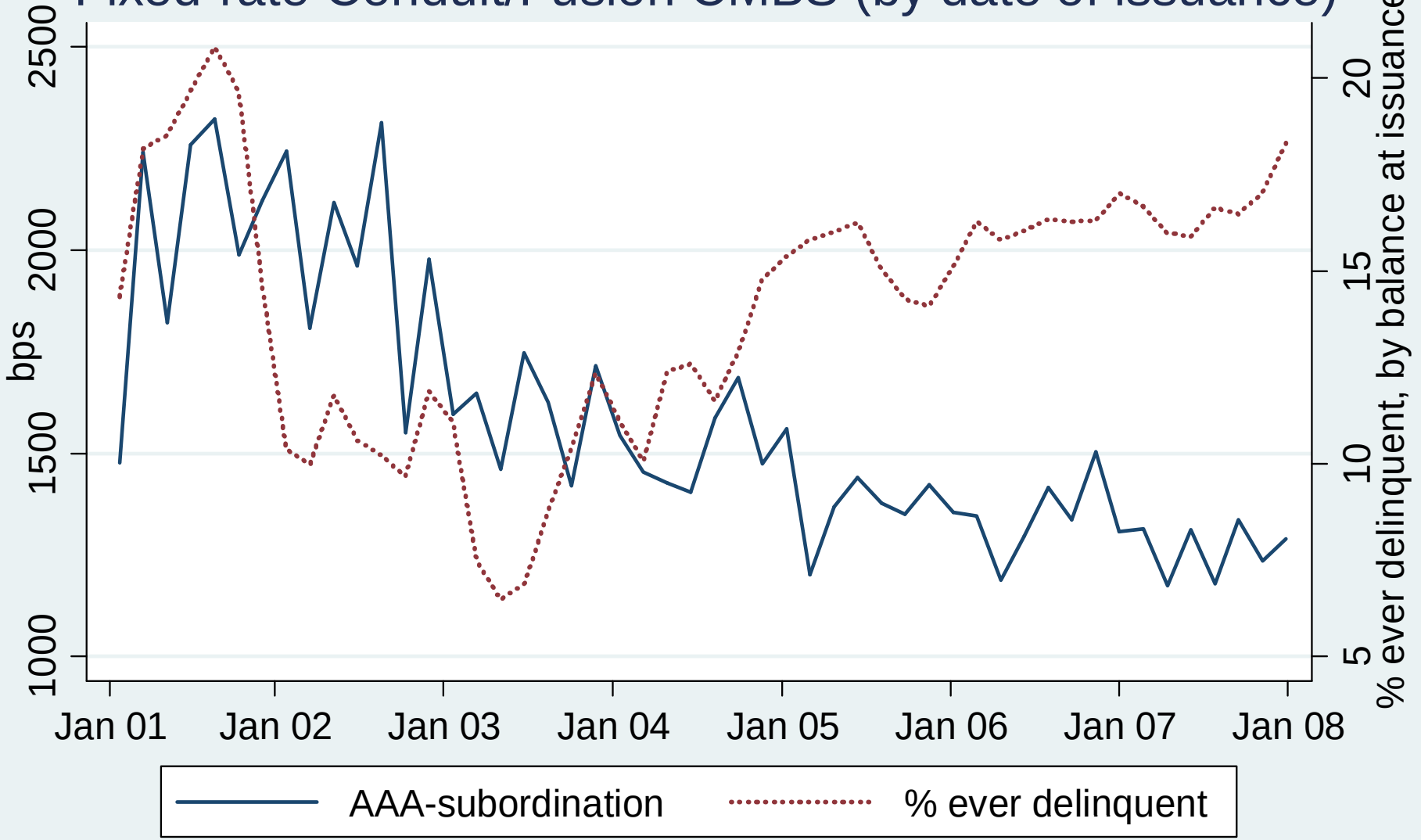
Figure 1: AAA Subordination and Pool-level Delinquencies for Fixed-rate Conduit/Fusion CMBS (by date of issuance)



Note: Loan considered to have been delinquent if it ever 60-days late, transferred to special servicing, liquidated or placed in foreclosure

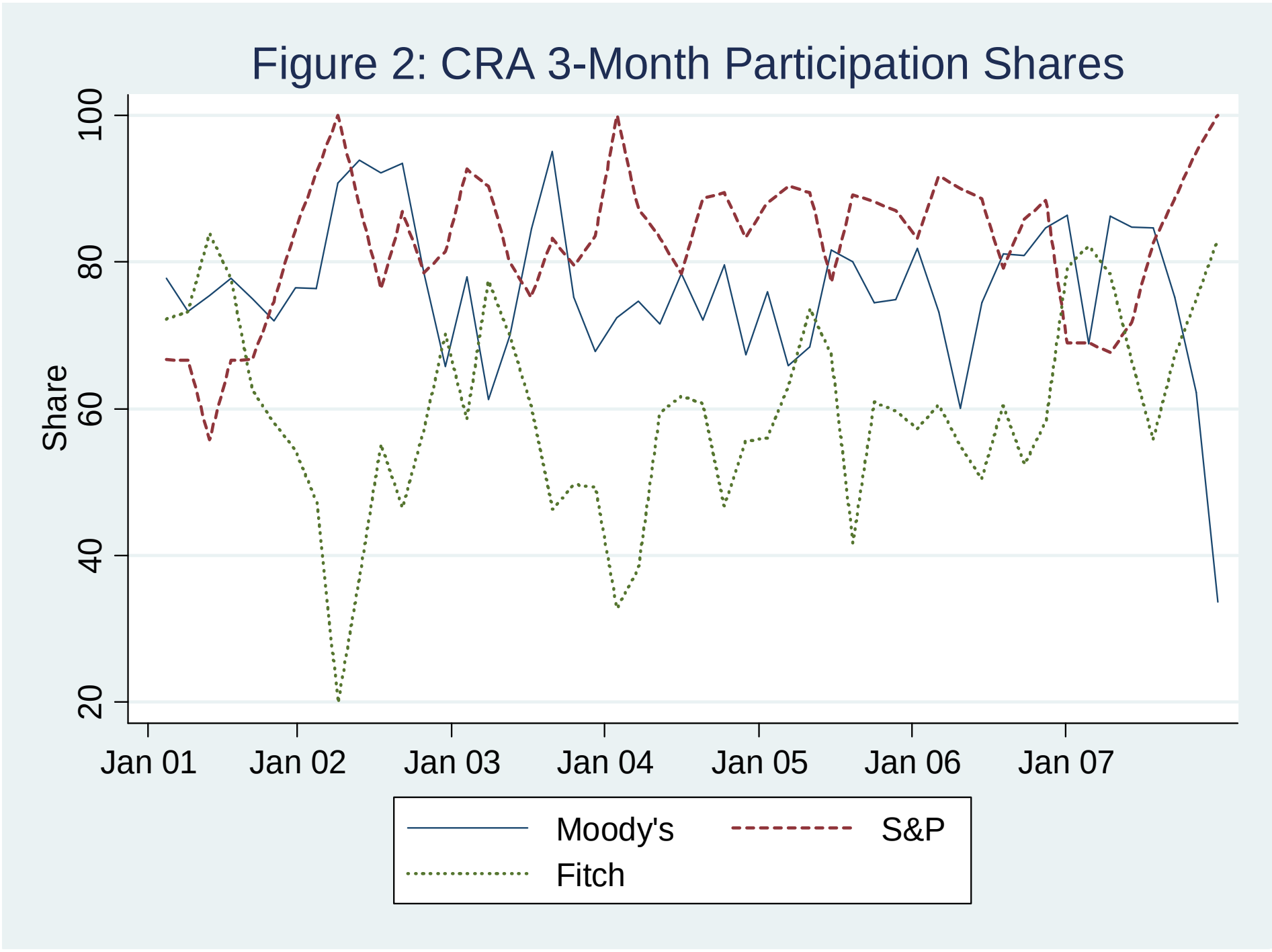


Figure 2: CRA 3-Month Participation Shares
Share
100
80
60
40
20
Jan 01
Jan 02
Jan 03
Jan 04
Jan 05
Jan 06
Jan 07
Moody's
S&P
Fitch

