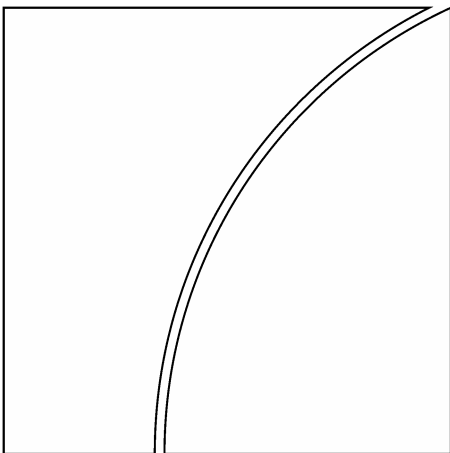


# Committee on the Global Financial System



## The role of ratings in structured finance: issues and implications

Report submitted by a Working Group established by the  
Committee on the Global Financial System

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## Executive summary

Structured finance, which involves the pooling of assets and the subsequent sale to investors of tranching claims on the cash flows backed by these pools, has become an important part of the financial system. Issuance volumes have grown steadily over recent years and the dynamics of market development, together with the benefits afforded to issuers and investors, suggest that growth is likely to continue. Given this and the prominent role played by the rating agencies in structured finance markets, the *Committee on the Global Financial System* established a *Working Group on the Role of Ratings in Structured Finance* to explore the rapidly evolving markets for these instruments.

This report documents the Group's main findings. It highlights several of the characteristics of structured products and the challenges arising for the rating agencies and other market participants. The remainder of the document is organised as follows. Section 2 sets out the broader background of structured finance markets, their structure, their development over time and the main drivers of activity. This is followed, in Section 3, by a discussion of the nature of structured finance ratings and of the methodologies applied by the major rating agencies in assigning these ratings. Section 4 evaluates the role of ratings - and rating agencies - in structured finance. Section 5 discusses some of the concerns that have been expressed regarding this role. Section 6 offers a set of implications.

### What is structured finance?

Structured finance instruments can be defined through three key characteristics: (1) *pooling* of assets (either cash-based or synthetically created); (2) *tranching* of liabilities that are backed by the asset pool (this property differentiates structured finance from traditional "pass-through" securitisations); (3) *de-linking* of the credit risk of the collateral asset pool from the credit risk of the originator, usually through use of a finite-lived, standalone special purpose vehicle (SPV). Forces driving financial intermediaries' issuance of structured finance instruments have included reduction of regulatory capital, access to new and cheaper sources of funding, and portfolio management. Investors' interest has been motivated by portfolio diversification and attractive risk-return profiles.

A key goal of the tranching process is to create at least one class of securities whose rating is higher than the average rating of the underlying collateral asset pool or to create rated securities from a pool of unrated assets. This is accomplished through the use of credit support specified within the transaction structure to create securities with different risk-return profiles. The equity/first-loss tranche absorbs initial losses, followed by mezzanine tranches which absorb some additional losses, again followed by more senior tranches. Thus, due to the credit support resulting from tranching, the most senior claims are expected to be insulated - except in particularly adverse circumstances - from default risk of the underlying asset pool through the absorption of losses by the more junior claims.

Tranching, in turn, contributes to both the *complexity* and risk properties of structured finance products. Beyond the challenges posed by estimation of the asset pool's loss distribution, tranching requires detailed, deal-specific documentation to ensure that the desired characteristics, such as the seniority ordering of the various tranches, will be delivered under all plausible scenarios. In addition, complexity may be further increased by the need to account for the involvement of asset managers and other third parties, whose own incentives to act in the interests of some investor classes at the expense of others may need to be balanced.

*Risk properties* are a related issue. Depending on their position in the seniority structure, tranches of structured finance instruments can be more leveraged than the portfolio of underlying assets: the more subordinated a given tranche, the greater the probability that the holder of that tranche will lose a significant portion of its investment. Losses to senior tranches, therefore, will be relatively rare, since, by construction, they should occur only with the very worst outcomes for the underlying portfolio.

The variety of possible risk profiles generated through tranching can lead to substantial differences among tranches, and between tranches and ordinary bond portfolios, in terms of the *ex ante* uncertainty about losses (ie unexpected loss, as reflected by the variance and higher moments of the loss distribution) and their timing, even when the two instruments have the same expected loss (mean). Subordinated tranches, for example, can lose their entire value if losses in the asset pool are severe enough. This would not occur with an exposure to a straight bond portfolio, assuming that recovery rates are positive. Subordinated tranches will thus have higher unexpected loss than a bond portfolio with the same expected loss or probability of default. Given that the latter criteria (expected

loss or probability of default) represent the one-dimensional risk indicators embodied in credit ratings, structured finance tranches can be riskier than investments in bond portfolios with equal ratings.

### **Structured finance ratings**

From the beginning, structured finance has largely been a “rated” market. Issuers of structured instruments apparently wanted them to be rated according to scales that were identical to those for bonds, so that investors, some of whom were bound by the ratings-based constraints defined by their investment mandates, would be able and willing to purchase the new products.

As a result, structured finance ratings are now among the largest and fastest growing business segments for the three leading credit rating agencies and have developed into an important revenue source. Moody’s annual report for 2003 documents that structured finance, at \$460 million, accounted for more than 40% of ratings revenues. Between 1996 and 2003, structured finance revenue grew at an annual compound rate of nearly 30%. Although separate public accounts for the other two major rating agencies are not available, the 2003 annual report of Fimalac SA, the parent company of Fitch Ratings, indicates that Fitch earned more than 50% of its revenues from rating structured finance transactions. Similarly, McGraw-Hill’s public reports suggest that structured finance is of comparable importance for its Standard & Poor’s division.

Much of the expertise involved in rating traditional debt carries over to structured finance. In both cases, the rating agencies aim to provide independent opinions about the credit risk embodied in debt instruments. What distinguishes the rating of structured finance transactions from the rating of traditional instruments is that the former requires the rating agencies to be involved in the deal’s structuring process. This is because a tranche rating reflects a judgment about both the credit quality of the underlying collateral asset pool and the extent of credit support that must be provided through the transaction’s structure in order for the tranche to receive the rating targeted by the deal’s arrangers. Deal origination thus involves obtaining implicit structuring advice by the rating agencies, at least to the extent that arrangers use rating agency models to pre-structure deals and subsequently engage in an iterative dialogue with the agencies in order to finalise these structures. As a result, ratings of structured finance instruments have a decidedly *ex ante* character. This contrasts with traditional bond ratings, where pre-rating discussions between issuers and agencies play a more limited role.

### **Central bank interest**

Structured finance permits the bundling of the credit risks of a pool of assets and the unbundling of these risks (via tranching of liabilities) in innovative ways. As a result, credit risk is transformed, in that tranching generates exposures to different “slices” of an asset pool’s loss distribution. This division of risks facilitates credit risk transfer, and can contribute to market completeness, potentially resulting in more efficient pricing and an improved dispersion of credit risk. Consequently, structured finance may enhance financial stability. Yet, the properties of structured finance instruments may also lead to situations where certain market participants hold positions that are riskier than they or their counterparties appreciate, thereby generating or magnifying unintended exposures to credit events. The market’s reliance - to a greater or lesser extent - on ratings and the significant role the agencies play in the process of structuring these instruments may thus raise issues for financial stability, to be discussed below.

The central bank community has every reason to make sure that it fully grasps the functioning of structured finance markets and any financial stability implications that may arise from the use of these instruments. However, central bankers may also be interested in structured finance markets for other reasons. One of these is that, while advances in portfolio credit risk analysis have been important for the creation of structured finance markets, risk measurement methodologies are still evolving. Continuing development of these markets, therefore, has pushed forward the state of the art in modelling portfolio credit risk, for example with regard to the estimation and incorporation of default correlations among the obligors in collateral asset pools. This may be important in the context of Basel II and beyond, if market participants were to turn to structured finance markets to gauge the state of the art in portfolio credit risk modelling.

In addition, much like implied volatilities derived from option prices, information extracted from the prices of structured finance tranches and related instruments may offer interesting insights in the

context of central banks' ongoing market monitoring efforts. For example, due to the introduction of tranching products on the basis of credit default swap (CDS) indices, the prices of these products can now serve as the basis for inferences about market participants' views on the magnitude of firm-specific relative to systematic risk factors, ie the business cycle.

## **Key findings**

Rating agencies play a key role in structured finance markets. As in other financial markets, the agencies act as providers of third-party opinions about the riskiness of debt instruments, ie as "delegated monitors", thus helping to overcome asymmetric information problems and improving efficiency and transparency. Yet, the rating agencies' activities have the potential of being particularly significant in situations where investors face relatively high costs in assessing the structure and risk profile of a given instrument - that is, in structured finance.

Complexity of structured finance instruments - which arises from the pooling and tranching of assets and from the involvement of third parties - may help to explain the particular role played by ratings in these markets. The rating agencies not only provide credit assessments of the underlying collateral asset pools. They also provide information on, and are involved in designing, the structural specifics of these securities. This is what sets structured finance apart from traditional credit ratings. Through their involvement in these markets, the rating agencies have thus contributed to developing accepted standards for markets that, by definition, had few prior standards.

Despite this "value added" by the rating agencies, market participants, in using ratings, need to be aware of their limitations. This applies, in particular, to structured finance and the fact 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.

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, which limits the potential for misunderstood risk exposures. 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. Nevertheless, rating agency "approval" still appears to determine the marketability of a given structure to a wider market. A potential downside of such an arrangement is the possibility that rating agency involvement and the oligopolistic structure of the ratings industry may hamper innovation. The Working Group, however, found no support for such a hypothesis. On the contrary, the weight of evidence supports the proposition that the agencies have responded flexibly to demands for ratings of innovative structures and to pressures for continuing improvements in their methodologies for rating existing ones.

Similarly, the Working Group believes that potential conflicts of interest in structured finance are not materially different from the issuer fee-induced conflicts, if any, that might exist in other parts of the ratings business. On this basis, it is the Group's assessment that the complexity of managing these conflicts is not affected by the agencies' involvement in rating structured finance instruments. However, to the extent that truly separate advisory services provided by the rating agencies in other business lines were to develop into an important revenue source in the future, the question of advisory fee-related conflicts of interest potentially originating in those business areas could well affect the complexity of managing conflicts of interest going forward.

Nevertheless, important challenges remain. The Working Group believes that risks associated with structured products may not have been fully grasped by some investors. Similarly, with consensus on "best practice" regarding the modelling of portfolio credit risk still lacking, "model risk" in instruments such as collateralised debt obligations (CDOs) is an issue for even the most sophisticated market participants. Use of structured finance instruments, together with the occurrence of worst case scenarios relating to mispriced or mismanaged exposures, might thus lead to situations in which extreme market events could have unanticipated systemic consequences. Given these issues and the fact that structured finance markets are still largely untested, continued growth in structured finance activity warrants ongoing central bank awareness.

## 1. Introduction

In May 2003, the *Committee on the Global Financial System (CGFS)* decided to establish a *Working Group on Ratings in Structured Finance* to explore the role of rating agencies in the rapidly evolving markets for structured finance instruments. To facilitate a better understanding of this role and of structured finance markets more broadly, the Working Group was mandated to identify and explain methodological differences that exist between the rating of structured finance instruments and more traditional credit products, and to explore the various methodological and organisational challenges involved in rating structured finance products.

This report documents the Working Group's findings, complementing earlier work by the CGFS and other official forums, such as CGFS (2003) and Joint Forum (2004b). It highlights several of the characteristics of structured products, challenges arising for the rating agencies and other market participants, and implications for central banks and investors. The report is based on the Group's discussions, written contributions by Group members on a number of technical topics, and series of interviews with rating agency officials and other participants in the structured finance markets.<sup>1</sup>

## 2. Structured finance markets: structure and development

### 2.1 Key characteristics of structured finance

Structured finance can be defined as a form of financial intermediation, based upon securitisation technology. It involves the pooling of assets and the subsequent sale to investors of claims on the cash flows backed by these pools. Typically, several classes (or "tranches") of securities are issued, each with distinct risk-return profiles. In addition, the underlying collateral asset pool is usually legally separated from the balance sheet of the transaction's originator. Assets in the collateral pool can range from cash instruments (eg residential mortgages, credit card receivables, loans and bonds) to synthetic exposures, such as credit default swaps (CDSs). Depending on the nature of these assets, pools may contain large numbers of relatively homogeneous individual holdings (eg several tens of thousands of consumer loans) or may be made up of rather heterogeneous exposures to a limited number of obligors (ie some 50-150 in the case of CDOs). (See Figure 1 for an overview of how structured finance fits into the ABS universe of instruments.)

A key goal of the tranching process is to create at least one class of securities whose rating is higher than the average rating of the underlying collateral pool or to create rated securities from a pool of unrated assets. This is accomplished through the use of credit support (enhancement), such as prioritisation of payments to the different tranches. The equity/first-loss tranche absorbs initial losses, followed by a mezzanine tranche which absorbs some additional losses, again followed by more senior tranches. Thus, the most senior claims are insulated from default risk of the underlying asset pool to the extent that the more junior tranches absorb credit losses. (The "slicing" of the pool loss distribution achieved by tranching is described in more detail in Section 3.2 below.)<sup>2</sup>

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<sup>1</sup> The Working Group was chaired by Peter Praet (National Bank of Belgium) and involved members from 16 CGFS-participating central banks and the BIS. The Group's mandate is reproduced as Appendix 1 of this report; summaries of the interviews conducted by Group members are annexed as Appendices 2 and 3.

