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**Credit Ratings Failures  
and Policy Options**

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## Abstract

This paper examines the role of credit rating agencies in the subprime crisis that triggered the 2007-08 financial turmoil. The focus of the paper is on two aspects of ratings that contributed to the boom and bust of the market for asset-backed securities: rating inflation and coarse information disclosure. The paper discusses how regulation can be designed to mitigate these problems in the future. The suggestion is that regulators should require rating agencies to be paid by investors rather than by issuers (or at least constrain the way they are paid by issuers) and force greater disclosure of information about the underlying pool of securities.

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## 1. Introduction

Since the 2007-2008 financial turmoil originated in the market for subprime mortgage-backed securities, much attention has been recently at the flaws of the securitization process and particularly at the failures of the rating agencies (CRAs), which played a key role in this process (see for instance the Financial Stability Forum Report, 2008, and International Monetary Fund, 2008). Two issues fare prominently in this respect.

First, since 2007 even very highly-rated structured debt products have performed very poorly: the value of AAA-rated mortgage-backed securities (as measured by the corresponding credit default swaps prices) fell by 70 percent between January 2007 and December 2008. This suggests that their initial ratings greatly understated the risk of structured debt securities. Such “ratings inflation” is central to the understanding of the crisis: insofar as many investors naively based their investment in these securities mainly or solely on inflated credit ratings, these led to a massive mispricing of risk, whose correction later detonated the crisis.<sup>1</sup>

Second, in the process of securitization and rating much detailed information about the risk characteristics of the underlying assets was lost. Given the way they are designed, ratings provide very coarse and limited information about these characteristics. This information loss is particularly serious in view of the heterogeneity of the collateral and the great complexity of the design of structured debt securities. Once a scenario of widespread default materialized, this detailed information would have been essential to identify the “toxic assets” in the maze of existing structured debt securities, and to price them correctly. Absent such information, structured debt securities found no buyers, and their market froze. So the information loss involved in the process of securitization and rating is largely at the source of the illiquidity that plagues securities markets since the crisis broke out.

In this paper, we draw on existing research to assess the likely causes for these two failures of rating agencies in the securitization process – ratings inflation and information loss due to their coarseness – and review the policies that may be adopted to correct or mitigate them in the future.

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<sup>1</sup> Both rating inflation and naïve investors’ excessive reliance on ratings are well captured by Lloyd Blankfein, CEO of Goldman Sachs, who wrote that before the crisis “too many financial institutions and investors simply outsourced their risk management. Rather than undertake their own analysis, they relied on the rating agencies to do the essential work of risk analysis for them. ... This over-dependence on credit ratings coincided with the dilution of the coveted triple A rating. In January 2008, there were 12 triple A-rated companies in the world. At the same time, there were 64,000 structured finance instruments, such as collateralised debt obligations, rated triple A.” (Blankfein, 2009, p. 7).

The most obvious motive for the inflation of credit ratings is an incentive problem: CRAs are paid by issuers, so that their interest is more aligned with that of securities' issuers than with that of investors. In this respect, CRAs are not unique: a similar conflict of interest also exists for other "financial gatekeepers", such as auditing companies, but as we shall see regulation has been much more lenient with credit rating agencies. Moreover, in the case of ratings the problem is exacerbated by the possibility for issuers to engage in "rating shopping", by soliciting only the most favourable rating among those potentially available from a set of competing agencies.

The reason for disseminating only coarse information when issuing structured debt securities is less obvious, since one would expect the provision of detailed public information to reduce the rents of informed traders, and thereby to enhance secondary market liquidity. This should in turn increase the issue price of the securities, leading issuers to ask CRAs to provide the most detailed assessment of the risk characteristics of their issues, or else complement their ratings with any additional data necessary for such assessment. But arguably issuers saw an even larger benefit in providing relatively coarse information: that of expanding the primary market of structured debt securities, by making them palatable also to investors who could not easily process complex information. By providing little information to all, they levelled the playing field so that unsophisticated could buy these securities without losing money to sophisticated ones, and thereby attracted the former into their primary market. Indeed, issuers and rating agencies grasped the counterintuitive principle that, to market very complex securities to a clientele that includes relatively unsophisticated investors, less rather than more disclosure enhances market size and liquidity. However the current crisis shows that the implied information loss can have dire consequences for market liquidity further down the road, if and when the neglected information becomes price relevant.

Moreover, the coarseness of ratings may reinforce the tendency to inflate them, as it expands the room for collusion between issuer and rating agency, and therefore the conflict of interest with investors. As we shall see, if ratings are set on a discrete scale, complacent rating agencies can suggest to issuers how to structure their securities or their tranches so that they can just attain a given rating. Therefore, in each rating class a disproportionate number of issues or tranches will feature a risk corresponding to the low end of that class. This enhances ratings inflation in comparison to a situation where ratings are set on a finer grid.

What can policy makers do to improve things for the future? We argue that the *preferred policy* would require a drastic change in regulation – not just in specific rules but in their guiding

principles as well. First, since both of the problems discussed above arise from the conflict of interest between rating agencies and investors, it is of essence to eliminate (or at least reduce) this conflict by addressing the issue of “who pays”. If rating agencies are tempted to please issuers by inflating their credit ratings and/or by choosing excessively coarse ratings, then the most appropriate solution is to have investors – not issuers – pay for their services, as indeed was the case before the 1970s. But switching from the “issuer pays” to the “investors pay” model may be difficult to implement in practice, because free-riding or information leakage could reduce the incentives of CRAs to produce informative ratings. This would in turn require regulators to reduce (or eliminate) the reliance of banking and security regulations on ratings. Moreover, to reap the benefits from the “issuer pays” model it will be necessary to prevent indirect payments by issuers to credit rating agencies in the form of the purchase of consulting or pre-rating services.

Second, in order to attain greater disclosure the issuers should make publicly available the complete (anonymous) data about the pool of loans (or bonds) underlying their structured finance products, so that buy-side investors may feed them into their own models to assess their risk characteristics. Clearly, few buy-side investors would have the technical skills to do this. Hence, the market for securitized products will be considerably smaller, since less sophisticated investors will tend to stay away from it. However, this problem is likely to be partially and gradually relieved by the entry of specialized information processors, who will supply financial advice to investors and provide healthy competition to CRAs. This highlights an additional reason to revoke the current regulatory delegation to a select group of CRAs, as in this setting there is no guarantee that these will be come to be regarded by investors as the most reliable ones, or will survive the competitive challenge mounted by other information processors.

Such sweeping changes will meet not only the opposition of credit rating agencies, but also that of regulators, due their considerable transitional costs. Therefore, policy makers may also want to consider a *second-best policy*, which tries to address the above-discussed problems without overhauling the current setup. Specifically, they may retain the “issuer pays” model but constrain the way in which agencies contract with issuers and are paid by them: issuers should pay an upfront fee irrespective of the rating issued (the so-called “Cuomo plan,” named after NY Attorney General Andrew Cuomo) and credit shopping should be banned. Similarly, regulators could enhance transparency not by forcing issuers to grant open and free access to all relevant data, but by determining the information that they must disseminate to the investing public, and therefore mandating a more complete format for the information to be disseminated by CRAs.

These more limited reforms may still be consistent with the current regulatory delegation of vast powers to a select group of rating agencies. But their effectiveness in addressing the failures of credit agencies exposed by the current crisis is likely to be limited. First, even if issuers must pay an upfront fee and cannot engage in explicit rating shopping, implicit collusion may still be sustainable: issuers may systematically patronize the agency that offers them the best ratings, which they can identify by comparing the models that agencies use to rate securities.