Figure 3: Identity of CRA with Lowest 3-Month Participation Share

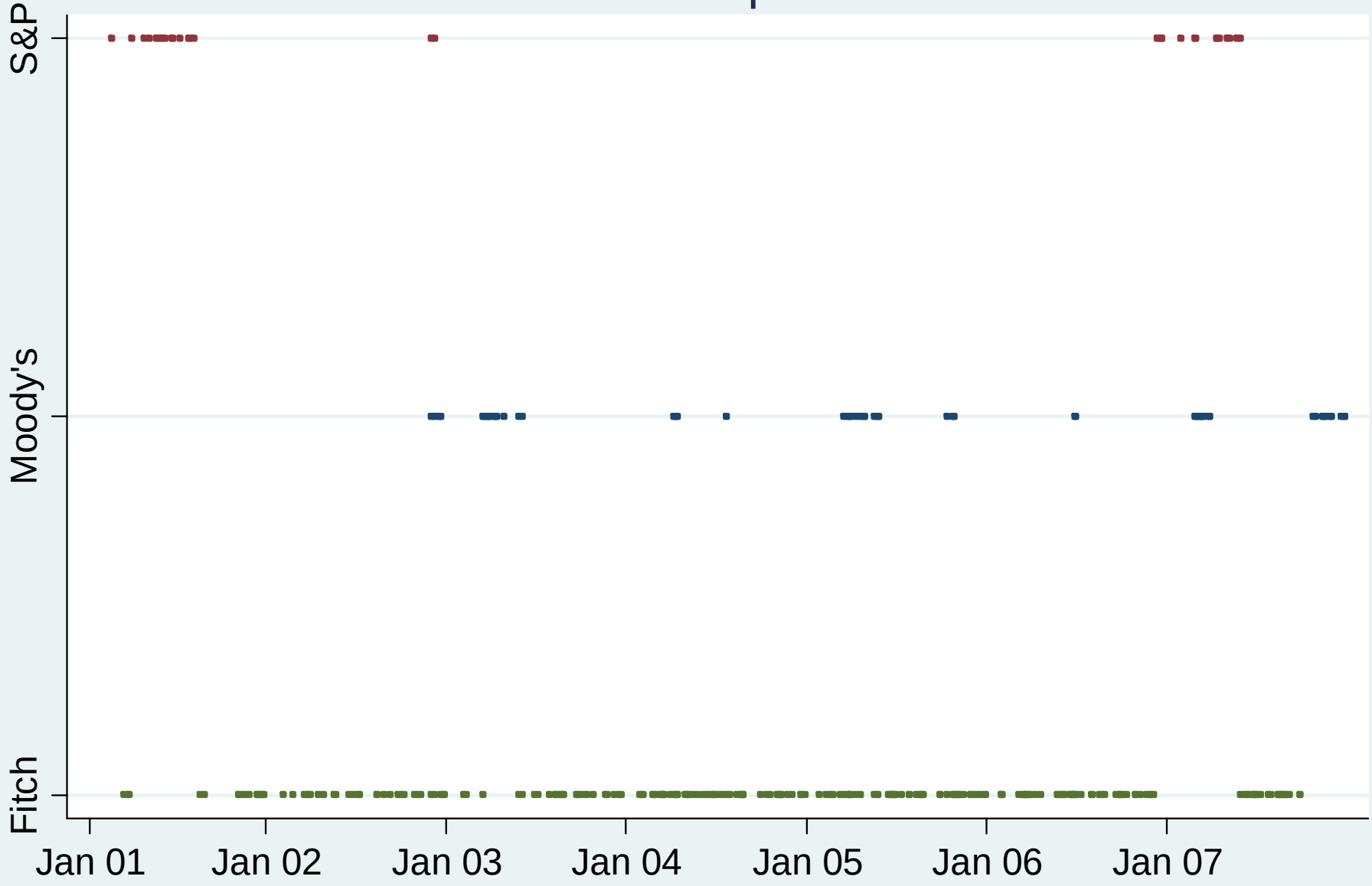
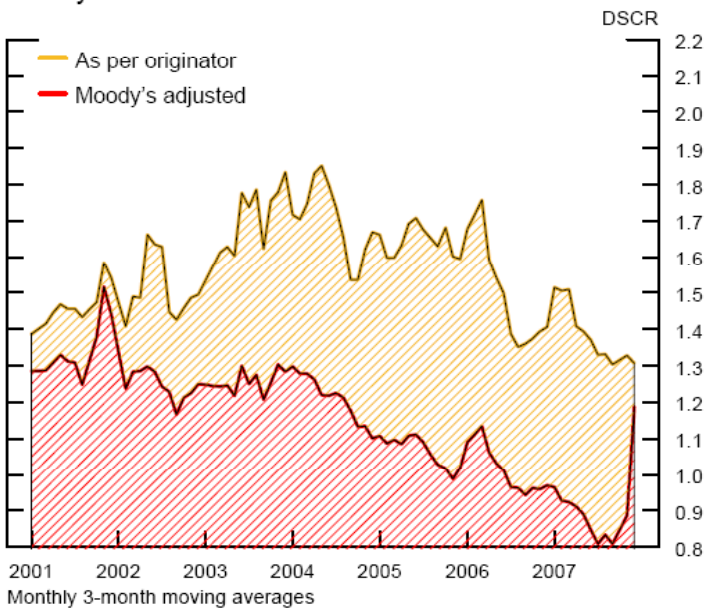
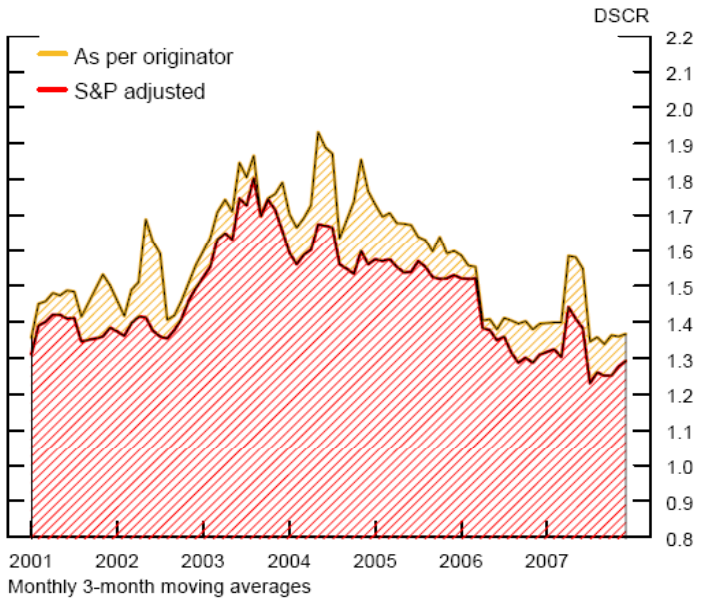