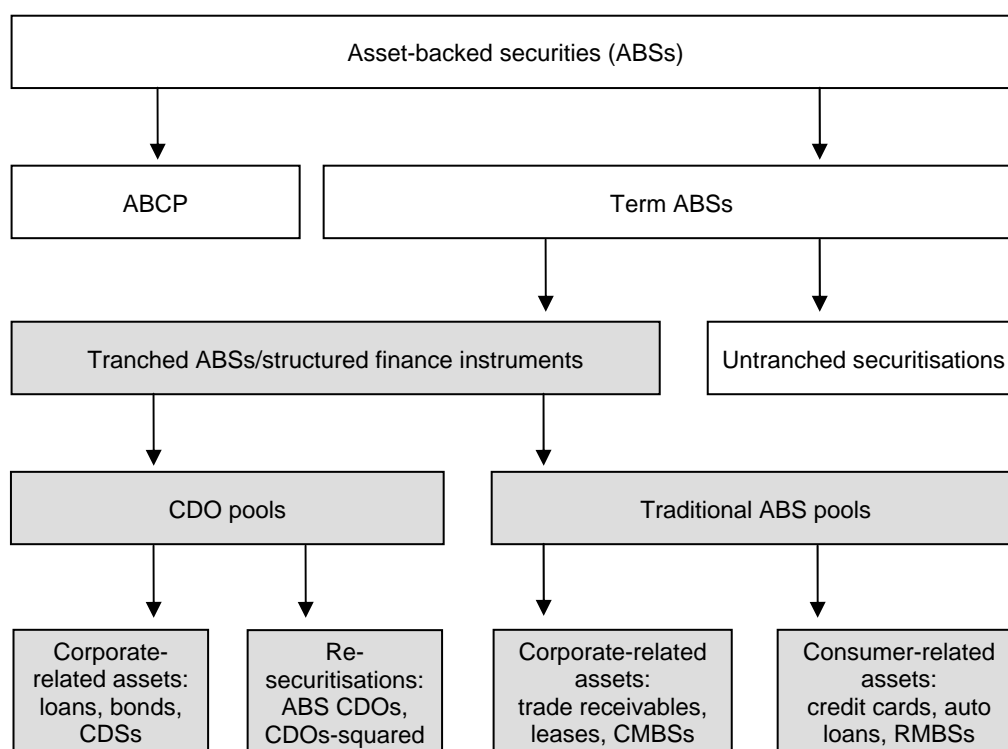
<sup>2</sup> In what follows, while much of the Working Group's findings will similarly apply to other financial instruments, the analysis will focus on "rated term products for indirect (SPV-based), tranching portfolio credit risk transfer", ie different types of *asset-backed securities* (ABSs), including *commercial* and *residential mortgage-backed securities* (CMBSs, RMBSs) and *collateralised debt obligations* (CDOs). In these transactions, interest rate and currency risks are usually hedged out. This definition excludes *asset-backed commercial paper* (ABCP), due to their short-term financing nature, non-tranching traditional securitisations, and instruments such as *credit-linked notes* (CLNs), to the extent that these are not tranching or pool-based. The analysis also excludes so-called covered bonds (eg *Pfandbriefe*), due to their on-balance sheet nature, and securities issued by US housing finance agencies, as there is no credit risk transfer.



Figure 1

### Structured finance products: an overview

Stylised overview of the range of structured finance products as part of the ABS universe



Source: Working Group.

Following this description, structured finance can be defined through three key characteristics:

- (1) *pooling* of assets (either cash-based or synthetically created);
- (2) *tranching* of liabilities that are backed by these collateral assets (this sets structured finance apart from traditional “pass-through” securitisations);
- (3) *de-linking* of the credit risk of the collateral pool from the credit risk of the originator, usually through use of a finite-lived, standalone financing vehicle (commonly referred to as a special purpose vehicle or SPV).

A key attribute of tranching is the ability to distribute cash flows received from the underlying asset pool to different investor groupings (according to factors such as riskiness, timing of payments, and fixed versus floating). As a result, tranching transforms the risk characteristics of the collateral pool into classes of securities with distinct, transaction-specific risk features.

## 2.2 Market participants and their roles

A number of different participants are involved in structured finance markets (Figure 2). These include: the *arranger*, who sets up the structure, tranches the liabilities and markets the tranches; one or more *originators*, who either originate the underlying assets in the course of their regular business activities or source them in the open market; the *servicer*, who collects payments and may track pool performance; the *asset manager*, who - in managed transactions - may assemble the initial pool and subsequently trades in and out of collateral assets; the *trustee*, who oversees cash distributions to investors and monitors compliance with deal documentation; and, in certain deals, *financial guarantors* (eg the so-called monolines), who provide guarantees on principal and interest payments to, or sell

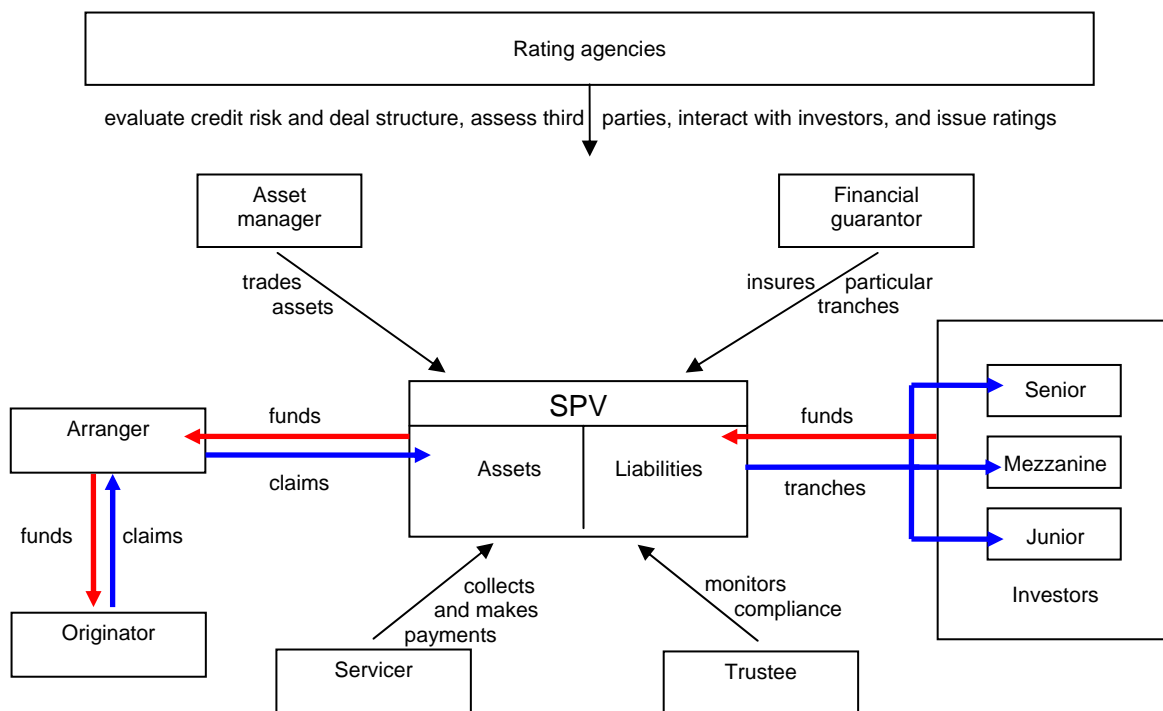
credit default swaps on, particular tranches as part of their business model of underwriting high-grade credit risk.

In addition, given their tranching nature, structured finance transactions will also involve one or more *investors* (either institutions or individuals), who buy different tranches issued against the asset pool. Also, as most of these tranches will be rated, one or more *rating agencies* tend to be involved. As is noted below, the provision of a structured finance rating by a rating agency can help to mitigate asymmetric information problems arising in the creation of a structured finance instrument, for example in assessing the rules governing the prioritisation of cash flows to the tranches. The rating agencies also collect and assess information on the performance of the servicer and of other third parties involved in the transaction.

Figure 2

**Structured finance: key market participants**

Stylised overview of the “players” involved in (funded) structured finance transactions and of their roles



Source: Working Group.

When structured finance instruments are made up of non-traded loans or similar claims, the originators tend to be banks or finance companies. When the collateral pool is made up of traded assets, the arranger is typically also the originator and is often an investment bank or the asset management arm of a financial conglomerate. The servicer, whose role is particularly important for instruments based on large, traditional ABS pools, is often the originating bank or a specialised institution. Asset managers are typically dedicated units within banks and other financial institutions or standalone asset management firms with prior experience managing fixed income assets. The role of trustee is usually assumed either by specialist legal firms or units within major financial institutions.

Investors differ across products and with regard to the seniority level of the tranches they invest in. Initially, demand for structured finance products was dominated by banks and dedicated ABS investors seeking exposure to new sectors, regions, or asset classes. Subsequently, insurance companies entered the market, initially at the more senior level. Later, owing in part to tightening spreads, they started to invest also at the mezzanine level of the larger, more granular asset pools and, to a lesser extent, CDOs. Although most of the investors interviewed by the Working Group indicated positive experience with structured finance investments and planned to maintain or expand

their involvement in structured finance markets, industry surveys seem to suggest that the global insurance sector has withdrawn from CDOs in 2003-04, partially owing to losses sustained on earlier investments. Part of the resulting demand gap appears to have been filled by money managers and hedge funds, whose CDO-related activities are reported to have increased.<sup>3</sup>

## 2.3 Market size

The structured finance market has grown rapidly in recent years. Estimates of market size tend to differ, depending on the data source, and consistent information across market segments has remained scarce, with reliable data on outstandings basically unavailable (see Box 1 for a more detailed description of data availability in structured finance markets).

### Box 1

#### Data on structured finance

No comprehensive and uniform source of data on the market for structured finance, either net flows or outstanding stocks, is currently available. However, there are several sources on new issuance, major investment banks and the rating agencies being the most important ones. Stock data are relatively sparse, although there are quarterly data on stocks of US collateralised mortgage obligations (CMOs) and three surveys of global credit derivatives outstanding, which also include some detail on (synthetic) structured products.

**Investment bank and rating agency data:** Information on the volume of issuance is provided by several of the large investment banks, drawing on a number of sources. The data typically cover the number of deals and the face value of funded issues.<sup>1</sup> Breakdowns are usually provided by region of issuance, type of deal or by collateral type (see Graphs 1 and 2 for estimates by JPMorgan Chase). In addition, the rating agencies provide quarterly data on the number and value of deals they rate.

**Survey data:** Annual surveys of the notional value of the stock outstanding of the credit derivatives market have been carried out by, among others, the *British Bankers Association (BBA)* and *Fitch Ratings*. The BBA asks respondents for estimates of the size of the market, while Fitch aggregate positions of respondents. The Fitch survey does not include hedge funds, which may account for 15-20% of the market. Also, with the focus being on credit derivatives, these surveys cover only part of the activity in structured finance markets more broadly. The latest *BBA survey* puts the notional value of the global market (including asset swaps) at end-2003 at \$3.6 trillion, with an expectation that the market would exceed \$5 trillion by end-2004. Of the end-2003 figure, 51% was accounted for by single-name credit default swaps (CDSs), while single- and multi-tranche synthetic CDOs accounted for 16%. The *Fitch Ratings survey* for end-2003 cites a figure of \$2.8 trillion notional of gross protection sold or \$3 trillion inclusive of cash-collateralised CDOs. The volume attributed to single-name CDSs (\$1.9 trillion) is comparable to that of the BBA survey. Fitch identified \$754 billion of portfolio products (including traded CDS indices), a rise of 50% from a year earlier. The Fitch survey also provides marked to market data: \$74 billion positions in the money (mainly attributable to sellers of protection) and \$54 billion out of the money (mainly recorded by buyers).<sup>2</sup>

Finally, *central banks*, coordinated by the BIS, currently conduct a semiannual survey of OTC derivatives. Arrangements are under consideration that would extend the coverage of these surveys to record the stock of credit default swaps (CDSs) at end-June and end-December at both notional and marked to market values. Coverage is expected to include CDSs referenced to both single- and multi-name instruments, broken down into reporting banks' outstanding positions sold to, or purchased from, broad groups of counterparties. Information would also be provided by type of reference entity and rating category and for certain maturity brackets.

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<sup>1</sup> Data will usually cover all cash CDOs and the funded portion of synthetic CDOs. (An unfunded structure uses portfolio credit default swaps exclusively to transfer the risk on the referenced entities to investors; partially funded structures typically issue notes to investors in the higher-risk tranches, while risk transfer on the low-risk senior and super-senior tranches is in the form of credit default swaps.) <sup>2</sup> The distribution of gains and losses between sellers and buyers of protection appears consistent with a decline in credit spreads from mid-2002. However, in aggregate, positions of sellers and buyers should be offsetting. Fitch suggests that the overall positive marked to market value could partly reflect unrecorded loss positions in the banking books of buyers of protection.

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<sup>3</sup> See Appendix 2 as well as Fitch (2003, 2004), Standard & Poor's (2003) and Wolcott (2004).

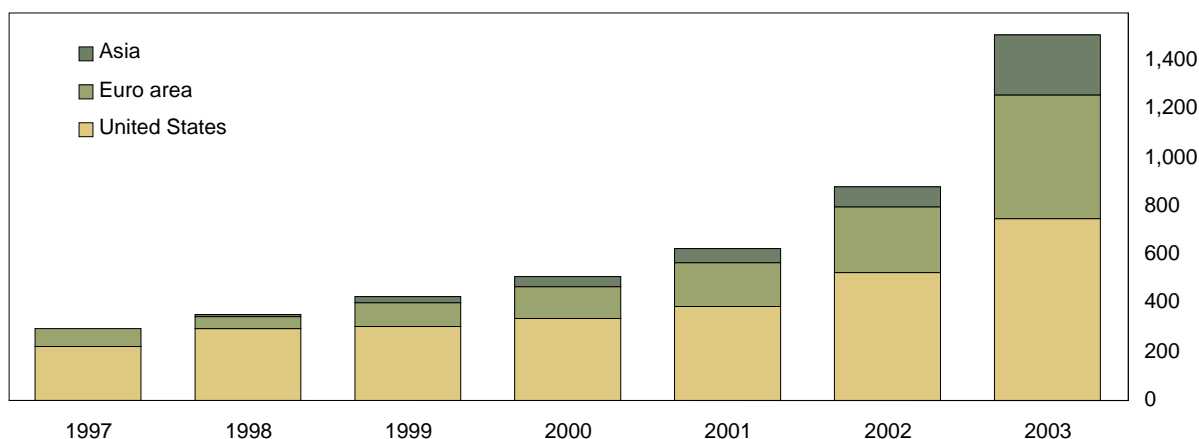
Issuance activity data, however, are broadly comparable across data sources. Volumes reported by JP Morgan Chase suggest that global funded structured finance issuance expanded at a compound annual rate of roughly 20% between 1997 and 2003, from about \$280 billion to more than \$800 billion per annum. Once synthetic transactions, which tend to be un- or only partially funded, are included, global issuance is even higher, reaching some \$1.5 trillion in 2003.

While about half of this total is CDO issuance, synthetic CDO volumes tend to be inflated by the dealer convention of quoting certain transactions, so-called single-tranche deals, on the basis of their full capital structure, although only the mezzanine tranche is actually marketed (see the description of single-tranche products in Section 2.6 below). This, together with a changing composition of issuance volumes over time, suggests that time series of issuance data should be interpreted with caution.

Non-US issuance, which - for various reasons - has lagged US volumes in the past, has increased at a compound rate of more than 25% since 1997, reaching about 50% of global issuance volume in 2003. As a result, issuance volume, when compared to net issuance of European domestic and international bonds and notes, rose from roughly 20% in 1997 to more than 50% in 2003. Structured finance issuance in the United States, some \$750 billion in 2003, compares to about \$2.9 trillion of net issuance of debt securities. In Asia, the same ratio increased from almost zero to nearly 20% (see Graphs 1 and 2).

Graph 1  
**Total ABS and CDO issuance by region**

In billions of US dollars; includes synthetic issuance



Sources: JPMorgan Chase; Working Group calculations.