Second, prescribing which pieces of information and which statistics CRAs should disseminate would shift the burden of identifying such information on the regulator, which can be complex in the presence of very diverse financial products. It may also expose such detailed regulation to the danger of failing to keep pace with financial innovation, especially in the design of structured debt securities, some of which may even be induced by regulation itself. Finally, it would induce many naïve investors to persist in the bad habits of the past, that is, that of forgoing an independent evaluation of the risk characteristics of these securities (based on additional data sources or other information processors) once a CRA has provided the information required by regulators.

In contrast, an open-access, non-prescriptive approach by regulators would shift on issuers and investors the burden of determining the pieces of information that are most relevant to evaluate the risk of each security, and would not run the risk of obsolescence. It would also reduce, instead of further increasing, the tangle of regulations in this area. This is an instance in which less regulation might also be safer and better regulation, in contrast to what is currently suggested by many.

## **2. Securitization process and rating agencies**

Asset-backed securities have been around for decades. However, between 2001 and 2006 there was a spectacular growth in the issuance of two new types of structured debt products: subprime MBS or Mortgage Backed Securities, and CDOs or Collateralized Debt Obligations. Subprime MBS are backed by pools of mortgage loans that do not conform with the standards set by Fannie Mae and Freddie Mac because of low FICO score, poor credit history or limited documentation. CDOs are backed by pools of corporate bonds and other fixed income assets, or by portfolios of tranches from MBS and other CDOs. As shown in Table 1, between 2001 and 2006 the combined issuance of subprime MBS and CDOs grew ten times, from \$100 billion to more than \$1 trillion.

[Insert Table 1]

This remarkable growth in the market for asset-backed securities would have been impossible without the help of CRAs. The reason is simple: for this market to succeed, it needed to attract the large pool of institutional investors that are subject to rating-based constraints. In other words, the market for subprime MBS and CDOs needed to be a “rated” market, in which the risk of tranches was assessed by CRAs using the same scale as bonds. In that way, the rating provided access to a pool of potential buyers, who would have otherwise perceived these securities as very complex and would have possibly shied away from them. Interestingly, rating agencies were very explicit in reassuring investors that the rating of structured securities was directly comparable with the rating of bonds. “Our ratings represent a uniform measure of credit quality globally and across all types of debt instruments. In other words, an ‘AAA’ rated corporate bond should exhibit the same degree of credit quality as an ‘AAA’ rated securitized issue” (S&P 2007, p. 4).

This led to a massive repackaging of risks into a vast quantity of newly issued AAA-rated securities: according to Fitch (2007), 60 percent of all global structured products were AAA-rated, in contrast to less than 1 percent of the corporate issues. Rating agencies benefited a lot from the growth of structured products. By 2006, 44 percent of Moody’s reported revenue came from rating structured finance products, with respect to 32 percent of revenues from the traditional business of rating of corporate bonds (Coval et al., 2008). In this way the issuers of structured products and the rating agencies became very much dependent on each other, until the collapse in the late 2007.

The extent of the crisis in the market for asset-backed securities can be best appreciated by looking at the dynamics of the ABX price indexes reported in Figure 1. ABX indexes provide an indicative measure of the value of MBS, as they are based on the price of credit default swaps offering protection against the default of baskets of subprime MBS of different ratings. In other words, a decline in the ABX index indicates an increase in the cost of insuring a basket of mortgages of a certain rating against default. It is clear from the graph that the crisis was first felt in March 2007 by the BBB-rated MBS. A few months later, in June 2007, all tranches (even the AAA-rated securities) experienced a substantial drop in value, as UBS shut down its internal hedge fund, Dillon Read, after suffering about \$125 million of subprime-related losses. As the crisis worsened, the indexes never recovered and kept declining across all ratings.

[Insert Figure 1]

The extent to which the performance of CRAs came to depend on the securitization process in recent years can be exemplified by comparing the profits of Moody's – one of the three largest agencies – with those of Reuters – a leading financial publisher and data provider – over the past 6 years. The choice of Reuters as a benchmark is justified by the fact that CRAs define themselves as “financial publishers”, and as such are treated by the law, even though their activity arguably goes beyond the simple publication of financial “opinions”.<sup>2</sup> The top chart in Figure 2 shows that Moody's earnings before interest and taxes (EBIT) grew threefold from \$541 million at the beginning of 2003 to \$1439 million in the third quarter of 2007, and then reverted to \$683 million by the third quarter of 2009, in perfect synchrony with the crisis. In contrast, Reuters profits took only a modest dip at the start the crisis, and kept growing thereafter. The time pattern of the two companies' return on assets (ROA) in the second chart paints a similar picture, although the level of Moody's profitability greatly exceeds that of Reuters throughout the period (even at its lowest value in the third quarter of 2009, it stands at 40% against the 6% of Reuters). Perhaps most tellingly, the ratio between the stock market capitalization of the two companies, shown in the bottom chart of Figure 2, attained its highest value – approximately 80% – in the late 2005 and early 2006, and dropped continuously thereafter, down to the current level around 20%.

[Insert Figure 2]

To understand how securitization works, which information is made available to investors and how CRAs contribute to it, it is best to consider a real example of a subprime MBS. The special-purpose vehicle shown in Table 2 is called GSAMP-Trust 2006-NC2 and owns 3,949 subprime loans for an aggregate principal of \$881 million. The originator of the underlying loans is New Capital Financial, at the time the second largest subprime lender in the US, originating \$51.6 billion in mortgage loans in 2006. It later filed for bankruptcy on 2 April 2007. The arranger of the deal is Goldman Sachs who bought the portfolio from the originator and sold it to a SPV named GSAMP-Trust 2006-NC2. The SPV funded the purchase of this loan through the issue of asset-backed securities (listed in Table 2). These securities entitle their holders to the cash flow generated by the loan portfolio, according to the seniority structure of their tranches (a “waterfall” scheme): holders of junior tranches can be paid only after more senior tranches have been paid in full. Therefore, in case of default, the “junior” tranche is the first to absorb losses from the underlying collateral loans, and

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<sup>2</sup> The legal status of “publishers” confers considerable legal privileges to CRAs, as we shall see below. However, if CRAs were standard financial publishers, it would be hard to justify the large discrepancy between Moody's profitability (or market valuation per employee) and that of Reuters or Dow Jones, as noted by Partnoy (2006).

when it becomes worthless the “mezzanine tranche” starts absorbing further losses, with the senior tranche (typically AAA-rated) being the most protected against default risk.

[Insert Table 2]

If sold to the public, these securities – or their tranches, if any – must be rated by a CRA and must be described in a public prospectus. In our example, there were 17 tranches: 5 AAA-rated senior tranches, 9 mezzanine tranches with ratings ranging from AA+ to BBB-, 2 B tranches with ratings BB+ to BB, and an equity tranche X with no rating. It is interesting to notice that the first 5 tranches representing almost 80% of the total were AAA rated. Tranche X (the riskiest one), being unrated, was not sold to the public. The prospectus of this MBS is a document of 555 pages deposited at the Securities and Exchange Commission (SEC) on 31 March 2006.

Prospectuses contain several summary statistics on the underlying pool of loans. From the prospectus of GSAMP-Trust 2006-NC2, we learn that 88.2% of the loans have adjustable rate (the remaining have a fixed rate); 98.7% are first-lien (that is, the first mortgage on the property); 90.7% are for first homes; 73.4% of the mortgaged properties are single-family homes; 38.0% and 10.5% are secured by residences in California and Florida, respectively, the two dominant states in this securitization. The average borrower in the pool has a FICO score of 626: 31.4% have a FICO score below 600, 51.9% between 600 and 660, and 16.7% above 660. The average mortgage loan in the pool has a loan-to-value ratio (LTV) of 80.34%: 62.1% have a LTV of 80% or lower, 28.6% between 80% and 90%, and 9.3% between 90% and 100%. The ratio of total debt service of the borrower to gross income is 41.78%. However, this information is not available for all borrowers, as only 52% of the loans have full documentation, that is, provide information about income and assets of the applicants.