Figure 4: DSCRs – Originator and CRA-Adjusted

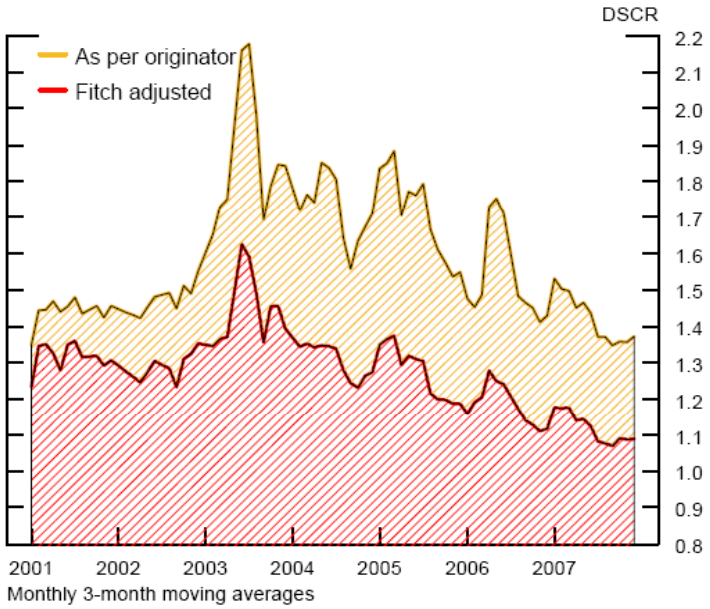
Moody's



S&P



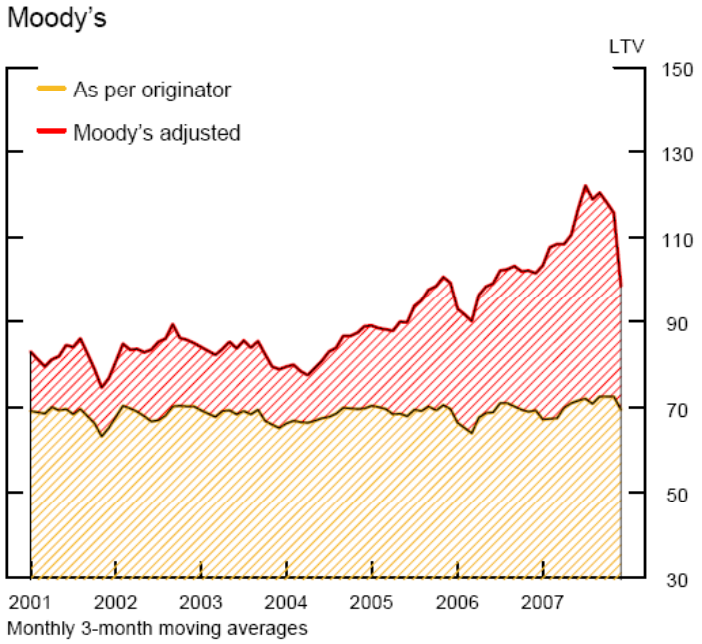
Fitch

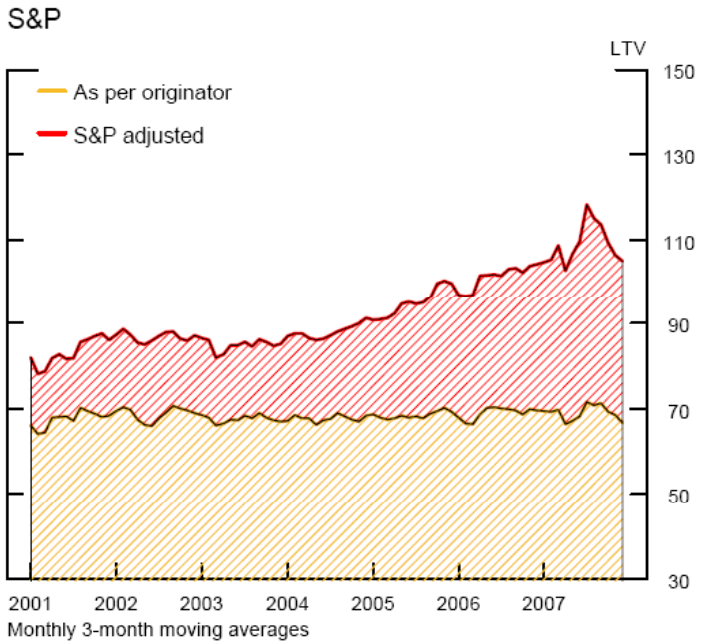


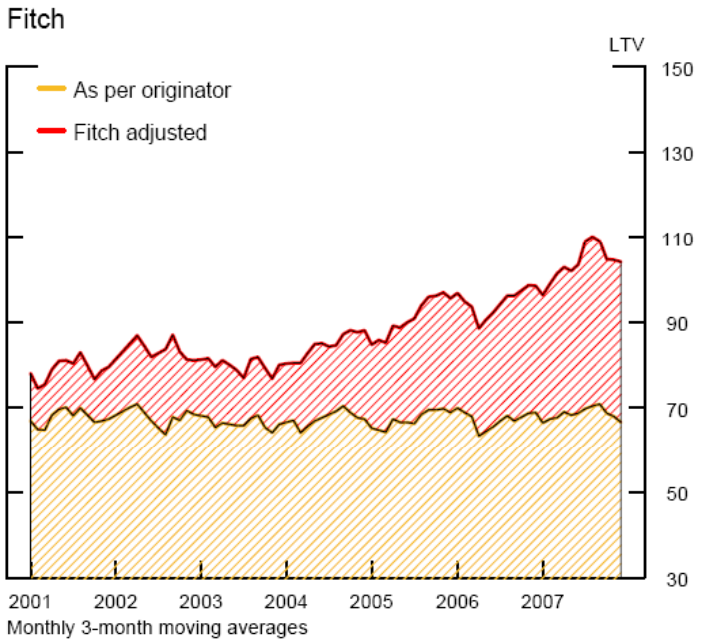
DSCR Haircuts

Year	Moody's	S&P	Fitch
2000	3.38%	3.16%	12.15%
2001	10.27%	5.19%	9.60%
2002	16.71%	5.98%	13.80%
2003	28.28%	5.04%	22.94%
2004	29.72%	7.16%	24.41%
2005	34.30%	6.00%	23.96%
2006	30.38%	5.27%	21.31%
2007	36.03%	7.10%	21.01%

Figure 5: LTVs – Originator and CRA-Adjusted







LTV Haircuts

Year	Moody's	S&P	Fitch
2000	14.17%	23.73%	14.88%
2001	21.19%	23.86%	19.31%
2002	23.68%	25.98%	19.14%
2003	21.99%	25.74%	22.13%
2004	22.03%	29.63%	26.76%
2005	36.61%	41.02%	37.00%
2006	44.68%	47.35%	41.59%
2007	60.40%	59.95%	53.50%

Table 1: CMBS Deal Volume and Distribution of Business Across CRAs

Year	Total Deal Volume ($billions)	CRA Configuration			
		Moodys and S&P	Moodys and Fith	S&P and Fitch	All 3 CRAs
2000 (n=17)	12.9	28%	36%	24%	12%
2001 (n=52)	44.4	36%	26%	26%	12%
2002 (n=35)	33.4	51%	12%	14%	23%
2003 (n=46)	55.1	47%	14%	24%	14%
2004 (n=65)	88.1	44%	15%	24%	17%
2005 (n=76)	164	40%	13%	24%	22%
2006 (n=77)	202	36%	19%	24%	21%
2007 (n=73)	227	30%	16%	30%	25%

Includes all US CMBS deals

Table 2: Sources of Variation in Fitch's Participation Share [in %]

Robust t statistics in brackets

	Specification 1	Specification 2	Specification 3	Specification 4
Constant	58.83***	56.11***	-19.17	-19.44
	[38.94]	[37.04]	[0.75]	[0.69]
Market Outcomes: Effect of one standard deviation change				
BBB/AAA spread for on the run CMBS	3.07***	2.80***	2.85**	1.53
	[3.97]	[2.95]	[2.61]	[1.43]
Deals per month	1.95	3.98***	2.51	2.6
	[1.33]	[2.82]	[1.27]	[1.45]
Ratio of CRE CDO to CMBS volume		-2.56*		-2.59**
		[1.71]		[2.14]
Investment Bank Market Shares (relative to Banc of America)				
Bear Stearns			140.68***	165.11***
			[2.77]	[3.10]
Citigroup			116.43***	79.51
			[3.20]	[1.40]
Credit Suisse			86.62**	69.01*
			[2.61]	[1.84]
Deutsche Bank			48.66	44.42
			[1.12]	[0.91]
Goldman Sachs			6.06	-4.44
			[0.14]	[0.10]
J.P. Morgan Chase			99.41***	78.46*
			[2.72]	[1.91]
Lehman Brothers			64.33	97.95*
			[1.46]	[1.96]
Merrill Lynch			137.02**	108.62*
			[2.51]	[1.73]
Morgan Stanley			146.34***	95.69**
			[4.01]	[2.38]
Greenwich Capital			74.02	87.66
			[1.33]	[1.53]
Wachovia			-21.4	64.39
			[0.55]	[1.66]
Observations	82	70	82	70
R-squared	0.07	0.19	0.42	0.47