## 2.4 Basic structured finance economics

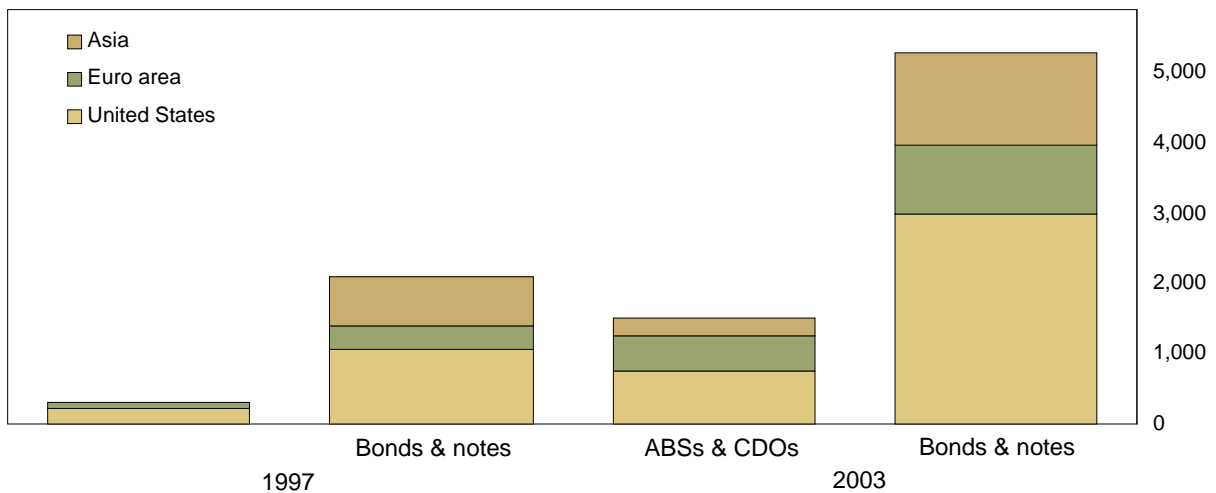
Among the above-mentioned characteristics of structured finance, tranching is the feature that most distinguishes structured finance products from traditional securitisations (pass-through instruments), as de-linking and pooling are common to both types of instruments. Yet, recognising the benefits associated with each of the three features of structured finance products helps to understand the situations in which structured finance markets are most likely to arise (ie in which structured finance instruments capture value) and the role that ratings play in these markets.<sup>4</sup>

<sup>4</sup> Mitchell (2004) reviews the theoretical finance literature with implications for structured finance markets.

Graph 2

**Total ABS and CDO issuance and net issuance of international and domestic bonds and notes by region: 1997 and 2003**

In billions of US dollars



Sources: JPMorgan Chase; BIS.

*De-linking.* The process of de-linking generates at least two benefits for originators as well as investors. One is the use of collateral (ie the underlying asset pool), which turns structured finance into a form of secured borrowing. However, despite the provision of collateral, structured finance differs from traditional forms of secured borrowing in that payments to the secured creditors (ie the tranche holders) are affected only by the performance of the de-linked asset pool and not by the performance of the originating firm. While defaults in the underlying asset pool will lower the payments to the tranche holders, other factors, such as the performance of the originator's management, should have no impact if the assets have been successfully de-linked.<sup>5</sup> A second benefit is that fully de-linked assets will not come under court jurisdiction should the originator file for bankruptcy. One of the key roles served by rating agencies in structured finance markets is to make judgments about the soundness of the legal structure of a transaction, including the degree to which de-linking has been legally effective.

The benefits of de-linking, taken together, allow for the issuance of claims secured by portfolios of assets with well defined characteristics and with returns that may be more predictable than the total returns of the originator. Part of the predictability may be due to the particular characteristics of the securitised assets (eg cash flows with stable distributions). Another part can be attributed to the more circumscribed character of governance issues arising with a structured finance product as opposed to those associated with firms as going concerns. Consequently, the credit risk of the de-linked assets is often lower than the credit risk of the originator, which facilitates access by the originator to cheaper sources of funding.

*Pooling and tranching: structured finance versus pass-through instruments.* An SPV issuing tranching claims against a pool of assets can be compared to a firm issuing debt and equity backed by the firm's assets, which include physical and human capital. Likewise, the intuition of the Modigliani-Miller theorem can be applied to SPVs: in a world of perfect financial markets, with no information asymmetries and with all assets readily tradable (ie without liquidity premia), tranching would not add value relative to a share in the pool, since the structure of liabilities would be irrelevant. Market imperfections are thus needed for structured finance to add value. Two such imperfections, which may play a role individually or in combination, are asymmetric information and market segmentation.

<sup>5</sup> Only in the case where the originator remains as the servicer of de-linked loans could poor managerial performance affect the payouts of the loans.

- *Asymmetric information.* An originator may have private information about the quality of certain assets and/or a comparative advantage in valuing these assets relative to other market participants. If the originator wishes to sell some of its assets, an adverse selection problem (Akerlof (1970)) will arise: because investors do not know the true quality of the assets, they will demand a premium in order to purchase them or a market will fail to arise in the first place. Originators, or arrangers, can overcome this problem by creating structured finance instruments.<sup>6</sup> Pooling creates diversification benefits, whereas tranching allows risk-averse investors and those with less information about asset values to purchase senior tranches and be protected from default. In the process, the originator or arranger may retain subordinated exposure (ie to the first losses in the pool) to alleviate investors' concerns with incentive compatibility. Banks, for example, typically retain the equity tranches of the collateralised loan obligations that they issue. Alternatively, reputation - established through a proven track record - may help to align incentives. In such an environment, a tranche rating can lower issuance costs by offering an independent assessment of the quality of the underlying assets and of the degree of protection afforded to senior tranche holders.
- *Market segmentation.* Different risk preferences among investors or publicly and privately imposed investment constraints can influence transaction costs and create markets that are segmented between investor groups. This leads to arbitrage opportunities that can be exploited through the creation of structured finance instruments. For example, when an arranger possesses private information concerning particular investors' preferences that is not easily attainable by other intermediaries, the arranger can profit from pooling and tranching, ie by creating securities with characteristics that are tailored to the investors' specific demands. Investors, who benefit from the additional diversification of their own portfolios achieved by the tailored product, will then be willing to pay a premium for it.<sup>7</sup> For instance, the AAA tranche of a portfolio of automobile loans may have a performance across differing stages of the business cycle that suits the demands of particular investors, but is not available through combinations of existing securities.<sup>8</sup>

A second form of arbitrage opportunity may appear when market segmentation leads to pricing differentials across certain classes of assets that can be included in the underlying pools of structured finance instruments. One example is given by arbitrage CDOs, where the underlying asset pools are comprised of bonds or credit default swaps (CDSs). Originators of these instruments seek to take advantage of the fact that the market spreads of certain rating categories of bonds tend to be higher than what would be expected solely on the basis of the default risk, and that this difference has been greater for certain rating categories (eg BB) than for others.<sup>9</sup> If the spread differentials across rating categories are large enough, it can be profitable for an arranger to assemble pools of bonds in the "cheaper" rating category, issue tranching securities against them, pay the holders of tranches in other rating categories a spread consistent with the market spread for bonds with similar credit risk, and compensate equity tranche holders with the "excess spread".

*Governance issues.* As noted above, finance theory suggests that, when asymmetric information exists, under certain conditions less informed investors will be more likely to purchase the senior tranches and more informed investors the subordinated tranches of a structured transaction.<sup>10</sup> Yet,

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<sup>6</sup> See Riddough (1997), De Marzo and Duffie (1999) and De Marzo (2004) for analyses of issues relating to asymmetric information in structured finance markets.

<sup>7</sup> See Oldfield (2000) for a detailed discussion of tranching and a model of this type of arbitrage.

<sup>8</sup> See Gaur et al (2003).

<sup>9</sup> See Rappoport (2001) and Meli and Rappoport (2003), who discuss a technique for estimating the spread that would be necessary to compensate investors for the credit risk associated with a given class of bonds, where the measure of credit risk takes into account both expected loss and loss variance. The authors find that the difference between observed market spreads and the spread needed to compensate investors for credit risk varies systematically across rating categories. Structural sources of market segmentation are identified as explanations for the differences across rating categories.

<sup>10</sup> See Gorton and Pennacchi (1990) and Boot and Thakor (1993). A supporting observation is that, while senior tranches of structured finance products are almost always rated, the most subordinated tranches typically remain unrated. The implied seniority preferences, however, will not necessarily hold in the presence of ratings-related investment constraints, where well informed investors may nevertheless be constrained to invest only in high-quality securities.

whereas asymmetric information can give rise to tranching, it is also potentially at the heart of a basic trade-off in designing structured finance instruments. To the extent that the holder of the most subordinated tranche is indeed better informed about the value of the collateral assets than are senior investors, it might seem natural to designate the subordinated note holder as the party in charge of workouts or portfolio restructuring should defaults occur among the obligors. This, however, leads to a conflict of interest between the subordinated note holder, who is often also the originator, and the more senior investors. Particularly when losses have erased most of the value of their stake in the asset pool, subordinated investors may have an incentive to take actions that avoid or defer liquidation of non-performing assets, as this might increase the chances of recouping a significant proportion of their investment.<sup>11</sup> Alternatively, when the underlying assets are tradable securities, the subordinated note holder may have an incentive to replace non-performing assets with substitute securities of low credit quality but high yields. Senior investors, on the other hand, have an interest in avoiding such substitutions.

These potential conflicts of interest between subordinated and senior investors can be addressed in at least three ways. First, the subordinated tranche holder may be designated to manage the assets in the portfolio, but the possible actions that this investor may take are restricted *ex ante*. Second, a third party may be designated to manage the portfolio. However, if this manager must hold one or more of the tranches in order to signal a commitment to properly managing the portfolio, the conflict of interest may reappear at the asset manager level. The third possibility is to have an unmanaged, or static, instrument in which no modifications of the original portfolio are allowed. This alternative, however, also involves potential drawbacks for investors, since the lack of asset substitutability would limit their ability to benefit from early identification of non-performing assets. In addition, unanticipated prepayments might leave the structure with inefficient excess cash holdings that could not be redeployed.

In line with these observations, the provisions of managed structured finance instruments generally impose strict limitations on the actions that note holders and/or third-party managers can take. These provisions amount to an attempt to write a “complete contract” that fully specifies the rights of all the transaction’s participants and the rules for determining payments to note holders under alternative scenarios of asset pool performance. Tranche ratings embody assessments of these structural features, including the degree to which conflicts of interest among note holders and between third-party managers and investors are managed.

## 2.5 Complexity and risk properties of structured finance instruments

As has been suggested above, tranching is crucially important for understanding the economics of structured transactions. Because tranching allows the risk characteristics of the collateral pool to be transformed, it contributes to transaction complexity, while also determining the risk properties of structured instruments:

(a) *Complexity*: Tranching creates a layer of analytical complexity beyond that of estimating the loss distribution of the collateral pool. It requires detailed, deal-specific documentation (ie definition of the transaction’s structure) to ensure that the intended characteristics, such as the seniority ordering of the various tranches, are actually delivered under all plausible scenarios. As noted above, the structuring process amounts to an attempt to write a contract between the transaction’s participants, covering all realisations of returns on the asset pool and the distribution of the resulting cash flows among tranche investors. Importantly, the calculation of cash flows to the different tranches can be complicated by dependencies among the credit standings of the multiple obligors in the pool. In addition, the complexity of the structure tends to be further increased by the involvement of third parties, such as asset managers and servicers, whose incentives to act in the interest of certain investor classes may have to be balanced.

(b) *Risk properties*: Depending on their position in the capital structure, tranches of structured finance instruments can be more leveraged than the portfolio of underlying assets: subordinated tranches, while being unaffected by defaults within the asset pool up to some (tranche-specific) level,

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<sup>11</sup> See Riddough (1997). This observation applies most directly to the case of CLOs, where the underlying assets are loans and where the subordinated tranche is held by the originator of the loans.

will be significantly more affected than the underlying asset pool (ie higher percentage losses) once the critical level of defaults is reached. That is, as the level of subordination below a certain tranche decreases, the possibility that the holder of that tranche will lose a large portion of its investment increases. Losses to senior tranches, therefore, will be relatively rare, occurring only in truly exceptional situations. Thus, compared to the other tranches and the underlying portfolio, senior tranches will tend to experience losses only in relatively bad times (ie in severe cyclical downturns or in response to exceptionally correlated shocks).

A related feature of tranching is that the variety of possible risk profiles that can be generated through tranching exposures can lead to substantial differences among structured finance tranches, and between tranches and ordinary bond portfolios, in terms of the ex ante uncertainty about losses (ie unexpected loss, as reflected by the variance and higher moments of the loss distribution), even when the two instruments have the same expected loss (mean). Subordinated tranches, for example, will lose their entire value if losses in the asset pool are severe enough. As this would not occur with an exposure to a straight bond portfolio - assuming that recovery rates are positive - subordinated tranches will have higher unexpected loss than a portfolio with the same expected loss. As a result, given that ratings are based on expected loss or probability of default, structured finance tranches can be significantly riskier than investments in bond portfolios with identical (weighted average) ratings. (See Box 2 for more detail on the risk properties of structured finance tranches.)

#### Box 2

##### **Ratings and the risk properties of structured finance products**

Ratings are assessments of expected loss (EL) or probability of default (PD) and are, hence, actuarial notions of credit risk that depend only on the first moment of the distribution of possible outcomes. Holding EL constant, however, an investment will tend to be riskier if its loss distribution is more dispersed. For example, a bond is less risky (and in fact not risky at all) if it pays a certain amount of 99 at maturity, as opposed to paying 100 with 99% probability and paying an amount of zero with a probability of 1%. Risk profiles of financial instruments are, therefore, more fully described by a combination of EL and information regarding the ex ante uncertainty of losses as reflected, for example, in the variance and higher moments of the loss distribution. Ex ante credit loss uncertainty, in turn, has come to be commonly referred to as "unexpected loss" (UL).

Considerations regarding UL are of particular importance in structured finance, as compared to bonds, because tranching can result in distributions of payoffs that differ significantly from the distributions of outcomes for the underlying asset portfolio. Accordingly, conventional credit ratings, because they are expressed on a one-dimensional scale and are based either on EL or on PD, cannot be a complete summary of credit risk. Two types of risk comparison merit mention in this context: (1) *risk comparisons among tranches and relative to the underlying asset pool*; (2) *tranche risk relative to portfolios of like-rated assets*, such as corporate bonds.

**Risk comparisons among tranches:** One feature of structured finance is that, due to the additivity of EL, the process of tranching will distribute the EL of the underlying portfolio across the various classes of securities issued against the pool. The equity tranche, although typically the smallest tranche in terms of notional size, will end up bearing much of the pool's EL. The senior tranche, being highly rated, will bear only a small portion of the EL, despite laying claim to most of the structure's principal. UL will behave similarly in that, measured against the notional value of the tranche, it will also tend to be higher for more junior tranches. The risk profile of a structured finance tranche, in fact, depends largely on two factors: its *seniority* (as determined by the lower boundary of the tranche) and its *thickness* (ie the distance between the upper and lower tranche boundaries). The latter, when expressed as a proportion of the underlying portfolio, constitutes a sort of conditional leverage measure. The lower the seniority, the lower the level of loss protection and the higher the risk of a given tranche. The narrower the tranche, the more the loss distribution will tend to differ from the distribution for the entire portfolio in that it will likely be more bimodal and, thus, riskier.