The above information is contained in 20 pages. The rest of the document describes the originator (New Capital Financial), the arranger (Goldman Sachs), the servicer (Ocweb), the securities administrator (Wells Fargo), the underwriting guidelines, and contains a list of disclaimers, reps and warranties (for instance, the absence of any delinquencies or defaults in the pool; compliance of the mortgages with federal, state, and local laws; the presence of title and hazard insurance; disclosure of fees and points to the borrower; statement that the lender did not encourage or require the borrower to select a higher cost loan product intended for less creditworthy borrowers when they qualified for a more standard loan product).

At this point, it is worth making three observations on the quality of the information available to investors. First, the data provided in the prospectus is not enough to help pricing or detect default. In fact, it is entirely made of summary statistics, which deliver information on the average claim but not on the individual loans in the portfolio, which may be critical to assess the risk of default of the portfolio and its tranches. Valuing these risks was of limited importance when house prices were rising and defaults were few. But as house prices stopped rising and the number of defaults started increasing, the valuation of these securities became very complicated and information about the underlying securities became very important. Yet, it was not available in the prospectus and in the yearly reports produced by the SVPs.

Second, detailed information on the pool of underlying securities is available through data providers like Loan Performance and McDash Analytics. Loan Performance's securities databases are the industry's largest and most comprehensive: they include loan-level data on more than 90% of the market for MBS securities. As stated on the website of McDash Analytics, these companies "collect loan level data directly from servicers into an anonymous database, distribute the cleansed data, and provide them to clients who want to perform prepayment and default benchmarking analysis on their mortgage asset holdings." The catch is that the subscription to these datasets is very expensive and a lot of skills are required to analyze this data. Hence, most investors did not bother to use them to assess the risks of their investment decisions (and check the quality of the credit ratings) until the crisis hit them. After all, why should they spend their money to replicate what rating agencies were (supposed to be) doing for free?

Third, no information is available on the stake retained by originators and arrangers and on their subsequent trades. This information might have been very important to help investors to assess to value of MBS securities because securitization of subprime loans generates a clear moral hazard problem. As loans are sold to the market, originators have less incentive to collect the soft information that is needed to screen the applicants. Keys, Mukherjee, Seru and Vig (2008) show that among loans with similar observable characteristics those that are more likely to be securitized (because their FICO score is just above the 620 cutoff) are more likely to default than those that are less likely to be securitized (because their FICO score is just below 620). This effect is present only for loans with low or no documentation, suggesting that securitization reduces the incentives to collect soft information. If so, holdings and trades of originators and arrangers would signal the quality of the underlying pool of loans, and thus provide very valuable information for investors.

### 3. Conflict of interest and rating inflation

As noted by Partnoy (2006), among all “financial gatekeepers” CRAs are those who face the most serious conflicts of interest. This is due to a combination of factors.

First, differently from analysts (but not from auditors), since the 1970s they are paid by the issuers whose instruments they rate. This change in practice came at the same time as the approval of a body of U.S. regulations that depend exclusively on credit ratings issued by Nationally Recognized Statistical Rating Organizations (NRSROs), a status until recently awarded only to Moody’s, Standard & Poor’s, and Fitch.<sup>3</sup> Being paid by the issuers creates an obvious incentive for rating agencies to distort ratings so as to please their clients, and win further business from them.

Second, unlike other gatekeepers, CRAs are allowed to sell ancillary services to the clients whose instruments they rate, in particular pre-rating assessments and corporate consulting. For instance, an issuer can ask a rating agency how it would rate a financial instrument with certain characteristics, and even ask how these should be modified to (just) obtain a certain rating. This type of activity facilitates rating shopping, that is, it allows an issuer to identify the rating agency that would provide the most favourable rating to its financial instruments, a point highlighted by Bolton et al. (2008), Skreta and Veldkamp (2009) and Spatt, Sangiorgi and Sokobin (2008). In particular, Bolton et al. (2008) show that precisely due to credit shopping the conflict of interest is exacerbated under duopoly compared to monopoly.<sup>4</sup> That competition has undesirable effects in this situation is also confirmed by the evidence in Becker and Milbourn (2008), who show that the entry by Fitch has been associated with greater ratings inflation.

Of course, for the conflict of interest to result in rating shopping it must be the case that there are some naïve investors who can be gullied by the inflated ratings, an element present both in Bolton et al. (2008) and in Skreta and Veldkamp (2009), or by regulations that induce the issuer to strive for the highest possible rating, as in Spatt et al. (2008). Importantly, regulation does provide such inducement, as pension funds, banks, investment funds and insurance companies are all subject to

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<sup>3</sup> Since 2003, the number of the NSSRO has risen to ten: between 2003 and 2005, the SEC designated two new NSSRO, and pursuant to the passage of the Credit Rating Agency Reform Act in 2006 by the U.S. Congress it designated five more – two Japanese ones and three small U.S. ones.

<sup>4</sup> In their model, there are naïve investors who believe the credit rating agencies’ stated ratings. The issuers of commercial paper will never buy a bad rating, so credit agencies have an incentive to overstate the quality of any given issuance if the reputation costs (i.e. future lost profits) are low enough or the share of naïve investors large enough. An increase in the number of credit agencies, i.e. more competition, makes investors actually worse off as it gives issuers more opportunity to shop around for a good rating.

regulation based on ratings, and the scope of this regulation has greatly expanded over time. For instance, since 1989 U.S. pension funds are allowed to invest in highly rated asset-backed and mortgage-backed securities. The minimum capital requirements of banks, insurance companies and brokerage companies are also affected by the credit ratings of the assets that they hold. Therefore, regulation *per se* has been an increasing source of demand for high ratings by financial institutions.

Thirdly, ratings agencies are largely immune to civil and criminal liability for malfeasance, because according to several U.S. court decisions they are to be considered as “journalists” and therefore their ratings are opinions protected by the First Amendment (freedom of speech). In contrast, after the Sarbanes-Oxley Act auditors and corporate boards face new rules regarding conflicts of interest, and financial analysts at investment banks are subject to restrictions on their activity and compensation. Therefore, for CRAs regulators have made much less of an effort to mitigate the conflict of interest than for other financial gatekeepers.

These considerations suggest that the inflation in credit ratings might have been exacerbated (i) by the regulatory implications of ratings due to the NRSRO status, which confers an intrinsic value to ratings over and above their true ability to measure risk, (ii) by the presence of naïve investors, whose number may have increased with the popularization of finance in recent years, and ironically (iii) by the increase in competition associated with the entry of a third NRSRO (Fitch). But these considerations can still not explain why the spectacular failure of ratings occurred in conjunction to structured debt securities and not (at least not on the same scale) until CRAs confined themselves to evaluating the default risk of corporate bonds, which for a long time was their main activity. To understand this, it is important to realize that the shift from corporate debt to structured debt securities increased tremendously the gap between the complexity of the instrument being rated and the coarseness of ratings.