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: (1) CRE_CDO/CMBS ratio is measured quarterly
(2) All other variables are three-month trailing moving averages measured for each month
(3) CRE CDO data were not available until early 2002

Table 3: Summary Statistics

	2001-2003 N = 110				2004-2005 N = 122				2006-2007 N = 121			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Dependent Variable												
AAA subordination level (in bps)	1,882.6	358.3	850.0	3,050.0	1,306.5	150.7	563.0	1,675.0	1,202.3	100.6	938.0	1,550.0
Explanatory Variables												
WA DSCR at origination, per originators' underwriting	159.2	28.2	117.2	312.6	168.2	24.9	137.2	289.4	142.7	16.7	116.5	217.1
Maximum of CRAs' pool-level DSCR haircuts [1]	-5.9	107.1	-378.2	630.2	66.3	84.7	-76.6	480.7	50.8	62.7	-143.2	220.7
WA LTV at origination, per originators' underwriting	67.9	4.4	56.9	74.6	67.9	4.7	48.2	74.2	69.0	3.7	57.9	75.6
Maximum of CRAs' pool-level LTV haircuts [1]	-70.2	34.2	-161.3	65.6	-5.9	61.5	-150.2	186.1	123.4	74.4	-11.2	396.6
WA expected delinquency rate based on property types	99.7	32.0	43.9	171.9	125.3	25.4	74.7	205.6	54.6	22.8	22.3	196.4
WA equity relative to loan balance at balloon	23.1	10.2	10.5	86.3	15.9	7.0	5.7	46.9	8.1	5.2	0.9	38.5
Cross-collateralization percentage	8.0	6.6	0.0	34.4	12.9	9.7	0.0	46.3	17.1	10.0	0.9	50.1
AA On-the-run spread: 3 Month Moving Average	57.4	10.2	42.4	78.2	39.1	4.3	31.2	45.9	56.0	40.9	33.0	195.4
Balance share Herfindahl	285.7	166.4	87.9	1,026.9	458.9	348.3	94.8	1,636.5	353.6	254.0	80.1	1,867.1
Originator share Herfindahl	4,761	2,139	1,455	10,000	5,242	2,264	1,536	10,000	4,844	2,174	2,165	10,000
Property-type share Herfindahl	3,009	518	2,166	5,080	3,062	522	2,200	4,557	2,846	547	2,048	4,920
MSA share Herfindahl	498	226	236	1,299	813	843	219	8,347	618	393	247	3,074
# of other deals in the same month	4.7	1.5	1	7	7.1	2.6	1	11	8.4	3.4	1	13
Deal size (in billions)	1.1	0.3	0.2	1.9	1.9	0.9	0.6	4.8	3.0	1.3	1.0	7.9
Fitch's 3-month participation share	58.2	15.5	15.4	88.2	57.1	9.9	27.8	80.0	65.1	10.6	46.2	84.4
Moody's has lowest overall particiption share	0.16	0.37	0	1	0.16	0.36	0	1	0.25	0.43	0	1
S&P has lowest overall participation share	0.16	0.37	0	1	0.00	0.00	0	0	0.17	0.37	0	1
Rating by Fitch and either Moodys or S&P	0.53	0.50	0	1	0.45	0.50	0	1	0.51	0.50	0	1
Rated by all 3 CRAS	0.04	0.19	0	1	0.07	0.26	0	1	0.11	0.31	0	1

[1] Pool-level haircut for each CRA is measured as % difference from that CRA's average pool-level haircut

Table 4a: Determinants of AAA Subordination Levels [in bps]