**Risk comparisons with like-rated assets:** Another aspect of structured finance is that tranching can lead to risk profiles that are substantially different from those of ordinary bond portfolios with the same (weighted average) rating. One factor behind this observation is the possibility of zero tranche recoveries for subordinated tranches. As a result, if defaults are severe enough, investors in all but the most senior tranches may lose the entire value of their investment. The narrower the tranche, the riskier and more leveraged it will be, as it takes fewer defaults for the tranche to be wiped out once its lower loss boundary has been breached. Subordinated tranches, therefore, have a wider distribution of outcomes than like-rated bond portfolios and will thus need to pay a higher spread to compensate for the added risk.

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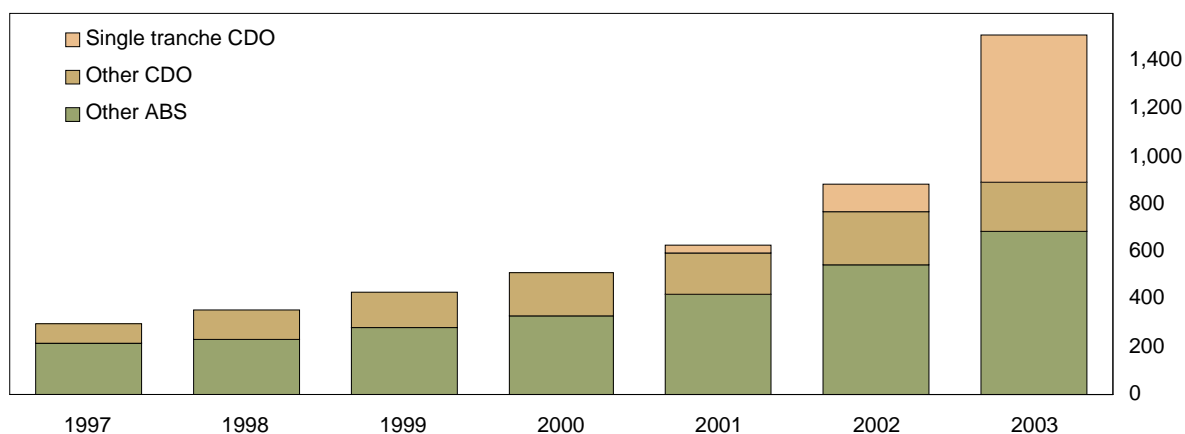
See Gibson (2004), Meli and Rappoport (2003) and O'Kane and Schloegl (2002).



## 2.6 Market evolution

On the basis of the broad driving forces highlighted above, motivations for investor and issuer involvement in structured finance and, with them, market structure have evolved over time and by type of market sector (see Graph 3). Three main activities can be identified as underlying the evolution of structured finance markets:

Graph 3  
**Total ABS and CDO issuance by type**  
In billions of US dollars



Sources: JPMorgan Chase; Working Group calculations.

(1) *Funding and capital management:* These were the main initial motivations in what was originally a cash market. Assets that were securitised were homogeneous and low credit risk. Building on mortgage pass-through securities that had first appeared in the early 1970s, tranching deals collateralised with pools of residential mortgages, in the form of so-called CMOs, began to be issued in 1983. This was followed by similar products in other ABS sectors, which were regarded as cost-efficient means to diversify funding sources and to obtain funds via collateralised lending.

Later, tranching securitisations began taking the form of collateralised loan and bond portfolios (CDOs), driven by a general desire by banks to transfer credit risk and release economic and regulatory capital. By selling off the senior tranches of a structured finance instrument, the originator effectively purchases an option that serves as a loss cap. The option removes part of the unexpected loss (UL) of the securitised assets from the portfolio of the originator, while most of the expected loss (EL) will be retained (if the originator keeps the equity tranche; a typical situation). The reduction in UL provides the rationale for economic capital benefits, with possible differences between economic and regulatory capital considerations giving rise to *regulatory arbitrage*.

(2) *Spread arbitrage:* Increasingly, spread arbitrage became an important driver for CDOs, and deals tended to include riskier and more heterogeneous assets using structures that aimed to purchase undervalued assets and repackage these to lock in any value differential.

Although *cash CDOs* were initially used for this purpose, the development of liquid markets for credit default swaps (CDSs) led to the appearance of *synthetic CDOs*, which - for legal and taxation reasons - had particular appeal in the European market. In such a structure, the SPV sells credit protection through CDSs and earns CDS premia in return. The CDSs serve as the assets in the underlying portfolio. Starting in 2002, tightening bond and CDS spreads resulted in reduced issuance of traditional CDOs and increasing interest in CDOs based on new collateral classes, such as SME (small and medium-sized enterprise) loans, leveraged loans, and structured finance instruments, including CDOs backed by ABS or CDO tranches (ie so-called CDOs-squared).

(3) *Improved risk-return profiles and diversification properties:* On the buy side of the market, learning from experience with early deals and enhanced investor sophistication have led to direct investor participation in the structuring process, with the aim to improve the risk-return profile and diversification properties of structured finance investments. At least two market trends can be distinguished along these lines:

*Managed structures:* Managed CDOs were introduced partially in response to the poor performance of early static deals, which exposed investors to adverse selection problems by issuers and event risk. However, some of the managed CDOs have also performed less well than hoped, due to what have been perceived to be incentive problems faced by asset managers, who, for instance, either held the equity tranches of the deals they managed or were believed to act in the interest of equity tranche investors. This, in turn, has led to the inclusion of explicit investment mandates into deal documentation to set out rules for managerial behaviour.

Importantly, managed products based on structured finance instruments have also begun to be marketed to retail investors in countries such as Australia, Italy, the Netherlands and New Zealand, and are being proposed elsewhere.

*Tailored exposures:* Another trend has been the appearance of synthetic single-tranche CDOs. These instruments, which usually do not involve an SPV, involve the sale of a single tranche to an investor who generally controls the deal structure by choosing the names in the collateral pool and the seniority of the exposure (usually at the mezzanine level). Single-tranche CDOs are designed to generate targeted exposures, rather than the investor simply buying into a given “off-the-shelf” product. As a result, the distinction between structurer and risk-taker has become increasingly blurred, with investors having structures specifically tailored for them. An advantage of these tailored deals is that they avoid adverse selection problems and limit other conflicts of interest. A significant portion of trading in single-tranche instruments, which have become increasingly commoditised, is now in the inter-dealer market, and trading in this area of structured finance shares many of the attributes of OTC markets for market risk derivatives.

### **3. Rating structured finance instruments**

#### **3.1 Structured finance versus traditional ratings: nature and process**

According to the major rating agencies (ie Fitch, Moody’s and Standard & Poor’s), all products they are asked to rate are subject to a common rating process. Rating decisions are made by a credit committee on the basis of an assessment of instrument-specific documentation and other information provided by analysts. The committee’s opinions may then be fed back into the rating process, for example through revision of standard assumptions. In addition, all ratings are ultimately mapped into an alphanumeric scale benchmarked to the historical performance of corporate bonds.

As with traditional credit ratings, where the issuer approaches the rating agency and pays the rating fee, for structured finance ratings it is the arranger who selects and approaches the rating agencies to be involved in a given deal. The rating agencies, in turn, will charge a fee that compensates for the entire rating process, with break-up fees applying should the arranger ultimately choose not to have the rating issued or if the deal ends up not being marketed.

Although the general rating process is essentially the same for bonds and structured finance products, a number of important features differentiate structured finance from traditional rated instruments. Structured finance instruments consist of portfolios of potentially heterogeneous obligors; each tranche reflects a different position in the deal’s capital structure; transaction-specific covenants determine the allocation of cash flows among tranches; and, increasingly, underlying asset pools are actively managed. As a result, rating agencies, originators and investors need to understand not only the default risk embodied in the collateral pool but also other, “non-default” risks - ie risks that are unrelated to defaults in the underlying collateral pool but which affect the credit risk of the tranches - arising from the transaction’s structure. As suggested in Section 2, the rules employed to mitigate such risks are frequently a source of “complexity” in structured finance instruments (see also Table 1).

A structured finance rating is an opinion regarding the likelihood that the cash flows from the underlying pool of assets will be sufficient to service the claims associated with a particular tranche. In common with other securitisations, structured finance ratings assess the sustainability of projected cash flows from a finite-lived reference portfolio, while traditional credit ratings assess the likelihood that the obligor’s ongoing business activities will generate the cash flows required for debt service and repayment. This finite-lived nature of the transaction makes structured finance ratings more comparable to project and leveraged finance than to corporate or sovereign bond ratings.

Table 1

**Structured finance versus traditional  
credit ratings: commonalities and differences**

<b>Issue</b>	<b>Structured finance</b>	<b>Traditional</b>
Rating process	Basically identical: analyst review, credit committee	
Rating concept	Identical rating basis: expected loss (EL) or default probability (PD)	
	Tranching can create securities with same expected loss, but much different unexpected loss properties	Expected loss may be a reasonable proxy for credit risk
Structural features	More “complex” - extensive analysis of “moving parts” required	Structural features, such as bond covenants, exist - but analysis less extensive
Credit risk analysis	Controlled environment enables more model-based, quantitative analysis of asset pool; emphasis on the relatively easily definable cash flow generated by the underlying asset pool; known maturity	More limited scope for quantitative analysis of overall balance sheet/franchise; emphasis on the cash flow generated by the obligor’s ongoing business activities (issuing entity is going concern)
Conflicts of interest	Exist in both cases	
	Between originators, investors, third parties - more transparent, easier to control, requires structural mitigants	Between shareholders, different debt holders, management - more difficult to control (covenants)
Nature of rating	Pronounced ex ante nature (targeted ratings, iterative process, rating issued at inception); more model-based; greater flexibility to adjust structural factors	Ex post, though with ex ante elements (pre-rating feedback, issuer first rated in mid-life); more judgmental; limited issuer ability to adjust credit characteristics
Performance	More stable on average, but larger changes - significant instability of particular asset classes	Benchmark for structured finance ratings via EL/PD mapping

Source: Working Group.

Structured finance tranches are usually tailored by arrangers with certain rating levels and corresponding rating agency requirements in mind. This implies that, in addition to an analysis of the underlying collateral pool, the rating agency must undertake careful analysis of cash flows, credit enhancements and other structural features designed to support the intended rating for a tranche. Deal origination thus involves obtaining structuring opinions by the rating agencies, at least to the extent that arrangers use rating agency models to pre-structure deals and subsequently engage in an iterative dialogue with the agencies in order to finalise the structures. This process implies that the rating of structured finance instruments has a pronounced ex ante nature, which contrasts with traditional bond ratings, for which pre-rating feedback to issuers and targeted ratings play a more limited role, given that corporates tend to be unable to significantly adjust their credit characteristics prior to bond issuance.

The emphasis in structured finance rating on assessing the structural features, ie the “moving parts”, of a deal is one of the features setting the structured finance rating process apart from traditional bond ratings. While structural features, such as bond covenants, do exist for traditional financial instruments, the nature of structured finance instruments (fixed reference portfolio and absence of control rights for equity holders) allows the agencies to employ more quantitative methodologies to measure risk than in rating bonds. This leads to a rather clean, analytical separation of the relevant risks in structured finance instruments. For example, whereas conflicts of interest between managers and particular investor classes can affect bonds as well as structured finance instruments, they can probably be assessed and managed more readily in structured finance, for example through the use of structural provisions. Thus, although structured finance ratings cannot be considered as mere model

outputs, they are arguably more so than are traditional bond ratings, where the agencies have had to rely on more broadly specified notions of credit quality.

Structured finance and bond ratings differ not only in the conceptual dimensions highlighted above, but also in terms of performance. Given their pooled nature, which mitigates exposure to idiosyncratic risk through diversification, structured finance products might be expected to - and indeed do - exhibit greater ratings stability on average. Empirical studies, including preliminary evidence produced by the Working Group, suggest that the volatility of structured finance ratings in general is significantly lower than for corporate bonds, although the average number of notches per structured finance rating change appears to be higher - perhaps reflecting their higher inherent leverage described earlier.

Fitch, for example, studies the performance of structured finance ratings by tracking the migration of rated tranches over the 1991-2001 period. Overall, ratings, particularly those in the investment grade segment, are found to be very stable, with 98% of the investment grade tranches maintaining their rating or being upgraded. Similarly, according to Moody's, structured finance ratings have changed much less frequently than have corporate ratings, even though the average number of notches changed per rating action has been higher for structured finance.<sup>12</sup>

Therefore, the likelihood of a rating change is smaller in structured finance, while the magnitude of the change is larger. At the same time, particular asset classes seem to exhibit a pronounced asymmetry in their transition behaviour. One such example is CDOs, for which Moody's reports a downgrade-to-upgrade ratio of 19.0 for 1991-2002. This may be compared with long-term ratios of 1.2 for all structured finance products and 2.3 for corporates. According to market sources, the sector's performance was primarily driven by an extraordinarily high rate of downgrades and defaults in corporate bonds in the underlying pools of collateralised bond obligations, which, in turn, appear to have suffered from shared concentrations in particular obligors.<sup>13</sup>

### 3.2 Structured finance rating methodology

As has been noted above, key to the reliability of structured finance ratings is the agencies' accuracy in assessing the credit risk in the underlying asset pool, as well as the accurate modelling of the distribution of cash flows from the asset pool to different groups of note holders. All three major rating agencies follow a two-step rating approach, which applies equally to CDOs and traditional ABSs: *credit risk modelling* (focuses on the asset pool), and *structural analysis* (focuses on the distribution of cash flows).<sup>14</sup>

First, analytical models are used to assess pool credit risk. The tools applied for analysing CDO and ABS pools will differ, and differences will also appear across rating agencies. The second step is a structural analysis, which will crucially depend on deal specifics, as laid out in the transaction's documentation. This step involves detailed cash flow modelling, based on the results of the credit risk analysis as well as legal assessments and evaluations of any third parties involved in the deal. The results of the cash flow analyses, in turn, may feed back into the credit model in the form of stresses applied to particular model assumptions. Finally, all of the information is aggregated and mapped into a single, alphanumeric tranche rating.

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<sup>12</sup> See Fitch (2002) and Moody's (2003). Violi (2004), using sophisticated statistical analysis, confirms these findings on the basis of data by Moody's and Fitch, showing that patterns of rating mobility for structured finance products appear to be fairly stable over time. This stability at the aggregate level, however, is found to mask important differences across asset classes, with higher ratings mobility documented for CDOs and certain ABS products.