### **3.1 Why complex securities and coarse ratings exacerbate rating inflation**

The complexity of structured debt securities greatly expands the scope and incentive of rating agencies to collude with issuers, if ratings are relatively coarse – e.g., if they are based on a few discrete classes such as AAA, AA, A, BBB, etc., rather than on a continuous scale. The complexity of structured debt securities arises from the fact that these are portfolios of assets, often numerous and highly heterogeneous in their risk and return characteristics. The extent to which the risk of these assets is correlated is very important to determine the sensitivity of structured debt securities

to aggregate risk, as underlined by Coval, Jurek and Stafford (2008). In addition, for MBS securities the risk of the underlying mortgage loans stems from two quite different sources: prepayment risk, which materializes when borrowers find early repayment worthwhile because of the improved refinancing conditions; and default risk, which instead occurs when interest costs escalate, housing prices decline, or there are adverse shocks to the borrowers' employment or income. The socio-economic and geographic composition of the underlying loan portfolio determines the exposure of the MBS to each of these risks. Complexity is further increased by "tranching": for instance, an AAA tranche has different exposure to default risk depending on whether it is protected by a thick layer of mezzanine tranches or not. Therefore, its value depends greatly on the size and number of the junior tranches.

This complexity, together with the coarseness of the ratings, opens the door to collusion between issuers and CRAs. Since each ratings class corresponds to a range of possible values of credit risk, the CRA may provide a pre-rating assessment to the issuer, explaining which rating the security would obtain depending on different potential structures of the underlying portfolio of assets. This allows the issuer to choose the portfolio structure that *just* enables the MBS or the CDO to be, for instance, AAA-rated. Therefore, AAA-rated structured debt issues will end up having not the rating corresponding to the *average* AAA-rated corporate bond but rather to the *marginal* one, implying that they are correspondingly riskier. The same "trick" could be applied to the rating of tranches, in which case the issuer can adjust not only the composition of the underlying portfolio but also the details of the "waterfall" scheme of seniority between tranches.

This may go a long way towards understanding the true meaning of the very large "credit enhancement" achieved by structured debt issuers relative to the credit risk of the underlying portfolio. Indeed, Bemmelech and Dlugosz (2009) find, using data on 3,912 tranches of CDOs, that "while the credit rating of the majority of the tranches is AAA, the average credit rating of the collateral is B+" and observe that the CDOs were structured according to a very uniform pattern – not only in their tranche structure but also in the composition of the underlying portfolio. They suggest that this uniformity may be explained by CRAs helping issuers to structure their CDOs so as to just fit their requirements to achieve an AAA rating. In support of this interpretation, they note: "Anecdotal evidence suggests that the S&P rating model was known to CDO issuers and was provided to them by the rating agency" (p. 632). For instance, by making its CDO Evaluator software available via its web site, S&P allowed issuers to simulate different scenarios of expected default given the characteristics of the collateral they had chosen: "The CDO Evaluator software

enabled issuers to structure their CDOs to achieve the highest possible credit rating at the lowest possible cost.” This is reflected even in the wording that S&P uses to define excess collateral: “what percentage of assets notional needs to be eliminated (added) in order for the transaction to provide *just enough* ... support at a given rating level” (p. 633).

Of course, if investors were all sufficiently sophisticated, they should take this behaviour by rating agencies into account: they should regard an AAA-rated CDO as riskier than an equally rated corporate bond, leading the CDO to be priced at a discount relative to the bond. This, however, will not occur if many investors are so naïve as to blindly use ratings to assess the riskiness of claims, as argued by Brennan et al. (2008). To support this claim, they quote the statement by the SEC that “certain investors assumed the risk characteristics for structured finance products, particularly highly rated instruments, were the same as for other types of similarly rated instruments”, and that “some investors may not have performed internal risk analysis on structured finance products before purchasing them” (*Federal Register*, Vol. 73, No. 123 page 36235, June 25, 2008). Indeed, precisely on this basis the SEC later recognized the need for differentiated ratings for structured products and corporate bonds. Also the Committee on the Global Financial System (2005) indicates that a number of the investors interviewed by their Working Committee “claim to rely almost exclusively on the rating agencies’ pre-sale reports and rating opinions for information on deal specifics and performance” (p. 23).<sup>5</sup>

### **3.2 Why rating coarseness supported the expansion of the structured debt market**

The previous section only considered one sense in which ratings can be regarded as coarse, that is, their discreteness (if ratings were continuous, rating agencies could obviously not play on the difference between the marginal and average credit risk within a given rating class). But in reality there are several other dimensions in which existing ratings are coarse.

First, the ratings released by S&P and Fitch reflect their assessments of the default probability of the corresponding security or tranche. But the default probability captures only one dimension of default risk: it does not indicate the magnitude of the “loss given default”, which is crucial to assess the security’s or tranche’s risk. Instead, Moody’s ratings reflect its assessment of the expected

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<sup>5</sup> Consistently with this, Firla-Cuchra (2005) documents that ratings explain between 70 and 80 percent of launch spreads on structured bonds in Europe. Indeed he interprets this as evidence that “some investors might base their pricing decisions almost exclusively on ratings”.

default loss, that is, the product of the probability of default and the loss given default. Though better as a measure of default risk, even this is not sufficient to assess the risk of a structured debt security. Indeed, Brennan et al. (2008) show that mispricing arises even if the valuation of structured debt securities is based on ratings that assess their expected default loss, rather than simply their probability of default.<sup>6</sup>

A proper assessment of the risk of such a security would in fact require also information regarding the covariance between default losses and the marginal utility of consumption (that is, its “beta”), as pointed out by Coval et al. (2008). These authors study the mispricing that arises if the rating only assesses the probability of default but fails to indicate whether default is likely to occur in high-marginal utility states. They also point out that, in tranching CDOs, the distribution of risk across the various tranches is very sensitive to the assumptions made by the rating agency about the correlation structure of defaults in the underlying portfolio, which happens to be precisely one of the weakest spots of the methodology commonly used by credit agencies: for instance, S&P simply assume two corporate bonds to have a 15 percent correlation if they are in the same sector, and a 5 percent correlation if they are from different sectors (Bemmelch and Dlugosz, 2009, p. 629), irrespective of the state of the aggregate economy. But default correlations are clearly much higher in economic downturns than in expansions, a fact that may contribute to account for the massive failure of credit ratings of structured debt in the current recession.

At another level, the coarseness of ratings reflects the limited amount of detailed loan-level data that CRAs used in their models to evaluate the risk of the underlying portfolio. As late as 2007, Moody’s reported that it was about to request more detailed loan-level data from issuers, for the first time since 2002, including even data that itself considered to be “primary”, such as a borrower’s debt-to-income (DTI) level, the appraisal type, and the identity of the lender that originated the loan. As noted by Mason and Rosner (2007), it is surprising that these data would not have been collected by them before, considering that “traditionally the loan to value ratio (LTV), FICO score and the borrowers’ DTI are the three most significant measures of credit risk on a mortgage” (p. 24). At least as surprising is that the models used by CRAs neglected the identity of the lender that originated the loan, considering that this piece of information turns out to be highly significant in predicting the subsequent rating downgrades of the same asset-backed securities, as documented by Johnson, Faltin-Traeger and Mayer (2009) in an empirical study of S&P ratings.

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<sup>6</sup> Well before the crisis, the Committee on the Global Financial System (2005) already warned that “the one-dimensional nature of credit ratings based on expected loss or probability of default is not an adequate metric to fully gauge the riskiness of these instruments. This needs to be understood by market participants” (p. 3). Clearly it was not!

Presumably, to effectively convey all this information about the risk of MBSs, CDOs and their tranches, the rating agencies would have had to produce multidimensional ratings, and also report statistics on the sensitivity of their ratings to the most crucial assumptions of their models, such as those on correlation between the defaults of the assets in the underlying portfolio. This, however, would have probably made their ratings much harder to understand and interpret for many investors, and would have limited the issuance of structured debt, contradicting the role that rating agencies saw for themselves in the development of this market. Indeed, as wittily pointed out by Partnoy (2006), “with respect to these new instruments, the agencies have become more like ‘gateopeners’ than gatekeepers; in particular, their rating methodologies for collateralized debt obligations (CDOs) have created and sustained that multi-trillion-dollar market” (p. 60).