Robust t-statistics in brackets

	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007
WA DSCR at origination, per originators' underwriting	-1.82	-0.74	-1.21	-1.71	-1.76	-0.78	-1.05	-1.90**	-1.55	-0.2	-1.12	-1.83*	-1.45	-0.33	-1.05	-1.90**
	[1.37]	[0.48]	[1.12]	[1.65]	[1.34]	[0.50]	[1.02]	[2.06]	[1.17]	[0.14]	[1.02]	[1.80]	[1.13]	[0.24]	[1.00]	[2.02]
Maximum of CRAs' pool-level DSCR haircuts [1]	0.1	-0.05	0.18	0.19	0.09	-0.04	0.15	0.26	0.07	-0.09	0.18	0.22	0.05	-0.06	0.16	0.26
	[0.42]	[0.15]	[0.78]	[1.01]	[0.38]	[0.13]	[0.71]	[1.56]	[0.30]	[0.32]	[0.79]	[1.18]	[0.22]	[0.24]	[0.71]	[1.54]
WA LTV at origination, per originators' underwriting	24.19***	45.78***	13.64***	8.45**	24.78***	45.51***	16.47***	7.78**	25.17***	47.53***	15.00***	7.85**	26.22***	46.66***	16.55***	7.78**
	[4.24]	[7.61]	[2.88]	[2.41]	[4.43]	[7.55]	[3.44]	[2.39]	[4.46]	[8.41]	[2.93]	[2.26]	[4.81]	[8.37]	[3.34]	[2.35]
Maximum of CRAs' pool-level LTV haircuts [1]	-1.66***	2.50***	0.14	0.16	-1.64***	2.50***	0.31	0.11	-1.57***	2.48***	0.24	0.12	-1.52***	2.51***	0.32	0.11
	[6.10]	[4.36]	[0.61]	[1.14]	[6.03]	[4.36]	[1.31]	[0.87]	[5.71]	[4.61]	[0.97]	[0.91]	[5.50]	[4.61]	[1.29]	[0.86]
WA expected delinquency rate based on property types	-2.03***	-1.37*	2.02***	1.30**	-2.12***	-1.35*	1.87***	1.01**	-1.58***	-0.69	1.91***	1.15**	-1.62***	-0.69	1.86***	1.01**
	[3.45]	[1.73]	[3.53]	[2.47]	[3.58]	[1.71]	[3.23]	[2.11]	[2.62]	[0.74]	[3.25]	[2.40]	[2.72]	[0.76]	[3.15]	[2.09]
WA equity relative to loan balance at balloon	-0.02	-6.53**	0.39	-1.46	-0.02	-6.58**	0.45	-1.64	-0.28	-6.67**	0.69	-1.92	-0.24	-6.88***	0.48	-1.65
	[0.01]	[2.41]	[0.17]	[0.85]	[0.01]	[2.43]	[0.18]	[1.02]	[0.09]	[2.51]	[0.28]	[1.17]	[0.07]	[2.66]	[0.19]	[1.02]
Cross-collateralization percentage	-0.37	3.96	0.4	-0.53	-0.38	3.82	0.38	-0.57	-0.54	3.89	0.68	-0.54	-0.74	3.98	0.41	-0.56
	[0.19]	[1.52]	[0.37]	[0.78]	[0.20]	[1.39]	[0.38]	[0.85]	[0.28]	[1.50]	[0.63]	[0.80]	[0.39]	[1.53]	[0.40]	[0.83]
AA On-the-run spread: 3 Month Moving Average	1.25*	9.03***	0.43	0.75***	1.33**	8.91***	-1.63	0.89***	1.89***	9.85***	-1.53	0.77***	2.04***	9.56***	-1.77	0.89***
	[1.84]	[3.64]	[0.19]	[3.82]	[2.01]	[3.65]	[0.66]	[4.84]	[2.82]	[3.91]	[0.55]	[3.70]	[3.06]	[3.88]	[0.63]	[4.40]
Balance share Herfindahl [2]	0.04	-0.05	0.09**	0.13***	0.04	-0.05	0.07*	0.12***	0.03	-0.01	0.08**	0.13***	0.03	-0.01	0.07*	0.12***
	[0.71]	[0.37]	[2.27]	[5.10]	[0.65]	[0.36]	[1.76]	[4.74]	[0.56]	[0.06]	[2.08]	[4.39]	[0.50]	[0.05]	[1.75]	[4.73]
Originator share Herfindahl [2]	0.01	0.03**	0.01**	0.01**	0.01	0.03**	0.01*	0.01**	0.01	0.03***	0.01**	0.01**	0.01	0.03***	0.01*	0.01**
	[1.11]	[2.58]	[2.13]	[2.06]	[1.11]	[2.54]	[1.92]	[2.25]	[1.19]	[2.89]	[2.22]	[2.23]	[1.16]	[2.80]	[1.91]	[2.21]
Property-type share Herfindahl [2]	-0.01	0.05	0	0.01	-0.01	0.05	0.01	0	0	0.07	0.01	0	0	0.07	0.01	0
	[0.23]	[1.10]	[0.18]	[0.62]	[0.23]	[1.08]	[0.44]	[0.22]	[0.03]	[1.52]	[0.25]	[0.17]	[0.07]	[1.52]	[0.44]	[0.21]
MSA share Herfindahl [2]	-0.06**	-0.04	-0.03**	-0.10***	-0.06**	-0.04	-0.02	-0.08***	-0.05**	-0.08	-0.03*	-0.09***	-0.05**	-0.09	-0.02	-0.08***
	[2.30]	[0.45]	[2.04]	[4.51]	[2.19]	[0.45]	[1.25]	[4.39]	[2.12]	[0.87]	[1.73]	[4.05]	[2.00]	[0.94]	[1.24]	[4.37]
# of other deals in the same month	-24.63***	-14.40*	-7.66*	1.45	-24.41***	-15.49*	-6.35	1.03	-23.12***	-10.15	-8.60*	0.86	-21.46***	-12.72	-6.46	1.02
	[5.64]	[1.76]	[1.70]	[0.71]	[5.65]	[1.86]	[1.47]	[0.54]	[5.26]	[1.31]	[1.92]	[0.44]	[4.95]	[1.65]	[1.53]	[0.52]
Deal size (in billions)	-109.46***	-285.50***	-19.21	-16.74**	-108.68***	-285.31***	-20.67	-12.38**	-109.61***	-317.34***	-19.82	-14.10**	-108.43***	-317.54***	-20.7	-12.40**
	[4.41]	[2.80]	[1.45]	[2.59]	[4.41]	[2.76]	[1.60]	[1.99]	[4.38]	[3.25]	[1.47]	[2.29]	[4.39]	[3.24]	[1.59]	[1.99]
Fitch's 3-month participation share					-1.23	0.51	-3.10***	-2.29***					-2.86*	1.61	-3.05**	-2.27**
					[1.04]	[0.55]	[2.69]	[4.39]					[1.81]	[1.37]	[2.47]	[2.54]
Moody's has lowest overall participtionshare									-69.64**	-87.51**	-42.68	-27.44**	-26.47	-119.36**	-4.08	-0.05
									[2.08]	[2.13]	[1.59]	[2.02]	[0.68]	[2.48]	[0.15]	[0.00]
S&P has lowest overall participation share									105.07**	67.58		-40.70***	163.86***	31.89		-0.87
									[2.51]	[1.60]		[2.81]	[3.12]	[0.65]		[0.04]
Rated by Fitch and either Moodys or S&P	-74.97***	9.74	-54.27***	-53.21***	-71.01***	5.96	-58.42***	-49.22***	-78.05***	3.57	-55.83***	-51.97***	-73.03***	-0.32	-58.49***	-49.25***
	[2.83]	[0.31]	[2.95]	[3.80]	[2.66]	[0.18]	[3.46]	[3.65]	[2.97]	[0.11]	[3.08]	[3.72]	[2.80]	[0.01]	[3.45]	[3.63]
Rated by all 3 CRAs	116.19**	30.72	15.88	40.53*	122.35**	22.32	20.64	38.51*	132.73***	52.07	18.88	37.13*	140.73***	44.63	20.84	38.36*
	[2.43]	[0.32]	[0.67]	[1.81]	[2.51]	[0.23]	[0.88]	[1.80]	[2.64]	[0.65]	[0.85]	[1.68]	[2.80]	[0.57]	[0.89]	[1.69]
											0				0	
Observations	353	110	122	121	353	110	122	121	353	110	122	121	353	110	122	121
Adjusted R-squared	0.58	0.85	0.6	0.63	0.58	0.84	0.63	0.67	0.59	0.85	0.6	0.66	0.59	0.85	0.63	0.67
Chow Tests for sample periods																
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05}$		$\chi^2_{(16)} = 233.1,\ p = .000$				$\chi^2_{(17)} = 267.5,\ p = .000$				$\chi^2_{(18)} = 280.5,\ p = .000$				$\chi^2_{(19)} = 309.1,\ p = .000$		
$\beta_{2001\text{-}03} = \beta_{2006\text{-}07}$		$\chi^2_{(16)} = 319.7,\ p = .000$				$\chi^2_{(17)} = 352,\ p = .000$				$\chi^2_{(18)} = 395.7,\ p = .000$				$\chi^2_{(19)} = 403.8,\ p = .000$		
$\beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(16)} = 31.7,\ p = .011$				$\chi^2_{(17)} = 38.5,\ p = .002$				$\chi^2_{(18)} = 43.8,\ p = .001$				$\chi^2_{(19)} = 36.7,\ p = .009$		
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(32)} = 444.3,\ p = .000$				$\chi^2_{(34)} = 482.1,\ p = .000$				$\chi^2_{(36)} = 541.7,\ p = .000$				$\chi^2_{(38)} = 559.5,\ p = .000$		

* significant at 10%; ** significant at 5%; *** significant at 1%

[1] Pool-level haircut for each CRA is measured as % difference from that CRA's average pool-level haircut

[2] Effect of a one standard deviation change

Table 4b: Determinants of AAA Subordination Levels [in bps]