<sup>13</sup> Along with CDOs, aircraft lease securitisations and manufactured housing (MH) ABSs, which are based on mobile home-related loans, have been among the worst performing structured finance asset classes. According to S&P, 45% of US ABS downgrades in 2003 and 56% of total US ABS life-to-date defaults originate from the MH ABS sector alone, highlighting the problems that may arise with structured finance instruments backed by sub-prime assets - for which the underlying assumption of the applicability of the "law of large numbers" may not apply (see Appendix 5).

<sup>14</sup> In the remainder of this document, the term "traditional ABS" will be used for structured finance securities backed by large homogeneous asset pools. This contrasts with CDOs, themselves part of the ABS universe, which are backed by smaller pools of more heterogeneous assets. (See Figure 1.)

### **Credit risk modelling: traditional ABS versus CDO pools**

The main factors driving the loss distribution of any portfolio and, hence, the three main inputs into each agency's methodology are estimates of:

- (1) *probabilities of default* (PDs) of the individual obligors in the pool and how these vary over the life of the transaction;
- (2) *recovery rates* (or losses-given-default (LGD), ie measures of recovery risk);
- (3) *default correlations* within the pool, which determine the tendency of multiple defaults to occur within a given period of time.

By use of credit risk modelling, assumptions on PDs, recovery rates and correlations will be turned into an overall assessment of pool credit quality. Choice of the approach used in the modelling process, in turn, will depend on collateral pool specifics, such as the number and homogeneity of assets, obligor classes, and historical performance.

Credit risk can be captured by use of the concepts of expected and unexpected loss, with the latter reflected in the volatility and other, higher moments of the portfolio loss distribution. Loss volatility can be substantial and is driven mainly by two factors: obligor concentration and default correlation. Concentration, ie the lumpiness of the portfolio, is linked to idiosyncratic risks. The lower the concentration, the less exposed is the portfolio to idiosyncratic risk. Correlation, on the other hand, relates to systematic risk and reflects the sensitivity of PDs to common factors and, therefore, individual obligors' exposure to undiversifiable (eg business cycle) risks.

Traditional ABS portfolios are usually made up of large, well diversified, homogeneous pools of assets (eg residential mortgages or credit card receivables), with no significant individual exposures relative to overall pool size. Thus, idiosyncratic risk is much less important for ABSs than for instruments with less diversified and more heterogeneous collateral pools. This implies that the default characteristics of an ABS pool can be estimated via the law of large numbers, and the underlying assets can be assumed to give rise to stable, predictable loss distributions. As a result, ABSs are typically rated by use of so-called "actuarial approaches", which employ the assumption that each originator's unique underwriting policy gives rise to characteristic loss and recovery patterns that are reasonably stable over time. Loss and dispersion measures can then be reliably inferred from sample data provided by the arranger, with assessments being based on the loss histories of static pools of assets originated by the same lender.<sup>15</sup>

CDOs, on the other hand, are "lumpy" (ie less granular than traditional ABSs) and generally contain, or are referenced to, relatively small numbers of non-homogeneous assets. As a result, both idiosyncratic and systematic risks are important. Methods used for calculating loss distributions for traditional ABS portfolios are thus inappropriate for CDOs. A key issue affecting CDO portfolios is default correlation, whose effect on the asset pool's loss distribution is illustrated in Graph 4. When correlation is close to zero, the pool's credit loss distribution will have a skewed bell shape that is best approximated by the binomial distribution. At higher correlation levels, the loss distribution changes and probability mass is moved into the tails, making both extreme and zero loss events more likely. For a given level of expected loss, higher correlation among obligors in the pool thus leads to loss distributions such that the senior tranches bear greater risk, as outcomes will be more dispersed.

### **Assessing the credit risk of CDO pools**

Senior tranches of CDOs and other structured finance instruments are usually created to achieve higher ratings than the average standalone rating of the assets in the collateral pool. Determining the amount of credit support necessary for a tranche to obtain a targeted rating, therefore, is a key element of the rating process. Critical to this decision are the size and position of the various tranches in the loss distribution (ie the so-called attachment and detachment points, which represent the critical levels of portfolio losses for which a tranche will first begin experiencing losses and then be exhausted).

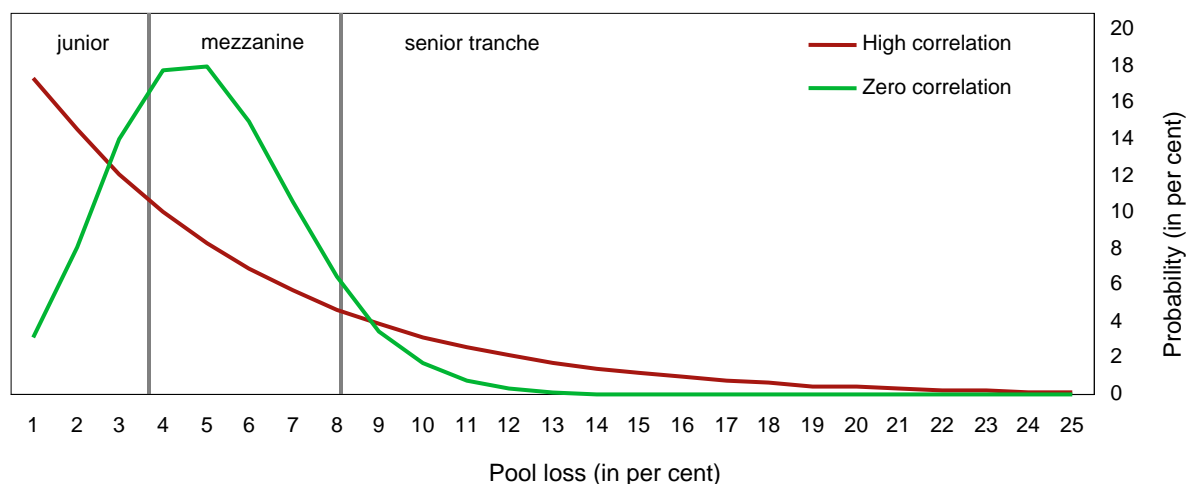
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<sup>15</sup> See Raynes and Rutledge (2003) for an overview of these actuarial approaches.

Graph 4

**Hypothetical loss distributions:  
high versus low correlation pool**

Impact of correlation on loss distributions for portfolios with an identical expected loss of 5%



Source: Working Group.

With respect to estimates regarding PDs of individual obligors in the asset pool, each agency uses its own or, if necessary, other agencies' ratings or similar information, such as output from banks' internal rating systems. The agencies differ somewhat in their approaches to estimating recovery rates, but all essentially continue to assume that recovery rates vary either independently from other parameters or not at all. Regarding default correlations, although the agencies' methodologies have converged over time, there still remain important areas of difference, partially reflecting the ongoing debate in the literature as to the "best" way to model correlations.

All three major rating agencies have revamped their CDO methodologies in the recent past or are in the process of doing so, which has led to substantial changes in the way credit risk in CDOs is evaluated. As a result, ratings "engines" based on Monte Carlo simulation now seem to be emerging as the industry standard. On the basis of these methodologies, default events are simulated within a simplified Merton-type "structural" credit risk model, where default occurs whenever the value of an obligor's assets falls below that of its liabilities. Asset-level probabilities of default and pairwise asset correlations (ie correlations of the asset values with a systematic factor) are fed into the model, which is used to estimate the properties of the entire collateral pool based on trials of random defaults with the assumed correlation structure. The output of the model, the pool's loss or default rate distribution, is then used, together with other inputs, to determine the required subordination level (credit enhancement) for each CDO tranche, given desired tranche ratings (see Appendix 4 for a more detailed description of a simple Monte Carlo simulation model).

As part of the implementation of their Monte Carlo methodologies, the major rating agencies have now introduced, at least for some of their CDO ratings, explicit modelling of default correlations (though indirectly, via asset correlations) on the basis of historical data - a major step away from the rather simple assumptions applied earlier. A key difference among agencies, however, remains in the empirical estimation of assumed asset correlations, which are not observable. Each agency's own approach has its merits and drawbacks and differences in approaches have led to different asset and, ultimately, default correlation assumptions across the major agencies.<sup>16</sup> This may matter in terms of rating outcomes, given the decisive role of correlations in estimating the credit risk of a collateral pool and the distribution of risk across tranches (see the coverage of "model risk" in Section 5.1 below). A similar argument applies with regard to recovery rate assumptions, which continue not to conform fully

<sup>16</sup> For example, see Zeng and Zhang (2002) and De Servigny and Renault (2003) for a discussion of some of the practical issues arising in the context of approximating asset value correlation with equity correlations.

with mounting empirical evidence of substantial cyclical variability in recoveries and negative correlation with default probabilities.<sup>17</sup>

### Box 3

#### CDO rating methodologies - a broad overview

CDO rating methodologies used by the three major rating agencies Fitch, Moody's and Standard & Poor's are broadly similar, but important differences remain. Moody's established Binomial Expansion Technique (BET) methodology is top-down, ie portfolio-based, while Fitch and S&P use methodologies more geared towards the asset level. All three agencies have revamped their methodologies in the recent past or are in the process of doing so, which has led to substantial changes in the way pool credit risk is evaluated and ratings are assigned. However, all their methodologies essentially attempt to capture the credit risk of CDOs by making estimates of or assumptions about each individual obligor's default and recovery rates and about pairwise default correlations among obligors in the portfolio.

**Moody's** continues to use its widely known BET model, although new Monte Carlo (MC) simulation-based methodologies have recently been introduced for static synthetic CDOs and CDOs-squared. In addition, Moody's is also using other methods, such as variants of the BET and a log-normal approach to rate CDO pools with particular features, when the standard BET model is not deemed to produce appropriate results. The new CDOROM Monte Carlo model is similar to the methodologies used by S&P and Fitch (see below) in that explicit inter- and intra-sector asset correlation assumptions are being fed into a simulation engine. In addition, the model also simulates correlated recoveries to account for systematic variation, although correlation between default and recovery rates is not explicitly taken into account (see Appendix 4 for short descriptions of the BET and a simple MC approach).

**Fitch** has recently revamped its CDO rating methodology by introducing its VECTOR model, which estimates CDO portfolio default distributions on the basis of Monte Carlo simulations. Default rates and asset correlations are inputs into the model. The default rates come from a new CDO Default Matrix (giving asset default rates by rating and maturity), which is based on historical bond default rates and can be modified to take account of "softer" default definitions when used for rating synthetic CDOs. Pairwise asset correlations, similar to what is done by Moody's, are based on estimates of cross- and intra-industry as well as geographical correlations of equity returns. As a result, Fitch will assign an internal and external correlation for each of the 25 industry sectors used. In the past, Fitch did not explicitly model correlations, but applied penalties for high obligor, industry and country concentrations in CDO collateral pools.

**Standard & Poor's** introduced its EVALUATOR model back in 2001. The model is based on Monte Carlo simulations, taking the PD and rating for any name in the pool and correlations between pairs of assets into account. The simulation engine draws large numbers of multivariate normally distributed numbers, which are then compared with a default threshold (based on the maturity and PD for the asset) to decide whether a given asset defaults or not. Being MC simulation-based, the model is broadly similar to VECTOR, but with subtle differences. Both models follow a two-step process, ie various probabilistic inputs are being calculated in one system and then fed into a separate cash flow model - the same applies to Moody's approach. However, while S&P's EVALUATOR is based on a one-period simulation, Fitch's VECTOR model computes the default distribution by use of a multi-period simulation. S&P's correlation assumptions are based on historically observed defaults, with asset correlation then calibrated to default correlation observed over the cycle, while Moody's and Fitch use assumptions based on equity returns as inputs for their respective MC models.

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See eg Cifuentes and O'Connor (1996), Bund et al (2003) and Standard & Poor's (2003) for more detail.

As a result, despite significant improvements over recent years, current rating methodologies may not sufficiently approximate the tails of pool loss distributions in that systematic risk and, hence, time variation in correlations and recoveries may not be sufficiently accounted for.<sup>18</sup> The same observation applies to the models used by other market participants, as there is no current consensus regarding what "best practice" is in terms of modelling credit risk in a portfolio context.

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<sup>17</sup> See eg Altman et al (2004) and Frye (2003).

<sup>18</sup> The agencies state that they attempt to make up for these deficiencies by stressing variables such as recovery rates and correlations in their simulations of portfolio loss distributions.

## Assessing structural risks

Evaluating the credit risk of a portfolio, as indicated above, is a challenging task in and of itself. Yet, the performance of structured finance products depends not only on the level of portfolio credit risk, but also on multiple dimensions of “deal structure”. It is this structure that transforms the credit risk embodied in the asset side of the transaction into a distinct set of risk characteristics on the liabilities side. Evaluating the structure of liabilities is, therefore, one of the rating agencies’ critical contributions, the eventual aim of which is to ensure that the intended seniority of the various tranches is - or is likely to be - the actual seniority and that structural risks do not compromise transaction performance. The principal risks taken into account in this context are:<sup>19</sup>

- (1) *market risks* (such as prepayment risk, interest rate and exchange rate risk, and the basis risk arising from any deal-inherent hedges);
- (2) *third-party risks* (ie performance risks relating to asset managers, servicers, hedge counterparties, and providers of external credit enhancements); and
- (3) *legal risk* (eg assessment of true sale perfection of the assets and bankruptcy remoteness of the SPV on the basis of legal opinions; see Box 4 for details).

In practice, structural analysis will involve detailed modelling of cash inflows (using the portfolio credit risk analysis as an input) and outflows (determined by the transaction’s structure) to review how cash flows to note holders change or are diverted under various stress situations. As part of this process, the agencies will make judgments about the expected performance of various third parties involved in the transaction. Importantly, as many tranching ABS deals tend to have relatively “complex” structures, more so than most CDOs, cash flow modelling is arguably the most critical part of the ABS rating process. The need to improve cash flow modelling was cited in the Working Group’s interviews as one of the main technical challenges for market participants going forward.

Key to the structure is the so-called *payment waterfall*, ie sets of covenants that dictate the priority ordering of interest and principal payments and allocation of losses among the parties involved in the transaction. Under normal circumstances, cash proceeds from the underlying collateral will be used, after the payment of various fees, to pay investors, starting from senior note holders downwards.