This drawback of disclosure is captured by the model of Pagano and Volpin (2008), where issuers may not wish to release complex information about their structured bonds, because only few potential buyers are sophisticated enough to understand the pricing implications of such information. Therefore, releasing it would create a winner’s curse problem for unsophisticated investors, and would limit the size and liquidity of their primary market. The point that disclosing detailed information about securitized assets may hinder their liquidity is also made intuitively by Woodward (2003) and Holmstrom (2008). The latter draws a parallel with the sale of wholesale diamonds, which de Beers sells in pre-arranged packets at non-negotiable prices, and argues that this selling method is aimed at eliminating the adverse selection costs that would arise if buyers were allowed to negotiate a price contingent on the packets’ content.<sup>7</sup> Similarly, Kavajecz and Keim (2005) show that asset managers are able to achieve a 48% reduction in trading costs via “blind auctions” of stocks, whereby they auction a set of trades as a package to potential liquidity providers, without revealing the identities of the securities in the package to the bidders. The argument that information disclosure may lead investors to require lower prices and therefore higher rates of return has also been offered by some as an explanation for the yield differential between the RMBS issued by Freddie Mac and those issued by Fannie Mae, as explained in Box 1.

[Insert Box 1]

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<sup>7</sup> Milgrom and Roberts (1992, pages 75-76), who describe this example in detail, suggest however a somewhat different rationale for de Beer’s selling method: they see it as intended to save bargaining costs, that is, the direct costs of haggling over each diamond and the attendant information costs for both the buyers and the seller.

### **Box 1: The Freddie-Fannie Yield Differential**

In the United States, the securitization process was pioneered in 1970 by a government agency, the Government National Mortgage Association (GNMA or Ginnie Mae), which securitized and sold the loans insured by the Federal Housing Administration (FHA). Its policy was to disclose no information about the underlying loan pools of its securities. Their stated reason for this policy was to reduce investors' ability to evaluate prepayment risk (the only relevant risk in this case, as these loans are insured against default): disclosing any information about the composition of its loan pools (such as the geographic distribution of the borrowers) would have given sophisticated investors an advantage in estimating the prepayment risk of the loan pool.

Later, two other public agencies were set up in the U.S. to securitize mortgage loans not insured by the FHA: these new agencies, which also guarantee securitized loans against default risk, are the Federal Home Loan Mortgage Corporation (FHLMC, widely known as Freddie Mac) and the Federal National Mortgage Association (FNMA or Fannie Mae). Initially, both agencies inherited Ginnie Mae's policy regarding information disclosure. However, in the 1990s Freddie Mac gave in to pressure to reveal more information about its loan pools, and since then it regularly discloses geographical information about its loan pools.

Some market practitioners believe that this differential information disclosure explains why in 1998-2008 Freddie Mac pools have traded at consistently higher yields than Fannie Mae's comparable loan pools, in spite of the fact that Freddie Mac's securities even pay a couple of days earlier (so they should pay lower yields). As shown in Figure 3, for 30-year bonds the differential has been 3.05 basis points over the whole decade, up to 4.8 basis points in the most recent and turbulent period (July 2007-October 2008). By releasing more detailed information about mortgage loan location, Freddie Mac may allow sophisticated investors to extract more trading and arbitrage profits at the expense of less sophisticated ones, so that the latter demand a discount to purchase them. If this explanation is correct, this is yet another example where more information disclosure about a security's characteristics implies a lower valuation.

[Insert Figure 3]

However, it must be recognized that the yield differential may arise from other subtle differences in the way in which Freddie Mac and Fannie Mae operate. For instance, their loan pools may differ because major lenders have exclusive agreements to securitize their loans with one agency. If lenders differ systematically in their loan quality, this may drive a difference between the values of the two agencies' securities. Another possible reason is the different extent to which Freddie Mac and Fannie Mae were believed to engage in "cherry picking", a practice that may occur when there is some latitude in delivering a certain bond pool to settle a trade, so that agencies may retain the best bonds (based on prepayment characteristics) for themselves. The spread between Fannie Mae and Freddie Mac yields may then reflect the belief that Freddie Mac has been cherry picking from its portfolio more aggressively than Fannie Mae.

However, suppressing price relevant information may backfire: while it enhances liquidity in the primary market, it may reduce liquidity in the secondary market or even cause it to freeze. This is because the information undisclosed at the issue stage may still be uncovered by sophisticated investors later on, especially if it confers them the ability to earn large rents in secondary market trading.<sup>8</sup> So limiting transparency at the issue stage shifts the adverse selection problem onto the secondary market. In choosing the degree of rating transparency, issuers effectively face a trade-off between primary and secondary market liquidity.

As shown by Pagano and Volpin (2008), the choice of transparency made by the issuers will depend precisely on the trade-off between primary market and secondary market liquidity: as just argued, coarse information enhances the first but endangers the second. The key parameters in this trade-off are the value that investors place on secondary market liquidity, as well the severity of the adverse selection problem in the primary market. If secondary market liquidity is very valuable and/or adverse selection would not greatly damage primary market liquidity, then issuers will choose ratings to be transparent and informative, even at the cost of reducing primary market liquidity. Conversely, if investors care little about secondary market liquidity and/or adverse selection would greatly impair primary market liquidity, then issuers will go for coarse and uninformative ratings.

But the degree of ratings transparency chosen by issuers falls short of the socially optimal one whenever secondary market illiquidity is more costly for society at large than it is for issuers of securitized assets. This may be the case if, for instance, a secondary market freeze were to trigger a cumulative process of defaults and premature liquidation of assets in the economy, for instance because banks' interlocking debt and credit positions create a gridlock effect. Then the degree of ratings transparency that is optimal for society exceeds that chosen by issuers of structured bonds.

This creates a rationale for regulation imposing a certain degree of transparency on issuers of these securities. Nevertheless, it must be recognized that such regulation will have a cost in terms of reduced liquidity or market size at the issue stage. In other words, imposing greater disclosure on the MBS market will most likely reduce its magnitude compared with the pre-crisis record, and will most likely induce investors to require higher yields even after market conditions will have gone back to normality, as exemplified by the Freddie Mac and Fannie Mae comparative experience.

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<sup>8</sup> That sophisticated investors engage in such activity is witnessed by the evidence collected by the Committee on the Global Financial System (2005): "Interviews with large institutional investors in structured finance instruments suggest that they do not rely on ratings as the sole source of information for their investment decisions [...] *Indeed, the relatively coarse filter a summary rating provides is seen, by some, as an opportunity to trade finer distinctions of risk within a given rating band*" (p. 3, emphasis added).

## 4. Possible policy interventions

In the discussion above, we have identified rating inflation and coarse ratings as the main targets for policy interventions. The obvious solution to address them is to change the incentives of rating agencies and increase disclosure. But, what are the specific policy reforms to implement? In what follows we outline two possible courses of action.

The first, which we regard as the *preferred policy*, is quite drastic, in that it requires not simply an adjustment of existing rules but a complete reorientation of regulation according to two new guiding principles: (i) ratings should be paid by investors, and (ii) investors and rating agencies should be given free and complete access to all information about the portfolios underlying structured debt securities, as well as about the design of their tranches.

The second policy, which we regard as a *second-best* one, imposes milder changes to the current market model, but is likely to be far less effective in addressing the problems illustrated in this paper. Furthermore, it is expected to require a considerable increase in an already hypertrophic regulation, in contrast with the preferred policy, as also underlined by Richardson and White (2009).