Robust t-statistics in brackets

	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007
WA DSCR at origination, per originators' underwriting	-1.77	-0.56	-0.57	-2.30**	-1.69	-0.66	-0.38	-2.47**	-1.53	0.05	-0.48	-2.38**	-1.4	-0.13	-0.38	-2.43**
	[1.30]	[0.35]	[0.56]	[1.99]	[1.26]	[0.41]	[0.38]	[2.40]	[1.13]	[0.03]	[0.46]	[2.11]	[1.05]	[0.09]	[0.38]	[2.35]
Maximum of CRAs' pool-level DSCR haircuts [1]	0.14	-0.09	0.05	0.28	0.12	-0.06	0.01	0.36**	0.11	-0.14	0.04	0.31	0.09	-0.11	0.01	0.36**
	[0.53]	[0.28]	[0.21]	[1.41]	[0.47]	[0.20]	[0.05]	[2.00]	[0.44]	[0.47]	[0.19]	[1.57]	[0.34]	[0.37]	[0.05]	[1.99]
WA LTV at origination, per originators' underwriting	26.07***	46.16***	16.66***	7.86**	26.67***	45.75***	19.49***	7.15*	27.03***	48.27***	17.91***	7.40*	28.05***	47.30***	19.49***	7.33**
	[4.49]	[7.41]	[3.86]	[2.01]	[4.66]	[7.34]	[4.34]	[1.96]	[4.67]	[8.15]	[3.79]	[1.91]	[4.96]	[8.23]	[4.18]	[1.99]
Maximum of CRAs' pool-level LTV haircuts [1]	-1.68***	2.45***	0.21	0.18	-1.66***	2.48***	0.37	0.13	-1.60***	2.46***	0.29	0.14	-1.56***	2.51***	0.37	0.14
	[5.96]	[4.82]	[0.86]	[1.11]	[5.91]	[4.88]	[1.47]	[0.87]	[5.62]	[5.17]	[1.12]	[0.97]	[5.42]	[5.18]	[1.43]	[0.94]
WA expected delinquency rate based on property types	-1.82***	-1.40*	2.13***	1.61***	-1.92***	-1.37*	2.00***	1.26**	-1.42**	-0.75	2.04***	1.44***	-1.47**	-0.74	2.00***	1.26**
	[3.09]	[1.79]	[3.52]	[2.97]	[3.25]	[1.76]	[3.31]	[2.59]	[2.36]	[0.82]	[3.32]	[2.96]	[2.47]	[0.83]	[3.25]	[2.57]
WA equity relative to loan balance at balloon	0.58	-6.48**	0.75	-1.23	0.58	-6.55**	0.84	-1.45	0.41	-6.55**	1.02	-1.78	0.45	-6.77***	0.84	-1.45
	[0.16]	[2.42]	[0.31]	[0.54]	[0.16]	[2.45]	[0.34]	[0.69]	[0.12]	[2.50]	[0.41]	[0.82]	[0.13]	[2.65]	[0.33]	[0.69]
Cross-collateralization percentage	-1.1	4.06	0.07	-1.19*	-1.1	3.88	0.02	-1.18*	-1.29	4.06	0.29	-1.12	-1.49	4.14	0.02	-1.13
	[0.56]	[1.60]	[0.06]	[1.67]	[0.56]	[1.45]	[0.02]	[1.69]	[0.66]	[1.61]	[0.27]	[1.61]	[0.78]	[1.64]	[0.02]	[1.62]
AA On-the-run spread: 3 Month Moving Average	1.34*	9.02***	0.23	0.71***	1.45**	8.90***	-1.71	0.88***	1.91***	9.96***	-1.48	0.69***	2.08***	9.69***	-1.71	0.84***
	[1.92]	[3.58]	[0.10]	[3.05]	[2.11]	[3.60]	[0.69]	[3.99]	[2.74]	[3.90]	[0.52]	[2.86]	[3.00]	[3.89]	[0.60]	[3.41]
Balance share Herfindahl [2]	0.03	-0.06	0.09**	0.14***	0.03	-0.06	0.07	0.13***	0.03	-0.02	0.08*	0.13***	0.02	-0.01	0.07	0.13***
	[0.55]	[0.46]	[2.12]	[4.47]	[0.47]	[0.42]	[1.63]	[4.22]	[0.39]	[0.14]	[1.95]	[4.01]	[0.32]	[0.10]	[1.63]	[4.28]
Originator share Herfindahl [2]	0.01	0.03***	0.01**	0.01**	0.01	0.03**	0.01**	0.01**	0.01	0.03***	0.01**	0.01**	0.01	0.03***	0.01**	0.01**
	[1.33]	[2.67]	[2.33]	[2.33]	[1.33]	[2.58]	[2.20]	[2.39]	[1.43]	[3.01]	[2.40]	[2.40]	[1.39]	[2.88]	[2.16]	[2.32]
Property-type share Herfindahl [2]	-0.01	0.05	0.01	0.01	-0.01	0.05	0.02	0	0	0.07	0.01	0	0	0.07	0.02	0
	[0.20]	[1.11]	[0.44]	[0.42]	[0.20]	[1.10]	[0.67]	[0.04]	[0.02]	[1.53]	[0.49]	[0.03]	[0.06]	[1.52]	[0.67]	[0.02]
MSA share Herfindahl [2]	-0.06**	-0.04	-0.04**	-0.10***	-0.06**	-0.04	-0.02	-0.09***	-0.06**	-0.07	-0.03*	-0.10***	-0.05**	-0.08	-0.02	-0.09***
	[2.27]	[0.38]	[2.16]	[4.49]	[2.15]	[0.40]	[1.49]	[4.30]	[2.11]	[0.76]	[1.89]	[4.04]	[1.98]	[0.84]	[1.48]	[4.39]
# of other deals in the same month	-25.04***	-14.30*	-6.35	1.61	-24.81***	-15.63*	-5.04	1.12	-23.83***	-10.76	-7.12	0.86	-22.11***	-13.47*	-5.04	1.04
	[5.47]	[1.76]	[1.39]	[0.71]	[5.49]	[1.86]	[1.13]	[0.54]	[5.13]	[1.38]	[1.55]	[0.41]	[4.85]	[1.73]	[1.16]	[0.49]
Deal size (billions)	-85.32***	-289.10***	-7.32	-3.98	-83.93***	-287.57***	-7.15	0.02	-83.12***	-320.48***	-7.09	-2.35	-81.26***	-319.55***	-7.15	-0.56
	[3.62]	[2.83]	[0.64]	[0.73]	[3.57]	[2.77]	[0.63]	[0.00]	[3.47]	[3.25]	[0.61]	[0.45]	[3.41]	[3.23]	[0.63]	[0.11]
Fitch's 3-month participation share					-1.38	0.58	-2.86**	-2.57***					-3.00*	1.64	-2.86**	-2.69***
					[1.17]	[0.65]	[2.46]	[4.99]					[1.88]	[1.37]	[2.29]	[2.74]
Moody's has lowest overall particiption share									-61.61*	-83.07**	-36.53	-23.85	-15.74	-116.30**	0.03	8.75
									[1.82]	[2.13]	[1.30]	[1.59]	[0.40]	[2.46]	[0.00]	[0.48]
S&P has lowest overall participation share									88.51**	68.94*		-49.33***	150.57***	31.26		-1.99
																[0.09]
											0				0	
Observations	353	110	122	121	353	110	122	121	353	110	122	121	353	110	122	121
Adjusted R-squared	0.57	0.85	0.58	0.55	0.57	0.85	0.6	0.6	0.57	0.86	0.58	0.58	0.58	0.86	0.6	0.6
Chow Tests for sample periods																
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05}$		$\chi^2_{(14)} = 231.9,\ p = .000$				$\chi^2_{(15)} = 255.4,\ p = .000$				$\chi^2_{(16)} = 269.9,\ p = .000$				$\chi^2_{(17)} = 294.3,\ p = .000$		
$\beta_{2001\text{-}03} = \beta_{2006\text{-}07}$		$\chi^2_{(14)} = 326.7,\ p = .000$				$\chi^2_{(15)} = 360.1,\ p = .000$				$\chi^2_{(16)} = 406.5,\ p = .000$				$\chi^2_{(17)} = 417.6,\ p = .000$		
$\beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(14)} = 25.8,\ p = .027$				$\chi^2_{(15)} = 33,\ p = .005$				$\chi^2_{(16)} = 40.2,\ p = .001$				$\chi^2_{(17)} = 31.1,\ p = .02$		
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(28)} = 424.2,\ p = .000$				$\chi^2_{(30)} = 460.1,\ p = .000$				$\chi^2_{(32)} = 513.8,\ p = .000$				$\chi^2_{(34)} = 531.6,\ p = .000$		

* significant at 10%; ** significant at 5%; *** significant at 1%

[1] Pool-level haircut for each CRA is measured as % difference from that CRA's average pool-level haircut

[2] Effect of a one standard deviation change

Table 4c: Determinants of AAA Subordination Levels [in bps]