One of the difficulties arising in this context relates to the *conflicting interests* among note holders. For example, senior note holders tend to receive a fixed spread during the life of a deal and a final bullet payment at the end. Accordingly, they have an interest in having buffers built up within the structure during the life of the deal against any unanticipated credit deterioration and will want to safeguard the quality of the collateral pool. On the other hand, equity tranche investors (who receive no principal payments) have an incentive to trade off at least some of the credit quality for a pickup in yield, and they prefer to see defaults occur late during the lifetime of the deal in order to maximise the yield payments they receive. In addition, equity investors will prefer higher default correlations among the collateral assets since, as noted above, higher correlation implies a greater probability of zero defaults in the portfolio than does lower correlation. Finally, in managed transactions, asset managers are often required to make decisions that will benefit one class of note holders at the expense of another. When managers hold equity tranche positions, this dual role creates an inherent conflict of interest.<sup>20</sup>

As noted in Section 2.4, structural provisions can be used to control such conflicts. CDOs and other tranching products rely extensively on structural features in the form of triggers and threshold levels, such as overcollateralisation (O/C) and interest coverage (I/C) tests. These tests, when triggered, divert cash flow to protect senior note holders, in order to maintain stability of performance for these classes over time. Increasingly, senior note holders are also being protected by rules regarding the use of excess spread, which represents the difference between the income earned on the collateral assets and contracted payments to the tranching liabilities. Preservation of excess spread, which is held in a reserve fund rather than being distributed immediately to equity holders, is thus increasingly viewed as best practice in protecting note holders - reflecting lessons learnt from the poor performance of more senior notes in earlier deals.

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<sup>19</sup> See Cousseran et al (2004) for more coverage of structural risks in structured finance transactions.

<sup>20</sup> See Dunbar (2004b) for coverage of an upcoming lawsuit involving such issues.



Box 4

**The legal assessment of structured finance transactions**

Besides considerations related to credit risk, tranching and priority of payments between the different classes of note holders, the evaluation of the soundness of legal structures supporting structured finance transactions represents a crucial step in the assessment of these transactions by the major rating agencies.

- In any structured transaction, the originator and/or arranger usually requests legal opinions on the deal and its structure from one or more specialised legal firms. Rating agencies then carry out reviews of these legal opinions, which form the basis of their own assessment of the soundness of the structure. These reviews should not be seen as a due diligence process, but rather as assessments based on plausibility checks on the various links of the “chain” involved in the structure. In that regard, it is widely acknowledged, among both arrangers and lawyers, that rating agencies rely on an objective, systematic and fairly conservative approach for such an assessment, which generally follows an iterative process with the originator and/or arranger. For some complex transactions, agencies may ask the arranger to provide distinct legal opinions from two lawyers as a prerequisite to rate the deal.
- Depending on their own internal organisation, agencies either review the legal opinions provided by the originator and/or arrangers in-house or outsource the review to external lawyers, although agencies’ reliance on in-house legal capacity seems to be generally limited. Nonetheless, rating agencies have accumulated over time a unique knowledge about the viability of structures combined with an ability to gauge various asset categories and country-specific legal frameworks. Given their central position in this market segment, they may thus compile and assess deal-specific information and challenge, if need be, the views of originators and arrangers about the legal soundness of transactions.
- Only a handful of specialised law firms operate in the structured finance area. Given this oligopolistic industry structure, which echoes the one observed in the rating sector, it is not unusual for the same firm to be approached by both the arranger and a rating agency with a mandate to deliver a legal opinion on a particular transaction. To mitigate possible conflicts of interest that arise in this context, the rating agencies may require Chinese walls within the law firm’s organisation or obtain additional legal opinions from different legal firms.

Overall, the track record of the structured finance market, as regards both traditional ABSs and CDOs, would tend to suggest that legal, documentation and execution risks embedded in transactions have been suitably addressed by rating agencies. Legal opinions provided by originators/arrangers, subsequently cross-checked by the agencies, are generally well documented even though sometimes inconclusive on certain technical aspects of a given transaction. As a result, only a few disputes of legal issues have publicly surfaced. While this is reassuring, it could still be a source of concern as only a few structured finance deals have actually been tested in court. Hence, there are still a number of major uncertainties regarding the legal soundness of specific deal features, most notably in connection with the possible impact of bankruptcy proceedings on the rights of SPVs and ABS/CDO investors with respect to collateral assets.

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See, for example, Deutsche Bank (2003) for more information.

As with traditional securitisations, assessing *third-party risk* is also critical. Asset manager quality appears to be one of the key performance drivers in structured finance. Past performance, including the extent to which the manager satisfied key covenants, is taken to be an important guide to quality. In the traditional ABS market, on the other hand, servicers are of key importance, and the attention paid to servicer quality is comparable to that paid to CDO asset managers. Servicer risk is of particular concern in jurisdictions where no established third-party servicer market exists, such as in continental Europe. As a result, while it may be relatively easy to find a replacement servicer for some asset classes (such as credit card receivables and auto loans), it may be considerably more difficult for more diverse portfolios. Deals backed by such pools, therefore, may need to have added liquidity support in the structure to help avoid default on payments to note holders while a potential servicer switch takes place. Similar issues may arise with regard to the performance of other third parties. The importance of the performance of third parties to the robustness of structured finance transactions and possible interactions with legal and default risks were underlined by the losses experienced on certain transactions in the US sub-prime home equity loan and US manufactured housing ABS markets in the late 1990s (see Appendix 5).

## 4. The role of ratings in structured finance: an assessment

### 4.1 Reliance on ratings

It is common for structured finance instruments to receive multiple ratings from different agencies, with each tranche except the most junior being rated. As a result, structured finance has largely remained a “rated” market, excluding only the inter-dealer segment of the market for synthetic CDOs. Indeed, as suggested by empirical research undertaken by the Working Group on pricing patterns for US ABSs, reliance on ratings as a source of credit information seems to be somewhat higher in structured finance than in traditional bond markets. In particular, ABS downgrades are found to have a stronger impact on prices than do downgrades for corporate bonds, and ABS downgrades are anticipated by prices to a lesser extent than bond downgrades.<sup>21</sup>

Despite this fact, however, investors do not appear to be overly reliant on ratings in making structured finance investment decisions. In fact, the Working Group’s interviews with investors and other market participants suggest that, in general, investors are aware of the risk of basing their investment decisions solely on ratings. In other words, investors view ratings as just one part of an informed investment decision (although investors often rely on rating agencies for deal information, especially regarding ongoing performance).

This is consistent with earlier survey evidence on European banks, as documented in ECB (2004), suggesting that the reliance on ratings is inversely related to the level of sophistication of surveyed banks - for those with highly developed pricing models, ratings appear to merely complement their own analysis. For less advanced banks, however, analytical tools are often less developed, meaning that ratings may have a larger impact on their structured finance-related decisions. Information obtained from the Working Group’s interviews tended to corroborate the viewpoint that the institutional investor community appears to have become increasingly sophisticated over time, in part as a result of learning from past mistakes. In addition, investors seem to avoid markets where they lack the required analytical expertise. Some investors, for example, expressed scepticism about the accuracy with which the agencies and other market participants can assess the riskiness of structures such as CDOs of ABSs or CDOs-squared (see Appendix 2).

### 4.2 The usefulness of structured finance ratings

The above discussion suggests that the use of ratings in structured finance, while ongoing, is becoming one component of a more general process of risk management. While part of the continued reliance on ratings might be explained by ratings-based restrictions imposed on investors (ie via investment mandates, regulatory requirements or internal risk and capital management systems), another part is probably due to value creation by ratings in the following, closely related areas:

(1) *Structuring opinions and third-party assessments:* As pointed out above, the pronounced ex ante nature of structured finance ratings stands in contrast to the more ex post nature of the credit risk opinions provided by traditional ratings. Deal origination implicitly involves obtaining structuring advice by the rating agencies, at least to the extent that arrangers use rating agency models to pre-structure deals and subsequently engage in an iterative dialogue with the agencies to finalise these structures.

Structured finance ratings appear to provide valuable and reasonably transparent assessments of pool credit risk and a transaction’s specific structural features, including evaluations of third-party and legal risks. While the one-dimensional scale of ratings makes it impossible to draw independent inferences about these individual components of the credit risk of a tranche, the rating will convey considered

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<sup>21</sup> Ammer and Clinton (2004) analyse the impact of changes in the credit ratings of certain types of ABS on the pricing of these securities. Similar studies for corporate and government bonds tend to point to a relatively limited marginal contribution by credit ratings to market information about borrowers. For ABSs, however, effects of downgrades are found to be stronger than those that have been reported for traditional bond instruments, with downgrades to speculative grade standing out in particular. At least for downgrades, therefore, the authors find that market participants may rely more on rating agencies as a source of credit information. For upgrades, market reactions are close to zero on average, implying an even greater asymmetry than has been found in event studies of bond rating changes.

judgments about the overall robustness of the structure. The third-party assessment offered by the rating agencies can thus have a significant role in the marketability of structured finance offerings, while - according to opinions expressed during the Working Group's interviews - also helping to protect the arranger against the reputation risk posed by potential deficiencies of the deal.

A related role of the rating agencies is in mediating between the competing interests of differing investor classes in structured finance transactions - at deal inception as well as over a deal's lifetime. This is accomplished both through continuing surveillance (see below) and through the opinions that the agencies publish regarding transaction structures which can best achieve a balance of interests between investors.

(2) *Information provision and deal surveillance:* The Working Group's interviews suggest that it is generally more difficult for investors to obtain information about the performance of structured finance pools than for, say, individual bonds. This may be true for several reasons. Some of the usual information sources for bond investors may either not exist in structured finance or information may be available only at a higher cost (relative to expected returns). Also, given the finite-lived nature of structured finance instruments, the overall investor community's incentives for active monitoring are lower than for bond and equity investments, which will limit related information gathering. This leaves the rating agencies as the main information providers (aside from arrangers and trustees), and may help to distinguish the agencies' role in surveillance and information provision in structured finance from that in traditional markets. Indeed, a number of investors interviewed by the Working Group claim to rely almost exclusively on the rating agencies' pre-sale reports and rating opinions for information on deal specifics and performance.

Structured finance ratings are reviewed on a relatively regular basis, depending on the availability of trustee/asset manager reports, which are a main input into the rating agencies' review process. The performance data from these reports are rerun through the agencies' models, with the underlying deals thus being at least partially "rerated".

(3) *Market development:* Building on their expertise and detailed credit and legal information amassed over the years, the major agencies (who "see every deal" and are thus the largest repositories of information about asset class performance, legal opinions, etc) have responded constructively to investor demands to extend existing structures to new uses. This has helped to increase the range of asset classes and jurisdictions to which structuring technology has been applied. In the process, the rating agencies have contributed to more efficient financing and risk transfer opportunities in what has become an important element of market-based financial intermediation.

Extending the application of structured finance to new products, asset classes or jurisdictions can be a challenge, as the relevant historical data necessary for evaluating risks may be unavailable or hard to come by. A similar point applies to legal opinions on the effectiveness of specific structures across different jurisdictions. Although the rating agencies have, at points in time, arrived at different opinions regarding specific structural features, there has been a convergence to new market standards over time. Similarly, the rating agencies have contributed to heightened awareness among market participants of the inherent conflicts of interest in structured finance transactions. This awareness has led to the introduction of specific structural features, such as those designed to ensure the preservation of excess spread (see above).

### **4.3 Standard-setting and implicit regulation**

Whereas the rating agencies may not be regarded as independent *standard setters* in structured finance, an implication of the above discussion is that they have played an important role in developing credit standards for a market for which, by definition, few standards had previously existed. This role has involved articulating investor views and embracing structural features that are evolving in the market and that the agencies judge to be viable. In publicising such information, the agencies provide a service with public good characteristics. They have also contributed to transparency, for example by adding their support to investor pressure for improved reporting by trustees and asset managers.

Continuing development of structured finance markets may serve to increasingly replace some of the traditional intermediation activities provided by integrated financial institutions with separate, more specialised financial services involving a multitude of different players. These services, in turn, are coordinated through SPVs, which own asset pools, enter into contracts for their servicing and administration and issue own financing instruments against these pools, while lacking the ability to

originate the underlying assets. In this sense, a number of features of structured finance markets and the rating agencies' roles in these markets lend a character of implicit regulation (in terms of supporting market discipline) to the process of rating these instruments. In particular, the rating agencies specify the amounts of credit enhancement necessary to achieve desired tranche ratings and they engage in ongoing monitoring of the resulting seniority structure. Finally, in managed transactions, rating agencies are also important for evaluating deal governance.

## 5. Possible issues arising for structured finance markets

### 5.1 Model risk

#### *Model risk in agency ratings*

Generally defined, "model risk" relates to potential errors made in evaluating and pricing the exposures arising from financial transactions. Model risk is, therefore, not confined to structured finance. However, given the lack of historical default data and the analytical challenges in assessing credit risk exposures (eg treatment of correlation, recoveries and time variation), it is likely to be a more important issue in the credit risk than in the market risk world. This applies, in particular, for structured finance instruments, as in the case of correlation assumptions discussed above. As a result, model-based risk assessments can be a long way from "true" values and, to the extent that investors rely on ratings for their structured finance investments, the model risk linked to the agencies' rating methodologies will be among the principal risks these investors are exposed to.<sup>22</sup>

In the context of rating structured finance instruments, model risk has two principal components. The first is related to the quantitative models (and assumptions) the rating agencies use to estimate portfolio credit risk, eg potential errors related to assumed correlation values. The second is related to deal-specific, structural model risk, which is in turn related to the arranger's proprietary structuring techniques and other determinants of "deal structure", eg covenants governing the redistribution of cash flows. Given the involvement of third parties, structural model risk - broadly defined - will also embody operational and legal risks. Importantly, model risk will ultimately translate into potential pricing risk, to the extent that ratings influence pricing or that other market participants make use of similar assumptions in their pricing models. In both cases, model risk reflects structural specifics: given that investors need to understand the risk profiles of their actual investments, not generic ones, accuracy crucially depends on customised assessments of deal structures.<sup>23</sup>

#### *Model risk in pricing and hedging: single-tranche CDOs*<sup>24</sup>

Model risk relates not only to the methodologies applied by the rating agencies, but also to the proprietary pricing models used by market participants. Despite significant methodological progress over recent years, credit risk modelling remains a challenging task. This applies, in particular, for the full integration of correlated defaults and credit spread changes into pricing and risk management applications.<sup>25</sup>

One area where this type of model risk may particularly matter is the single-tranche CDO market, which has been one of the most dynamic market sectors over recent years (Graph 3). Single-tranche CDOs are similar to bilateral OTC derivatives contracts among dealers or between dealers and investors. Through such a contract, the investor takes an exposure, usually at the mezzanine level of

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<sup>22</sup> Adelson (2003) argues that the high numbers of downgrades of high-yield CDO tranches over recent years are at least partially the result of undermodelling of both default and recovery rates and, hence, a manifestation of model risk.

<sup>23</sup> See also Raynes and Rutledge (2003).

<sup>24</sup> See Joint Forum (2004b) for similar coverage of the single-tranche market.

<sup>25</sup> On this issue, see Duffie (2004).

the capital structure, while the dealer (at least implicitly) retains the remaining tranches. As noted above, these instruments have certain advantages over full-capital-structure deals, including the fact that long ramp-up periods (ie the time needed to assemble the assets for the collateral pool) are avoided and that the potential for conflicts of interest that arises with other tranching products is less pronounced, since there is only one investor.