### 4.1 Preferred policy

*(1) Credit rating companies should be paid by investors and not by issuers.*

Since both rating inflation and the tendency to issue coarse ratings arise from the conflict of interest between rating agencies and investors, it is crucial to eliminate (or at least reduce as far as possible) this conflict by addressing the issue of “who pays”. If rating agencies tend to please issuers by inflating their credit ratings and/or by choosing excessively coarse ratings, then the most appropriate solution is to have investors – not issuers – pay them for their services, as indeed was the case before the 1970s. How would such a system work? Not too differently from the market for other forms of financial information, spanning from the sale of price and transaction data by trading platforms and newspapers to the sale of advice by financial analysts and of economic forecasts by econometric consultancies. Financial analysts are perhaps the most fitting comparison: their analysis and recommendations are either sold to investors on a standalone basis or are packaged together with financial services by large banks or securities companies.<sup>9</sup>

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<sup>9</sup> While in most cases analysts are paid by investors (“sell-side analysts”), companies can also hire a fee-based research firm to prepare one or many reports (“paid-for analysts”). Interestingly, Kirk (2008) documents that paid-for analysts issue relatively less accurate forecasts and more optimistic recommendations than sell-side analysts, which is consistent with the idea that the former are more exposed to a conflict of interest than the latter.

It should be recognized that even this arrangement is not completely free from incentive problems: if some investors are large enough (or manage to set up cooperative arrangements to purchase ratings), they may also end up affecting ratings – for instance, they may try to induce CRAs to avoid or delay rating downgrades for securities in which they have invested heavily. But it is hard to imagine that such large investors may wield sufficient power as to distort the ratings of all the competing agencies, and presumably other investors will try to patronize rating agencies that have shown no such tendency to shade their ratings so as to please their large customers.

More importantly, switching from the “issuer pays” to the “investors pay” model may be difficult to implement in practice because of free-riding or information leakage within the pool of investors: after buying a rating, an investor could re-sell or leak the information to other investors, who could in turn resell or leak it to others. The end result would be that ratings would yield negligible revenues. Hence, CRAs would have little incentive to produce them, or at least to invest effort in producing valuable ratings. The problem is akin to that arising in the markets for music CDs or software, where the ability of consumers to reproduce and disseminate music and software at low cost via the web makes life difficult for their producers.

In principle, this hurdle can be overcome by appropriate public intervention: in particular, institutional investors who are required to buy only investment-grade asset-backed securities can be required to buy a rating at a pre-set fee. If there is enough competition between CRAs, institutional investors will tend to patronize the best CRAs, so that the market will ensure quality control. Of course, the regulator will have to set the rating fee at the right level, so as to ensure the viability of CRAs but avoid leaving them with excessive rents. A variant of this approach is the “platform pays” model proposed by Mathis et al. (2009): when an issuer wants to apply for a credit rating by a CRA, it is required to contact a platform (an exchange, a clearing house or a central depository), which would charge a fee to the issuer and choose a CRA to get the rating done. The platform’s interposition would thus prevent direct contracting between issuers and CRAs, and its concern to retain trading activity by investors would presumably induce it to select the most reliable CRA.

Even if the “investors pay” model is accepted and successfully implemented, a remaining problem arises from the danger of implicit collusion between issuers and CRAs, in a situation where delegation by banking and securities regulations has conferred a tremendous power to a select group of CRAs over issuers. To prevent implicit collusion, it is essential to prohibit indirect payments by

issuers to CRAs in the form of the purchase of consulting or pre-rating services. A more direct (and consequential) way to deal with the problem would be to eliminate the many regulations that delegate powers to rating agencies: once the rents that these regulations confer to these agencies are gone, issuers will have less of an incentive to circumvent the “investors pay” principle. However, it must be recognized that this poses the problem of finding a substitute for ratings in the banking and securities regulation.

*(2) Arrangers and servicers should disclose the complete data on the individual loans (or bonds) underlying the structured finance products.*

To face the problems discussed in the previous sections, the disclosure of nothing less than the entire set of data available to the arrangers and servicers should be required. It should be clear from the discussion in Section 2 that currently prospectuses do not contain enough information to allow investor to assess the risk of default of a specific product and the change in risk characteristics over time. The information on individual loans currently available (for many but non for all securities) through expensive data providers like Loan Performance should become available for free to all investors. With these data, buy-side investors may be able to form their own assessment of the risk characteristics of the product.

It is important to notice that this form of disclosure reduces both the risk of secondary market freezes (as all available information is given to all investors) and the possibility of collusion between issuer and rating agency. In fact, when the information becomes available on the market, specialized information processors will enter and provide financial advice to investors, thereby providing healthy competition to CRAs. This will weaken the unhealthy bond that now exists between issuers and CRAs.

It is also worth highlighting that imposing disclosure requirements on the issuers is far better than imposing them on the rating agencies themselves, as was proposed by the Securities Exchange Commission, in July. SEC (2008) indicates that CRAs should disclose *all information* used to determine ratings for structured products. Although this policy would make CRAs more accountable to the public, it would also reduce their incentives to invest in improving their risk models. Moreover, transparency about rating models could lead to greater collusion with issuers: as seen above, S&P was so transparent about its CDO Evaluator Manual that issuers could predict perfectly the rating they would get, and thus structure deals so as to just get an AAA rating!

As already highlighted in the Section 3, the policy being proposed here should be expected to reduce the price at which securitized assets can be sold at the issue stage and therefore the size of the market for structured debt securities, in comparison with the pre-crisis period. But at least the market would be placed on safer foundations than it was at that time.

#### **4.2 Second-best policy**

This alternative policy retains the current principle that rating agencies are paid by issuers, but tries to restrain the conflict of interest with investors by limiting the way in which agencies contract with issuers and are paid by them, and tries to remedy the coarseness of ratings by prescribing a minimal informational detail to issuers and credit agencies.

*(1) Credit rating companies should be paid an upfront fee irrespective of the rating issued and credit shopping (and paid advice by rating agencies to issuers) should be banned.*

The requirement of an upfront fee is the so-called “Cuomo plan,” named after NY Attorney General Andrew Cuomo. As noted by Bolton et al. (2008), this requirement needs to be supplemented with the ban of rating shopping for it to be effective. SEC (2008) goes some way in the direction of banning the rating shopping. Its plan is to prohibit CRAs to act as both a rater and a paid advisor for a tranching securitization.

Restricting the compensation contracts for rating agencies may instead be less effective. Even if issuers must pay an upfront fee and cannot engage in explicit rating shopping, implicit collusion may still be sustainable: they may systematically patronize the rating agencies that offer them the best ratings, for instance because they know the models that each agency is going to use to evaluate their securities. As a result, the conflict of interest may persist.

*(2) Transparency should be enhanced, by determining the information that issuers and rating agencies must disseminate to the investing public.*

This rule would require mandating a more complete format for the information to be disseminated by rating agencies. This is the policy suggested by the Committee on the Global Financial System (2008), which recommends that CRAs present their ratings so as to facilitate comparison within and across classes of different structured finance products; provide clearer information on the frequency of their updates, and better documentation about their models and the sensitivity of ratings to the assumptions made in their models, and especially reduce the coarseness of their ratings by

producing additional measures of the risk properties of the structured finance products. In the same spirit, the Financial Economists Roundtable (2008) suggested that ratings should be complemented by an estimate of their margin of error. One may add yet more indications: for instance, that the agency should provide statistics that measure the systematic risk of the loan pool and of individual tranches, beside estimates of the probability of default and of the loss given default.