Robust t-statistics in brackets

	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007
WA DSCR at origination, per originators' underwriting	-1.43	-0.73	-0.49	-1.14	-1.41	-0.73	-0.41	-1.06	-1.24	-0.35	-0.42	-1.17*	-1.19	-0.37	-0.44	-1.1
	[1.36]	[0.77]	[0.71]	[1.60]	[1.38]	[0.76]	[0.62]	[1.62]	[1.22]	[0.39]	[0.58]	[1.72]	[1.25]	[0.39]	[0.63]	[1.65]
WA LTV at origination, per originators' underwriting	31.56***	41.67***	14.35***	9.42***	32.14***	41.54***	16.09***	9.49***	32.00***	43.04***	15.00***	9.10***	33.00***	42.57***	15.95***	9.33***
	[5.81]	[7.06]	[3.43]	[3.34]	[6.01]	[7.07]	[4.04]	[3.49]	[6.00]	[7.54]	[3.38]	[3.28]	[6.42]	[7.36]	[3.94]	[3.36]
WA expected delinquency rate based on property types	-1.04*	-1.21	1.85***	0.98**	-1.15*	-1.2	1.62***	0.71*	-0.5	-0.48	1.73***	0.86**	-0.58	-0.48	1.65***	0.74*
	[1.75]	[1.49]	[3.36]	[2.39]	[1.94]	[1.48]	[2.90]	[1.83]	[0.83]	[0.49]	[3.01]	[2.20]	[0.98]	[0.50]	[2.86]	[1.88]
WA equity relative to loan balance at balloon	5.03	-8.03**	-0.25	-2.14	5	-8.06**	-0.41	-2.38	4.41	-8.16**	-0.17	-2.58	4.34	-8.33**	-0.46	-2.44
	[1.35]	[2.39]	[0.11]	[1.27]	[1.34]	[2.39]	[0.18]	[1.48]	[1.23]	[2.50]	[0.07]	[1.55]	[1.21]	[2.56]	[0.19]	[1.50]
Cross-collateralization percentage	-0.5	7.13**	0.05	-0.47	-0.5	7.05*	-0.13	-0.5	-0.71	7.01**	0.15	-0.52	-0.96	7.10**	-0.19	-0.53
	[0.26]	[2.04]	[0.05]	[0.66]	[0.26]	[1.93]	[0.13]	[0.70]	[0.37]	[2.04]	[0.15]	[0.72]	[0.51]	[2.05]	[0.18]	[0.73]
AA On-the-run spread: 3 Month Moving Average	0.81	6.77***	0.75	0.77***	0.93	6.69***	-0.71	0.91***	1.65**	7.58***	-0.39	0.83***	1.87**	7.37***	-0.36	0.92***
	[1.03]	[2.64]	[0.35]	[3.94]	[1.20]	[2.65]	[0.32]	[4.83]	[2.15]	[2.92]	[0.16]	[3.95]	[2.45]	[2.86]	[0.14]	[4.54]
Balance share Herfindahl [1]	0.02	-0.33**	0.10***	0.12***	0.02	-0.33**	0.09**	0.11***	0.01	-0.29*	0.10**	0.12***	0.01	-0.29*	0.09**	0.11***
	[0.37]	[2.08]	[2.70]	[4.75]	[0.30]	[2.07]	[2.36]	[4.23]	[0.19]	[1.85]	[2.61]	[3.99]	[0.12]	[1.85]	[2.35]	[4.12]
Originator share Herfindahl [1]	0	0.03**	0.01**	0.01**	0	0.03**	0.01**	0.01**	0	0.03***	0.01**	0.01***	0	0.03***	0.01**	0.01**
	[0.49]	[2.59]	[2.27]	[2.47]	[0.50]	[2.55]	[2.13]	[2.61]	[0.59]	[2.84]	[2.34]	[2.64]	[0.57]	[2.75]	[2.04]	[2.60]
Property-type share Herfindahl [1]	0.03	0.06	0	0	0.03	0.06	0	-0.01	0.04	0.07	0	-0.01	0.04	0.07	0	-0.01
	[0.68]	[1.00]	[0.11]	[0.13]	[0.67]	[0.99]	[0.20]	[0.59]	[0.97]	[1.33]	[0.20]	[0.58]	[1.00]	[1.33]	[0.17]	[0.62]
MSA share Herfindahl [1]	-0.05**	0.05	-0.04***	-0.09***	-0.05**	0.05	-0.03**	-0.07***	-0.05*	0	-0.04**	-0.08***	-0.04	0	-0.03**	-0.08***
	[2.19]	[0.48]	[2.66]	[4.40]	[2.03]	[0.48]	[2.07]	[4.24]	[1.76]	[0.02]	[2.51]	[3.87]	[1.62]	[0.01]	[2.10]	[4.05]
# of other deals in the same month	-26.96***	-16.29*	-7.48*	0.59	-26.66***	-17.04*	-6.53	0.1	-24.74***	-11.73	-8.16*	0.08	-22.46***	-13.66	-6.2	0.12
	[5.59]	[1.73]	[1.71]	[0.28]	[5.58]	[1.78]	[1.57]	[0.05]	[5.15]	[1.32]	[1.86]	[0.04]	[4.74]	[1.52]	[1.52]	[0.06]
Log of deal size	-160.98***	-375.48***	-15.23	-15.38**	-159.64***	-375.75***	-14.09	-11.36*	-158.02***	-405.95***	-14.5	-12.63*	-154.99***	-407.69***	-14.3	-11.31*
	[6.46]	[2.83]	[1.11]	[2.24]	[6.38]	[2.80]	[1.06]	[1.70]	[6.41]	[3.13]	[1.04]	[1.94]	[6.30]	[3.13]	[1.07]	[1.72]
Fitch's 3-month participation share					-1.57	0.34	-2.68**	-2.15***					-3.86**	1.17	-2.85**	-1.69*
					[1.22]	[0.32]	[2.42]	[4.03]					[2.36]	[0.89]	[2.34]	[1.86]
Moody's has lowest overall particiption share									-85.10**	-89.40*	-27.79	-33.28**	-26.32	-112.65**	10.95	-13.06
									[2.41]	[1.88]	[1.08]	[2.41]	[0.61]	[2.06]	[0.41]	[0.72]
S&P has lowest overall participation share									141.24***	72.92		-38.10**	219.45***	47.21		-8.18
									[2.85]	[1.59]		[2.53]	[3.74]	[0.88]		[0.39]
Rated by Fitch and either Moodys or S&P	-62.40**	-40.42	-50.83***	-59.29***	-57.35**	-43.19	-54.76***	-56.45***	-67.33**	-45.69	-51.82***	-57.94***	-60.70**	-49.45*	-54.63***	-56.57***
	[2.16]	[1.41]	[2.84]	[4.19]	[1.99]	[1.42]	[3.24]	[4.09]	[2.37]	[1.52]	[2.90]	[4.10]	[2.18]	[1.67]	[3.22]	[4.06]
Rated by all 3 CRAS	149.23***	-31.87	15.22	44.24*	156.98***	-38.21	17.28	41.93*	168.12***	-5.2	16.34	41.67*	178.07***	-13.11	16.97	42.75*
	[3.12]	[0.36]	[0.65]	[1.81]	[3.22]	[0.43]	[0.71]	[1.84]	[3.33]	[0.07]	[0.71]	[1.78]	[3.50]	[0.18]	[0.69]	[1.81]
											0				0	
Observations	353	110	122	121	353	110	122	121	353	110	122	121	353	110	122	121
Adjusted R-squared	0.51	0.81	0.6	0.61	0.51	0.81	0.62	0.64	0.53	0.81	0.6	0.63	0.53	0.81	0.62	0.64

Chow Tests for sample periods

$\beta_{2001\text{-}03} = \beta_{2004\text{-}05}$	$\chi^2_{(14)} = 187.5,\ p = .000$	$\chi^2_{(15)} = 204.4,\ p = .000$	$\chi^2_{(16)} = 197.9,\ p = .000$	$\chi^2_{(17)} = 219.6,\ p = .000$
$\beta_{2001\text{-}03} = \beta_{2006\text{-}07}$	$\chi^2_{(14)} = 262.7,\ p = .000$	$\chi^2_{(15)} = 276,\ p = .000$	$\chi^2_{(16)} = 276.8,\ p = .000$	$\chi^2_{(17)} = 279.7,\ p = .000$
$\beta_{2004\text{-}05} = \beta_{2006\text{-}07}$	$\chi^2_{(14)} = 25.3,\ p = .031$	$\chi^2_{(15)} = 30.6,\ p = .01$	$\chi^2_{(16)} = 37,\ p = .002$	$\chi^2_{(17)} = 29.3,\ p = .032$
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05} = \beta_{2006\text{-}07}$	$\chi^2_{(28)} = 362.6,\ p = .000$	$\chi^2_{(30)} = 377.7,\ p = .000$	$\chi^2_{(32)} = 388.9,\ p = .000$	$\chi^2_{(34)} = 396.3,\ p = .000$

* significant at 10%; ** significant at 5%; *** significant at 1%

[1] Pool-level haircut for each CRA is measured as % difference from that CRA's average pool-level haircut

[2] Effect of a one standard deviation change

Table 4d: Determinants of AAA Subordination Levels [in bps]