Importantly, as the price of a given CDO tranche is directly related to the probability of losses occurring relative to its position in the portfolio (size and degree of subordination), prices will be directly influenced by correlation assumptions (Graph 4). Modelling the relationships between PDs incorrectly, therefore, results in the risk of pricing these instruments incorrectly. In addition, when a dealer sells a single-tranche CDO, the required hedging strategy is more demanding than for deals with fully capitalised structures. Effectively, every time the dealer sells a single tranche to a client (ie buys credit protection), a hedge portfolio based on positions in all underlying names will have to be calculated. Delta, ie the hedge ratio, will depend on factors such as relative default premia on individual credits, tranche thickness and position, maturity, and correlation and recovery assumptions. Delta will thus vary for each name and tranche and will change over time, depending on movements in spreads and as the maturity of the transaction approaches. Having calculated the deltas at the outset of the trade, the dealer then needs to adjust the hedge dynamically as market prices and other parameters move.<sup>26</sup>

This process gives rise to a number of issues, one of which relates to the limited liquidity available in hedging markets for credit risk. As single-name CDSs remain a relatively illiquid trading market, the eligible universe of reference entities will be limited to a few hundred CDS names and ABSs with liquid secondary markets. At the same time, hedges will be set up on a book basis, not on the basis of individual deals, and use of contracts based on CDS indices can significantly ease hedge implementation.<sup>27</sup> Nevertheless, hedge adjustment needs will have to be balanced with the lack of liquidity in the underlying assets, which will create basis risk. In addition, delta estimation will lead to model risk similar to that described above. This, together with the short track record and largely untested nature of the market, may open up the possibility for wrongly priced and inadequately managed risk positions even for the most sophisticated market players. At the same time, the Working Group's interviews suggest that these risks are broadly recognised in the market and that net positions tend to be relatively small in comparison with dealers' overall credit exposures. This observation, however, does not exclude that single-tranche-related trading and hedging activity could become a factor contributing to heightened market volatility in times of stress.

## 5.2 Rating agency conflicts of interest

### *Conflicts of interest in the ratings industry*

Over recent years, concern has been expressed by several observers regarding potential conflicts of interest in the ratings industry. Potential conflicts arise from the fact that ratings are paid for by issuers rather than investors, and from the fact that rating revenues represent most of the agencies' total revenues. Ratings also rely at least partially on issuer-provided information. Issuer-paid fees may thus encourage rating agencies to act in the issuer's rather than the investors' interest, resulting in initial ratings being more favourable or downgraded less often than they otherwise should be.

The main countervailing force, often cited by the rating agencies and others, is the need to establish and preserve a track record of ratings in the markets the agencies wish to serve. The agencies appear to be sensitive to the value of their reputational capital for future business and to market sanctions that

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<sup>26</sup> For descriptions of single-tranche hedging, see eg Martin et al (2003) and Gibson (2004).

<sup>27</sup> Growth in tradable CDS index products has not only provided an efficient tool for the implementation of single-tranche CDO-related hedges, it has also allowed for the creation of a more liquid and transparent market for tranching credit risk and, on this basis, promises more efficient price discovery in single-name and index-based CDS markets. The recent merger of Dow Jones's *TRAC-X* and the iBoxx *CDX* index is expected to accelerate this process even further, by broadening the investor base for tranching credit risk, adding to the liquidity of standardised credit risk tranches and improving market participants' ability to calibrate their proprietary pricing models on the basis of market-implied asset correlations. See Calamaro et al (2004) and Mashal et al (2004), among others, for more detail.

would be associated with poor management of conflicts of interest. Their incentive to build and protect a reputation for quality services, therefore, serves as the main disciplinary device regarding conflicts of interest. On this basis, the agencies state that they seek to actively manage conflicts of interest through measures such as compensation arrangements that ensure that analysts are not rewarded on the basis of their ratings, internal rules that separate rating analysis from sales units, and efforts to diversify their revenue base and to avoid dependence on individual clients.<sup>28</sup>

### **Conflicts of interest and structured finance ratings**

#### *Issuer-paid fees and “structuring advice”*

The differing nature of structured finance ratings from traditional bond ratings, in particular the agencies' involvement in the structuring of deals, has sparked concern that potential conflicts of interest in structured finance markets may be especially pronounced.<sup>29</sup> According to this view, the fact that the agencies may have expressed an “ex ante opinion” regarding deal structure suggests that they are providing “structuring advice”. Therefore, the agencies may not be fully independent of the instruments for which they ultimately issue a rating. Indeed, an analogy has been drawn with auditing firms and the consulting services they provided to their audit clients. The resulting conflicts of interest gained prominence in the context of certain auditors' relations with clients such as Enron, where the incentive to preserve large consulting revenues was said to have unduly influenced audit opinions. Given the importance of structured finance as a revenue source for the rating agencies, it has thus been argued by some that adverse incentives from the combination of “structuring advice” and ratings might be important enough to bias the agencies' ratings of certain structured finance products.

It should be noted, however, that in contrast to the truly ancillary nature of the consulting services that were provided by a number of auditors, the assessment of transactions' structural features is an integral part of the process of rating structured finance tranches. In fact, there appear to be no fundamental differences in the rating processes for structured finance products and traditional bonds. The potential conflicts of interest arising in structured finance are thus unlikely to be materially different from those in the traditional segments of the agencies' business. More specifically, in the case of traditional bonds, issuing firms will enquire about possible rating levels, given factors such as firm structure and credit conditions. For structured finance ratings, arrangers will indicate targeted tranche ratings and how the deal's structural specifics may then be adjusted to achieve them. In both cases, the agency can communicate to the issuer the rating that it plans to assign, with the main difference lying in the issuer's flexibility to adjust credit characteristics in response. In the case of a bond, this flexibility will be limited, as the issuer cannot quickly respond to a potential rating that is lower than desired by making significant changes to its structure or operations. In contrast, with a structured finance instrument, the proposed structure can more easily be changed to adjust the credit enhancement of particular tranches in order to raise ratings to their targeted levels.

The ease with which such changes can be made in structured finance transactions, together with the initial targeting of the rating level, explains the iterative dialogue which may take place between the arranger and the rating agency during the rating process. However, a single fee is charged by the agency for the rating process in its entirety, and structuring advice, to the extent that it is provided, is not separable from the other components of this process, including the assignment of the rating. In addition, given that the rating process for structured finance instruments must always entail evaluations of deal structures, it would appear that the rating agencies do not treat transactions materially differently when they are the only agency to be approached than when the deal has previously been submitted to another agency.

Importantly, even for the agencies' traditional business, the actual boundary between “ex ante” and “ex post” ratings is blurred in practice. For example, it has become common for rating agencies to offer special services relating to firms' bond ratings, such as pre- and post-rating assessments of factors that could impact rating levels. These services may be separately rewarded and may thus exacerbate any potential conflicts of interest arising from “issuer fees”. Also, as debt issuance may impact the

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<sup>28</sup> See Schwarcz (2002) and SEC (2003).

<sup>29</sup> See eg Crockett et al (2003).

existing seniority structure of an issuer's liabilities, new issues are not rated in isolation. Similar to the structural analysis involved in structured finance ratings, the rating agencies will thus need to take a bond issuer's entire capital structure into account and assess any implications for third parties, such as subordinated debtors (see also Table 1).

Given these similarities, the Working Group believes that the complexity of managing potential conflicts of interest has not been altered by the agencies' involvement in rating structured finance instruments. While evidence on the effectiveness of the agencies' measures has so far been limited, one recent study of bond ratings seems to suggest that the rating agencies are relatively responsive to reputation concerns.<sup>30</sup> On the other hand, to the extent that truly separate advisory services provided by the rating agencies in other business lines - and funded separately from ratings - were to become a major revenue source, the potential for advisory fee-related conflicts of interest would arise in the future and could meaningfully affect the complexity of managing these conflicts going forward.<sup>31</sup>

#### *Reputation risk and "conservative bias"*

Rather than imparting a favourable bias on ratings, some observers have argued that asymmetric concerns over reputation risk could work in the direction of "conservative bias". That is, by applying overly rigid standards in order to avoid downgrades at all costs, the agencies could hamper market innovation.<sup>32</sup> It is plausible that limited competition among the agencies could have a similar effect, if the concentrated industry structure were to affect incentives to innovate. However, while the counterfactual is hard to establish, there is little indication of such influences in structured finance markets, which have become one of the most dynamic parts of the financial system. In addition, by making their rating models freely available to the market, the rating agencies have increased transparency and may have helped to strengthen the objectivity of the rating process. Inviting practitioner and academic comment on their methodologies also helps the agencies to keep their approaches up to the mark. In fact, in their interviews with the Working Group, the agencies cited their attempts to "keep up" with arrangers' models and demands from investors as one of the significant challenges that they face in rating structured finance instruments.<sup>33</sup>

As a result, although high entry costs - possibly aided by regulation - have limited the number of agencies active in structured finance markets, competition among the agencies and from sophisticated arrangers appears to have promoted continual improvements in structured finance rating methodologies and in marketed deals' structural features. Best practices in structured finance thus seem to arise endogenously through contestability of the market.

#### *Structured finance and the role of monoline insurers*

As the business models and balance sheet structures of key participants in structured finance markets are affected by their credit ratings, the agencies' involvement in these markets is inherently multilayered. Along these lines, another potential conflict of interest arises when the ratings of some structured credits are contingent on the agency's own rating of a monoline insurer that provides credit enhancement to the most senior tranche(s) of these structures. (See Box 5 for more information on these "monoline wraps".)

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<sup>30</sup> Covitz and Harrison (2003) analyse the degree to which reputation-related incentives keep rating agency conflicts of interest in check by measuring the agencies' delay in recognising credit quality deteriorations. On the basis of this analysis, they find no evidence consistent with rating agencies acting in the interests of issuers due to a conflict of interest.

<sup>31</sup> For example, the rating agencies have now started to provide Basel II-related consulting services. If these services were to become a major revenue source, potential conflicts of interest could be further magnified, particularly if these services were directed at clients that also have other business relationships with the advising rating agency.

<sup>32</sup> See Schwarcz (2002) for an argument along these lines.

<sup>33</sup> It should be noted that this, in connection with high entry costs, may raise capacity issues that would be expected to slow, though not prevent, innovation in structured finance.

It is conceivable that an agency might hesitate to downgrade a monoline when its condition has deteriorated, given the implications for all of the structured securities the monoline has wrapped. Furthermore, because the maintenance of a high credit rating is an integral requirement of the monolines' business model, the rating agencies are effectively elevated to a role as unofficial regulators of the monoline industry, essentially serving as vehicles of market discipline. Recognising this, the agencies appear to engage in very close surveillance, with each monoline deal rated on a separate basis and with shadow incremental capital charges applied to the monoline for each deal. According to information obtained in the Working Group's interviews, it is these charges, rather than formal regulatory requirements, that are the binding constraints on the monolines' business.

#### Box 5

##### **Monolines and their relationship with rating agencies**

Monoline insurers provide credit enhancement to several forms of structured finance, including guarantees on senior tranches of mortgage and other asset-backed securities and credit enhancement of ABCP programmes (including financial guarantees on assets purchased by those programmes). In their CDO business, they provide guarantees or write credit default swaps on senior notes or tranches. Monoline involvement in structured finance also includes their role as managers of some CDOs. In addition, investors appear to value the surveillance undertaken by monolines of the deals they wrap as well as their influential role in the restructuring of troubled credits. So, aside from the intrinsic value of their guarantee, their involvement is perceived as reducing both the PD associated with the wrapped asset and its EL.<sup>1</sup>

In fact, in the absence of these additional benefits, the value of a monoline wrap in some structured finance transactions may at first sight be unclear. For transactions based on very well diversified pools of assets - ie where remaining idiosyncratic risk is minimal - the circumstances in which a monoline would be called upon to meet its guarantee obligations would appear to be only those of very severe and widespread systemic default where the monoline itself, notwithstanding the diversity of its portfolio, would be at significant risk of failure given its high leverage. Nevertheless, while meeting agencies' minimum diversity criterion, structured deals may in practice still exhibit significant sectoral risk because of higher than expected correlation. Defaults on such collateral could be general enough within, say, a sector or class of borrower for a monoline's guarantee on a transaction to be called, but the problem may not be sufficiently widespread to bring a monoline's general capacity to meet its obligations into question, given the diversity of its portfolio.

The market's comfort with the very high balance sheet leverage of monolines rests largely on the perceived strength of their risk management (as evidenced by a record of very low losses) and the intensive surveillance of their activities - including the setting of shadow, risk-based capital requirements against individual transactions - carried out by the rating agencies. As the monolines have expanded their involvement in structured finance, agency surveillance has given increasing emphasis to potential new concentrations of credit risk. This focus (eg on structured credits with the same collateral manager or servicer) involves a wide range of stress tests, including ratings transition scenarios and more extreme system-wide defaults.

In some structured credits, the monoline's AAA or AA rating will be integral to or constitutive of the rating of highly rated liability tranches and/or of those assets comprised in a structure's collateral that have a monoline wrap. This feature is not unique to monolines since the rating of collateral backing unwrapped transactions is also determined by the agencies (and the monoline may itself be partly reliant on the agency's rating of a credit when considering whether or not to provide a guarantee).

However, a wrapped "super-senior" tranche often constitutes a very high proportion (80% or more) of the deal. Also, in some re-securitisations, monolines may already have guaranteed a significant part of the collateral. In these circumstances, the consequences of a monoline downgrade could be far-reaching both for the rating of the structure and for the credibility of the agencies' rating approach.

This interdependence may lead to greater caution on the part of the agencies, so as to minimise the impact of model risk (in the assessment both of the particular structure and of the monoline's own rating) and other possible misjudgments. But it could also affect the willingness of an agency to downgrade a monoline (or place it on credit watch) given the wider implications. A delay in recognition of the impaired status of a monoline could mean greater disruption once the depth of an agency's concerns became evident to the market.

The balance of these risks is hard to assess with any precision. However, there appear to be several factors that mitigate concerns. Monoline wraps are only one form of credit enhancement in structured credits.<sup>2</sup> The agencies emphasise that the choice of enhancements is ultimately for the sponsor alone to determine; the agencies assess these singly and in combination on their merits according to well determined rules. Although the ratings industry has only a small number of players, they have their own individual approaches to assessing both structured credits and the monolines. Model-based assessments are also only one part of their overall evaluation. Fundamentally, the franchise of each agency rests on a successful ratings track record. Experience



### Monolines and their relationship with rating agencies

suggests that potential market disruption following a downgrade of a monoline is likely to be partly mitigated by the monolines themselves: in response to greater than expected downgrades of some of the earlier structured credits they supported, monolines have also raised the threshold in terms of the minimum rating of the tranche they will consider wrapping.