However, this prescriptive approach places considerable burdens and risks on the shoulders of regulators. It requires the regulator to identify the data and statistics that CRAs should provide, which can be very costly in the presence of very diverse financial products. It also exposes regulation to the danger of failing to keep pace with financial innovation, for instance with new ways of designing structured debt securities, some of which may even be induced by regulation itself. Finally, it may induce investors to forgo once more an independent evaluation of the risk characteristics of these securities (for instance by turning to additional data sources or other information processors), trusting that the rating agency has provided all the information required by regulators.

## **5. Conclusion**

What has been the role of CRAs in the subprime crisis? This paper focus on two aspects that contributed to the boom and bust of the market for asset-backed securities: rating inflation and coarse information disclosure.

Ratings inflation coupled with naïve investment decisions led to a massive mispricing of risk, whose correction has been the trigger of the crisis. The likely motive for the inflation of credit ratings is an incentive problem: CRAs are paid by the issuers of the securities being rated, and therefore their interest is more aligned with the issuers than with the investing public.

The coarseness of ratings is one of the main reasons for the illiquidity that has plagued securities markets since the crisis broke out. After house prices stopped rising and defaults started on subprime mortgages started to increase, market participants realized that the detailed information required to identify “toxic assets” in the maze of structured debt securities had simply been lost in the process of securitization, and that ratings provided an insufficient guidance to identify them. We argue that the reason why coarse (and uninformative) ratings had been produced was to expand the

primary market of these securities, by making them palatable also to investors who could not easily process more complex information than coarse ratings.

What can be done to mitigate these problems in the future? Our preferred policy option is to move towards a system where credit ratings are paid by investors, and where arrangers and servicers disclose for free the complete data on the individual loans underlying the structured finance products, so that buy-side investors may feed them into their own models so as to assess their (changing) risk characteristics. Admittedly, such reforms are not without implementation problems, and are likely to reduce the liquidity and size of the primary market for structured finance securities in comparison with the pre-crisis period. Yet, they will restore investors' confidence in the securitization process, which can still prove a valuable tool to enlarge financial markets and transfer risk from lenders to investors. These reforms will also create opportunities for specialized information processors providing healthy competition to CRAs, and sharpen the investors' awareness that they must not place blind faith in ratings alone.

There are encouraging signs that some elements of the above reforms are already being discussed seriously in the policy arena. On 17 September 2009, the SEC voted at a public meeting to propose rules to bar companies from "shopping" for favourable ratings of their securities, by requiring companies to disclose whether they had received preliminary ratings from other agencies – in other words, whether there was "ratings shopping". Even though this does not amount to a ban on credit shopping, at least it informs investors whether any shopping went on, and allows them to take this into account in pricing the corresponding securities.

Regarding disclosure, in July 2009 the American Securitization Forum (ASF) has recently advanced a drastic proposal – essentially the preferred policy outlined in Section 4.1 (item 2). The ASF has developed very detailed and standardized templates for loan-level information reporting by issuers of Residential MBS (RMBS). This information includes both data at the time of the origination of the loan and monthly updates to monitor its performance and the economic conditions of the borrower. If this proposal is accepted, the amount of standardized loan-level information that will be available to purchasers of RMBS will be as good as that of the issuers and servicers themselves.

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**Table 1. Issuance of Mortgage Backed Securities and CDOs over time**

	<b>Total Mortgage Origination</b>	<b>Subprime Origination</b>		<b>Subprime MBS</b>		<b>CDO Issuance</b>
	(\$bn)	(\$bn)	(% of total mortgages)	(\$bn)	(% of subprime mortgages)	(\$bn)
2001	2,215	190	8.6%	95	50.0%	6
2002	2,885	231	8.0%	121	52.4%	36
2003	3,945	335	8.5%	202	60.3%	30
2004	2,920	540	18.5%	401	74.3%	157
2005	3,120	625	20.0%	507	81.1%	272
2006	2,980	600	20.1%	483	80.5%	552
2007Q1	680	93	13.7%	52	55.9%	186
2007Q2	730	56	7.7%	30	53.6%	176
2007Q3	570	28	4.9%	16	57.1%	93

Source: Gorton (2008), Inside Mortgage Finance, Securities Industry and Financial Markets Association, and Creditflux.