Robust t-statistics in brackets

	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007	Full Sample	2001-2003	2004-2005	2006-2007
WA DSCR at origination, per originators' underwriting	-1.26	-0.69	-0.34	-1.47*	-1.23	-0.69	-0.26	-1.36*	-1.07	-0.31	-0.28	-1.47**	-1.03	-0.33	-0.29	-1.38*
	[1.16]	[0.70]	[0.51]	[1.92]	[1.18]	[0.69]	[0.40]	[1.93]	[1.01]	[0.34]	[0.40]	[2.03]	[1.03]	[0.34]	[0.43]	[1.92]
WA LTV at origination, per originators' underwriting	33.57***	42.19***	16.19***	9.54***	34.07***	42.21***	17.92***	9.61***	34.12***	43.66***	16.76***	9.29***	34.98***	43.34***	17.74***	9.54***
	[6.04]	[7.07]	[4.07]	[2.93]	[6.22]	[7.09]	[4.69]	[3.03]	[6.22]	[7.62]	[3.95]	[2.93]	[6.58]	[7.45]	[4.56]	[2.97]
WA expected delinquency rate based on property types	-0.82	-1.14	1.95***	1.24***	-0.94	-1.14	1.75***	0.92**	-0.32	-0.47	1.86***	1.10***	-0.4	-0.47	1.79***	0.95**
	[1.38]	[1.42]	[3.37]	[2.97]	[1.57]	[1.42]	[3.03]	[2.32]	[0.53]	[0.50]	[3.10]	[2.77]	[0.68]	[0.50]	[3.00]	[2.36]
WA equity relative to loan balance at balloon	5.7	-8.10**	0.25	-2.15	5.69	-8.09**	0.14	-2.43	5.23	-8.15**	0.33	-2.69	5.18	-8.29***	0.09	-2.52
	[1.48]	[2.55]	[0.11]	[0.90]	[1.46]	[2.50]	[0.06]	[1.08]	[1.39]	[2.63]	[0.14]	[1.15]	[1.38]	[2.67]	[0.04]	[1.10]
Cross-collateralization percentage	-1.25	7.32**	-0.24	-1.21	-1.24	7.34**	-0.43	-1.2	-1.5	7.50**	-0.16	-1.18	-1.75	7.57**	-0.49	-1.19
	[0.65]	[2.18]	[0.23]	[1.53]	[0.64]	[2.12]	[0.42]	[1.52]	[0.77]	[2.30]	[0.16]	[1.48]	[0.91]	[2.30]	[0.47]	[1.48]
AA On-the-run spread: 3 Month Moving Average	0.94	7.13***	0.7	0.74***	1.07	7.14***	-0.64	0.89***	1.71**	8.00***	-0.25	0.76***	1.93**	7.87***	-0.21	0.87***
	[1.17]	[2.75]	[0.32]	[3.10]	[1.35]	[2.76]	[0.29]	[3.88]	[2.15]	[3.03]	[0.10]	[3.06]	[2.46]	[3.00]	[0.08]	[3.45]
Balance share Herfindahl [1]	0.01	-0.32*	0.10**	0.13***	0	-0.32*	0.09**	0.12***	0	-0.28*	0.10**	0.13***	-0.01	-0.28*	0.09**	0.12***
	[0.16]	[1.94]	[2.51]	[3.98]	[0.07]	[1.93]	[2.20]	[3.59]	[0.01]	[1.77]	[2.44]	[3.48]	[0.10]	[1.76]	[2.19]	[3.54]
Originator share Herfindahl [1]	0.01	0.03**	0.01**	0.01***	0.01	0.03**	0.01**	0.01***	0.01	0.03***	0.01**	0.01***	0.01	0.03***	0.01**	0.01***
	[0.70]	[2.57]	[2.45]	[2.81]	[0.69]	[2.51]	[2.37]	[2.85]	[0.81]	[2.82]	[2.50]	[2.92]	[0.78]	[2.73]	[2.26]	[2.83]
Property-type share Herfindahl [1]	0.03	0.06	0	-0.01	0.03	0.06	0	-0.01	0.04	0.07	0	-0.01	0.04	0.07	0	-0.01
	[0.70]	[1.04]	[0.07]	[0.56]	[0.69]	[1.04]	[0.01]	[1.03]	[0.95]	[1.36]	[0.00]	[1.02]	[0.98]	[1.36]	[0.04]	[1.05]
MSA share Herfindahl [1]	-0.06**	0.05	-0.04***	-0.09***	-0.05**	0.05	-0.03**	-0.08***	-0.05*	0.02	-0.04**	-0.08***	-0.04	0.02	-0.03**	-0.08***
	[2.16]	[0.53]	[2.70]	[4.28]	[1.99]	[0.53]	[2.18]	[4.02]	[1.78]	[0.20]	[2.57]	[3.75]	[1.64]	[0.18]	[2.21]	[3.89]
# of other deals in the same month	-27.49***	-18.49*	-6.5	0.42	-27.21***	-18.33*	-5.56	-0.13	-25.58***	-14.4	-7.04	-0.25	-23.28***	-15.87*	-5.16	-0.2
	[5.52]	[1.97]	[1.44]	[0.17]	[5.52]	[1.90]	[1.28]	[0.06]	[5.12]	[1.58]	[1.54]	[0.11]	[4.76]	[1.70]	[1.21]	[0.09]
Deal size in billions	-133.91***	-377.13***	-3.94	-0.4	-132.04***	-377.07***	-1.93	3.29	-128.56***	-406.61***	-3.01	1.56	-124.91***	-407.90***	-2.29	3.06
	[5.46]	[2.94]	[0.34]	[0.07]	[5.34]	[2.94]	[0.17]	[0.57]	[5.25]	[3.27]	[0.25]	[0.27]	[5.09]	[3.26]	[0.20]	[0.52]
Fitch's 3-month participation share					-1.61	-0.06	-2.45**	-2.43***					-3.90**	0.83	-2.67**	-1.97*
					[1.24]	[0.06]	[2.21]	[4.37]					[2.32]	[0.59]	[2.18]	[1.95]
Moody's has lowest overall particiption share									-74.81**	-92.13**	-23.08	-31.09*	-14.62	-109.37**	13.36	-7.4
									[2.07]	[2.04]	[0.87]	[1.98]	[0.33]	[2.04]	[0.48]	[0.37]
S&P has lowest overall participation share									125.74**	58.48		-47.10***	205.50***	39.32		-12.23
																[0.53]
											0				0	
Observations	353	110	122	121	353	110	122	121	353	110	122	121	353	110	122	121
R-squared	0.49	0.81	0.58	0.5	0.5	0.81	0.6	0.55	0.51	0.81	0.58	0.54	0.51	0.81	0.6	0.54
Chow Tests for sample periods																
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05}$		$\chi^2_{(12)} = 180.3,\ p = .000$				$\chi^2_{(13)} = 190.7,\ p = .000$				$\chi^2_{(14)} = 185,\ p = .000$				$\chi^2_{(15)} = 200.4,\ p = .000$		
$\beta_{2001\text{-}03} = \beta_{2006\text{-}07}$		$\chi^2_{(12)} = 257.7,\ p = .000$				$\chi^2_{(13)} = 268.2,\ p = .000$				$\chi^2_{(14)} = 262.9,\ p = .000$				$\chi^2_{(15)} = 265.1,\ p = .000$		
$\beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(12)} = 19.4,\ p = .079$				$\chi^2_{(13)} = 25,\ p = .023$				$\chi^2_{(14)} = 31.8,\ p = .004$				$\chi^2_{(15)} = 23.1,\ p = .083$		
$\beta_{2001\text{-}03} = \beta_{2004\text{-}05} = \beta_{2006\text{-}07}$		$\chi^2_{(24)} = 338.5,\ p = .000$				$\chi^2_{(26)} = 349.1,\ p = .000$				$\chi^2_{(28)} = 354.8,\ p = .000$				$\chi^2_{(30)} = 354.7,\ p = .000$		

* significant at 10%; ** significant at 5%; *** significant at 1%

[1] Effect of a one standard deviation change