**Table 2. Example of REMBS: GSAMP-Trust 2006-NC2**

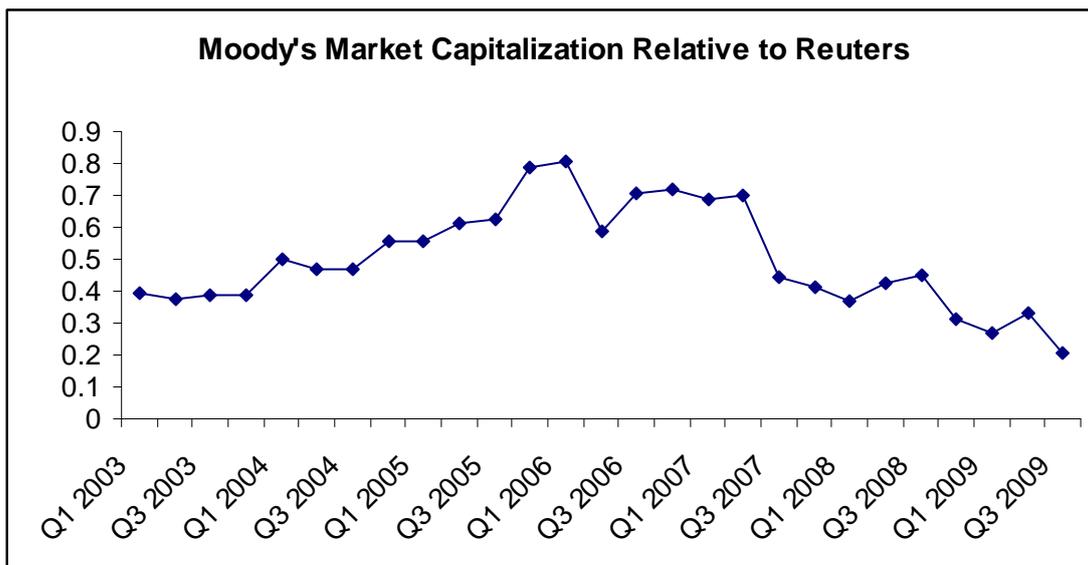
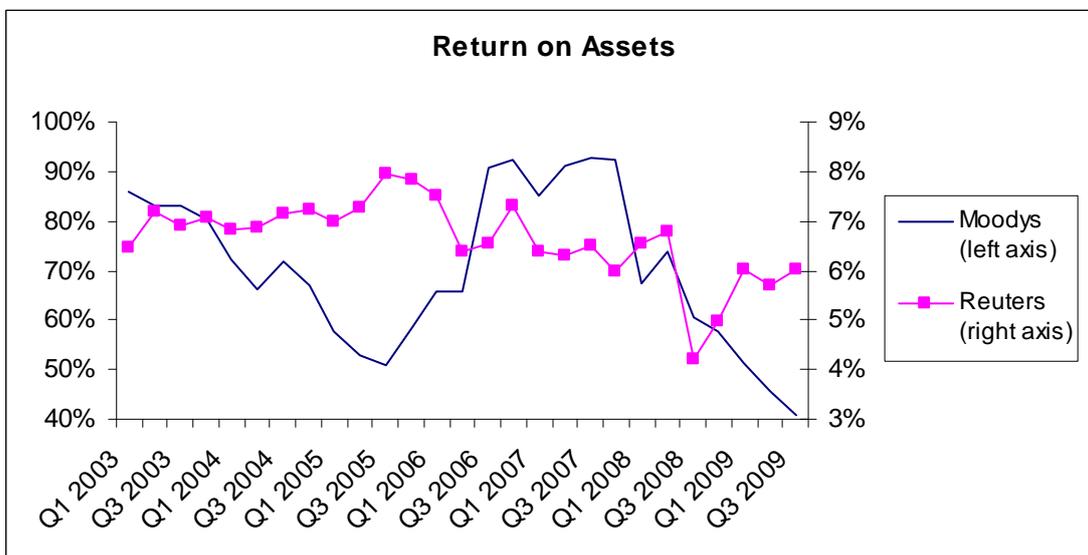
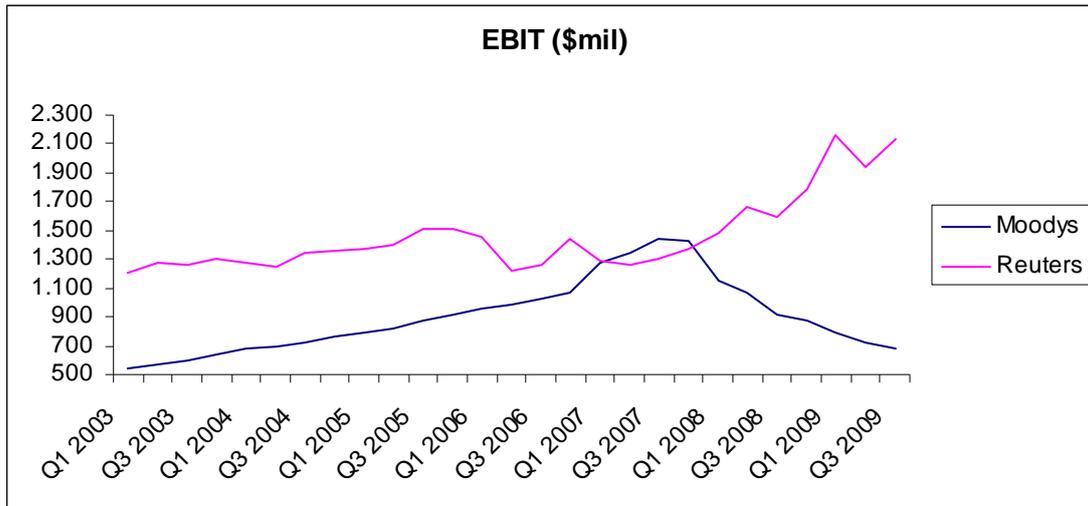
<b>Tranche description</b>	<b>Width</b>	<b>Credit Rating</b>	<b>Coupon rate</b>		
			<b>Class</b>	<b>Notional</b>	<b>% of total</b>
A-1	\$239,618,000	27.2	AAA	Aaa	0.15%
A-2A	\$214,090,000	24.3	AAA	Aaa	0.07%
A-2B	\$102,864,000	11.7	AAA	Aaa	0.09%
A-2C	\$99,900,000	11.3	AAA	Aaa	0.15%
A-2D	\$42,998,000	4.9	AAA	Aaa	0.24%
M-1	\$35,700,000	4.0	AA+	Aa1	0.30%
M-2	\$28,649,000	3.2	AA	Aa2	0.31%
M-3	\$16,748,000	1.9	AA-	Aa3	0.32%
M-4	\$14,986,000	1.7	A+	A1	0.35%
M-5	\$14,545,000	1.7	A	A2	0.37%
M-6	\$13,663,000	1.6	A-	A3	0.46%
M-7	\$12,341,000	1.4	BBB+	Baa1	0.90%
M-8	\$11,019,000	1.2	BBB	Baa2	1.00%
M-9	\$7,052,000	0.8	BBB-	Baa3	2.05%
B-1	\$6,170,000	0.7	BB+	Ba1	2.50%
B-2	\$8,815,000	1.0	BB	Ba2	2.50%
X	\$12,340,995	1.4	NR	NR	.

Source: Ashcraft and Schuermann (2008), SEC-filed prospectus for GSAMP 2006-NC2.



**Figure 1. Value of MBS securities as implied by the ABX indexes**

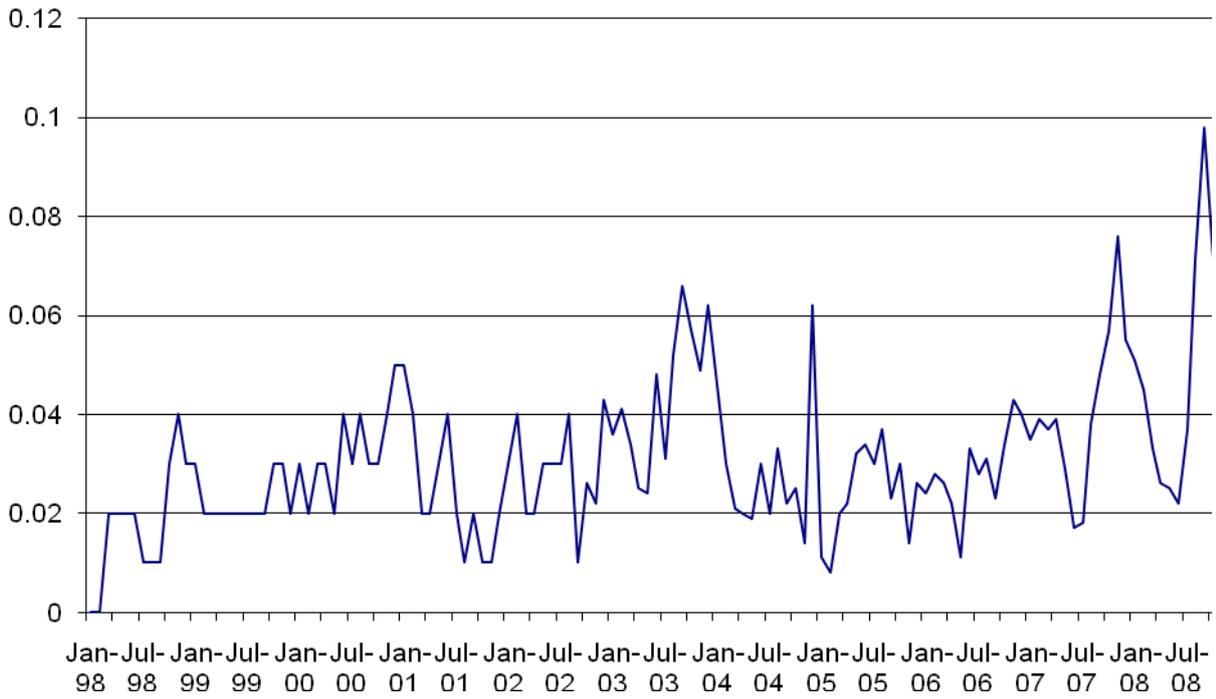
Each ABX index is based on a basket of 20 credit default swaps, which offer protection against the default of asset-backed securities containing subprime mortgages of different ratings. The index is set at 100 on 1 January 2007 for all ratings. Source: Brunnermeier (2008).



**Figure 2. Moody's vs. Reuters**

The top chart shows earnings before income and taxes (EBIT), and the second the return on assets (ROA) of the two companies. The bottom chart displays the stock market capitalization of Moody's relative to that of Reuters. Source: Worldscope.

## Fannie-Freddie MBS Spread



**Figure 3. Spread between Fannie Mae and Freddie Mac bonds**

The Figure shows the current coupon yield differential between Fannie Mae 30 Year MBS and Freddie Mac 30 Year Gold PC. Source: data kindly provided by Susan Woodward, Sand Hill Econometrics.