The monolines' growing participation in synthetic structured finance may also be accompanied by greater market discipline because synthetic business exposes the monolines to greater liquidity risk than is the case with their traditional financial guarantee business. The latter involves them guaranteeing the timely payment of interest and principal due on guaranteed debt according to original schedule. In the event of a default, they are not obliged to accelerate payments due to bondholders. A high proportion of the fees payable on financial guarantees of municipal bonds are also paid up front. In contrast, when guaranteeing synthetic structures, including CDSs, a monoline is obliged to meet an accelerated payment in the event of default on the underlying security, equal to the face value of the obligation less its marked to market value at the time the loss is determined. (Some settlements of CDSs do not require a cash settlement per se; instead the guarantor may be obliged to purchase the defaulted credit - in which case it swaps a liquid asset for an illiquid one.) Sellers of protection also receive fees periodically rather than at the time the contract is initiated. CDSs, or wraps of structured credits collateralised by CDSs, thus involve an increase in liquidity risk. They address this principally by restricting their guarantees to only highly rated credits. These differences in the nature of the guarantee are reflected in the different accounting treatments that are applied.

Whereas non-accelerated financial guarantees are off-balance sheet, CDS-linked transactions are treated under US GAAP as a derivative and so must be marked to market, potentially creating greater volatility in a monoline's reported earnings and in its balance sheet leverage. The monolines typically provide estimates of the impact on earnings of given changes in credit spreads on the marked to market value of their CDSs. Nevertheless, in their ratings assessments and commentaries, the agencies tend to look through the volatility of GAAP earnings from this source.

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<sup>1</sup> This source of comfort has been described by one of the rating agencies as follows: "At the risk of oversimplifying the appeal of the guarantors' product, it can be said that the guarantors provide value in situations where the liquidity and credit premium required by the market for direct securitization is high and the guarantors' wrap can significantly reduce this market premium." See Moody's (2003c). <sup>2</sup> In the US cash ABS market, monoline-wrapped tranches represented nearly 30% of issuance in 1999, but the share has since fallen back - to around 10% in 2003. In Europe, the share of cash ABSs with a monoline wrap has been rising (to around 9% in 2003) and super-senior tranches of synthetic issues, a high proportion of which will have been guaranteed by monolines, were around €30 billion in 2002-03. Monoline involvement varies across sectors, reflecting the different specialisations of the three main players (ie MBIA, AMBAC and FSA). Source: Merrill Lynch (2004).

On this basis, the Working Group considered the potential significance of a monoline downgrade for the downgraded entity itself and structured finance markets more broadly. The Group agreed that a downgrade of a large monoline from its high rating, usually at the AAA or AA level, could severely undermine its business, perhaps affecting confidence in the financial guarantor sector more widely. While such a downgrade might also affect sentiment towards existing monoline-wrapped structured securities, it should be noted that monoline wraps merely provide secondary credit enhancement, with subordination and overcollateralisation generally comprising the key elements of protection to senior tranches. Markets in structured products are thus likely able to continue functioning with reduced monoline involvement - though possibly with lower tranche ratings for given spread levels. Indeed, reliance on monoline-provided enhancements during 2004 has been declining as credit spreads have become tighter. Nevertheless, as holders of "wrapped" instruments would tend to bear valuation losses in the event of a monoline downgrade, the Working Group cannot rule out the possibility of distressed monolines helping to propagate and thus exacerbating the severity of low-probability systemic events.

## 6. Implications and policy issues

The Working Group believes that there are a number of policy issues related to structured finance in general, and the role of ratings in these markets in particular, that are worth highlighting. While some of these issues resemble the findings of earlier work in the area of credit risk transfer, others are

uniquely linked to the specific features of structured finance discussed above and may help to improve the understanding of how these markets may affect the financial system.

## 6.1 General implications

### ***Market efficiency***

Structured finance has extended the range of securitisation activities and, in turn, contributed to the expansion of market-based financial intermediation. It has increased the liquidity of otherwise illiquid credit exposures and led to the creation of instruments with risk-return profiles tailored to investors' specific requirements, given constraints or preferences. Overall, structured finance represents a move towards more complete financial markets, implying improved pricing efficiency and a more efficient distribution of credit risk.

### ***Financial stability***

Similar to other forms of risk transfer, structured finance improves the ability of market participants to manage financial risks more effectively. In turn, this allows these risks - at least in theory - to be better dispersed and more easily absorbed, suggesting that any shocks may increasingly be spread across a multitude of different market participants. In addition, structured finance gives investors the opportunity to better manage the risk of their investment portfolios, through broadened access to new asset classes and the ability to acquire instruments with tailored risk-return profiles.<sup>34</sup>

Yet, the scale of risk transfer that is actually occurring through structured finance can be overstated, particularly if originating institutions hold on to the equity tranches of the instruments they issue.<sup>35</sup>

In addition, structured finance instruments transform risk, with the potential of magnifying the exposures of certain market participants who acquire these instruments. This raises the possibility that, instead of spreading risk more efficiently, the risk transfer that does occur could lead to undue concentrations, in that investors may wind up with positions that are riskier than they realise. The potential for underestimating risk is particularly present for structured finance instruments, where pooling, tranching and the involvement of different players require greater analytical rigour and more precise documentation than for other financial instruments. As a result, while these risks may be well understood by most of the "market", problems may occur at the margin. Indeed, the assessment of pool credit risk remains an analytical challenge for all market participants, with the modelling of default correlation and spread risk remaining very much open issues.

Overall, if risk is inaccurately priced and exposures are concentrated in ways that are not fully appreciated by market participants, the occurrence of worst case scenarios could have systemic implications. Although the current scale of the more sophisticated structured finance activities is still quite small relative to other parts of the credit market, central banks may nevertheless want to be vigilant as markets continue to grow.

### ***Market structure and discipline in the ratings industry***

Structured finance ratings, just as traditional ratings, are part of a business exhibiting economies of scale. The importance of reputation and accumulated knowledge, the latter arising from access to the majority of marketed deals, tends to generate barriers to entry into the ratings industry and may help to explain the industry's oligopolistic structure.

At the same time, there is no obvious indication that market structure and related conflicts of interest have unduly influenced rating agency behaviour, or curbed the market's incentives to innovate.

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<sup>34</sup> See CGFS (2003) and Rule (2001) for similar points in the more general context of credit risk transfer.

<sup>35</sup> Recent surveys of risk transfer activity show that the scale of cross-border and cross-sectoral net credit risk transfer has remained limited. In particular, credit derivatives and related instruments, such as synthetic CDOs, appear to be largely used for trading among banks rather than to achieve a transfer of credit risk exposures across sectors. See Fitch (2003, 2004), Standard & Poor's (2003) and ECB (2004).

Contestability of the market for credit risk assessment, reflected by the sophistication of other market participants such as arrangers, appears to provide motivation for the agencies to engage in ongoing development of their methodologies for credit risk modelling and their views on structuring. Nevertheless, as lack of competition is generally seen as weakening the power of market discipline, initiatives designed to lower non-market barriers to entry are to be welcomed.

## 6.2 Implications for central banks, regulators and market participants

### **Central banks' market monitoring**

Structured finance markets raise issues for central banks that are familiar, but that are becoming more challenging. At the core of these developments is the contribution of structured finance in the move towards more market-based intermediation of financial services rather than the traditional provision of these services through banks' on-balance sheet activities. This, in turn, will tend to increase the financial system's reliance on markets.<sup>36</sup>

- *Non-bank intermediaries:* In the past, central banks' attention in the area of financial stability has largely been focused on banks and other depository institutions. Increasing importance of liquidity risk and its interaction with other risk factors, however, means that systemic problems could be increasingly likely to originate outside the banking sector, eg from the non-bank intermediaries that have arisen as major players in some structured finance sectors (such as securities firms, insurance companies or financial guarantors). Disturbances, when they develop, may thus be harder to detect and to resolve. Nevertheless, structured finance also entails legal separation between pools of assets and the assets' originators, which will tend to make the financial system less vulnerable to institutional spillovers.
- *Market functioning:* With market liquidity now requiring greater attention, central banks may have to refocus their traditional approaches towards safeguarding financial stability, with more emphasis being placed on helping to preserve the smooth functioning of markets.

### **Risk management and investor due diligence<sup>37</sup>**

Investors often invest in structured finance instruments in order to generate a yield pickup, which may entail taking "exposure to complexity" (ie model risk) combined with a move along the credit spectrum. In addition, for all but the most senior tranches, structured finance instruments may be significantly more leveraged than comparable portfolio investments in traditional corporate credit. As a result, tranching products can have unexpected loss characteristics that differ substantially from those for equally rated bond portfolio exposures.

- *Risk measurement:* An important implication is that ratings, which are based on EL or PD, are likely to provide an incomplete description of the riskiness of debt instruments. This is especially true for structured finance transactions, due to the effects of pooling and tranching. Exclusive reliance by structured finance investors on ratings can thus lead to unintended concentrations in exposure to unexpected loss, as reflected by the higher moments of the loss distribution.<sup>38</sup>

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<sup>36</sup> See White (2004) for a similar point.

<sup>37</sup> See Joint Forum (2004b) for a similar set of implications in this category and the following, although from a regulatory perspective and based on an analysis of synthetic credit risk transfer markets.

<sup>38</sup> Evidence on the basis of corporate bond price data is consistent with investors going beyond credit ratings, ie the first moment of the return distribution, in pricing these instruments. Campbell and Taksler (2003), for example, find that idiosyncratic firm volatility explains cross-sectional differences in bond yields better than do credit ratings, suggesting that the second moment is priced by the market.

Box 6

**Regulatory developments in structured finance - Basel II**

*Basel II* is introducing for the first time a differentiated regulatory framework for securitisation exposures, motivated by the fact that the Basel II rules for loans were not deemed suitable for portfolio structures involving different degrees of loss participation. The new framework establishes two approaches: the Standardised Approach and the Internal Ratings-Based (IRB) Approach. Both approaches primarily rely on publicly available external ratings provided by rating agencies.

Under the *Standardised Approach*, securitisation exposures are assigned a risk weight according to their public external rating, while unrated exposures must be deducted from capital.<sup>1</sup> There are three exceptions to this general treatment. First, unrated most senior tranches may receive the average risk weight of the underlying exposures, subject to supervisory review. Second, exposures in a second loss position (or better) in ABCP programmes will receive the greater of 100% and the highest risk weight assigned to any of the underlying individual assets of the pool. Third, eligible liquidity facilities will receive the highest risk weight assigned to any of the underlying individual assets of the pool covered by the facility and a credit conversion factor depending on the maturity of the facility.

Under the *IRB Approach*, the securitisation framework establishes three different methodologies and a hierarchy among them: the Ratings-Based Approach (RBA), the Supervisory Formula (SF) and the Internal Assessment Approach (IAA). For rated exposures, the RBA must be used. If the exposure is unrated and the bank either is the originator or has obtained permission from the supervisor, the SF can be used. If the exposure is one to an ABCP programme and meets certain conditions, for example that the exposure is equivalent to at least investment grade at inception, the bank can use the IAA. In all other cases, the bank must deduct the exposure.

The *RBA* assigns a risk weight to every exposure according to the external tranche rating. Weights are taken from an RBA risk weight table and are more risk-sensitive than the table proposed under the standardised method. Risk weights range from 7%, which is the floor for AAA tranches, to deduction for below BB- positions. In addition, the weights depend on the granularity of the underlying pool and the seniority of the considered tranche (since these are considered to be parameters that have more impact on the level of UL than on the rating). The SF, on the other hand, rests on a supervisory formula that assigns a capital charge on the basis of certain inputs to be calculated by the bank. These inputs are: (a) Kirb, ie the capital requirement prior to securitisation; (b) the effective number of assets; (c) the weighted average loss-given-default of the underlying pool, (d) the thickness of the tranche, and (e) the subordination level. Thus, the formula relies completely on internal credit risk inputs of the bank. The IAA, introduced due to the particularities of ABCP programmes, envisages the use of internal assessments of the credit quality of the securitisation exposure by the bank based on rating agency methodologies, if certain operational requirements are met.

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<sup>1</sup> Standardised risk weights for securitisation exposures: AAA to AA-, 20%; A+ to A-, 50%; BBB+ to BBB-, 100%; BB+ to BB- receive 350% for investors, but deduction for originators; B+ and below and unrated positions will have to be deducted in all cases, with the exceptions mentioned above. See Himino (2004) for a short overview of the Basel II framework.

Investors and other market participants need to understand this and adapt their risk management approaches accordingly, as differences in the risk properties not captured by ratings will tend to influence ratings transition behaviour and tranche valuation. The following issues may be highlighted in this context:

- *Due diligence:* Investors should avoid exclusive reliance on ratings and develop the analytical capabilities to assess the risks embodied in structured finance instruments.
- *Ratings-based constraints:* When structured finance is an allowable asset class in investment mandates, ratings-based investment constraints may not be effective as a tool for defining broad maximum levels of portfolio credit risk. This needs to be understood by those devising such mandates and their parallels in similar types of publicly and privately imposed restrictions. (The securitisation framework under Basel II may be seen as a reflection of these considerations; see Box 6.) Importantly, this caveat also applies to the eligibility criteria for collateral assets in central banks' lending operations.
- *Correlation:* Adding tranching products to an existing portfolio raises issues regarding the management of correlations on the portfolio level - particularly for "correlation-intensive" products such as CDOs. Investors need to be aware of the possibility of hidden concentrations leading to higher than expected losses when portfolio correlation has been underestimated.

## ***Disclosure and transparency***

Non-bank market participants are now more closely involved in the management of market and credit risks than in the past, possibly leading to changing information needs. Risk transfer, for example, is known to make it more difficult for policymakers and market participants to monitor market development and to track the “circulation” of market and credit risks through the system and over time. This applies in particular once unregulated institutions are involved in the risk transfer process, should the scale of their activities be sufficient to potentially cause or exacerbate market disruptions.

- *Market data:* Data on structured finance activities, despite recent improvements in this regard, are much less developed than those available for other markets. This applies to statistical data on market structure (ie issuance, outstandings) as well as pricing/valuation-relevant information (ie changes in pool holdings, default performance).<sup>39</sup>

From a central bank perspective, given that the scale of activity in various sectors can be an issue in case of any disturbances, more data may be useful - on an appropriate level of aggregation - to monitor the development of the market over time. In addition, as transparency has long been identified as an important factor supporting market discipline, improved disclosures by and to market participants (ie in the form of enhanced pre- and post-issuance information for investors and disclosures of structured finance activities for use by market participants' counterparties) are clearly desirable. However, as low transparency also hampers market development, incentives exist for market participants to find adequate solutions. Secondary markets for CDOs, for example, have recently become more liquid, partially due to better and more comprehensive information jointly being made available by major underwriters. Nevertheless, central banks and other authorities may want to consider more active measures to improve transparency in the future, should the relative opaqueness of structured finance markets continue.<sup>40</sup>

A related point is that a common shorthand for the importance of a position - that is, notional size - is inappropriate to judge riskiness, as tranching will distribute expected and unexpected losses across tranches in ways that are not well reflected by notional amounts. Therefore, it may be valuable for market participants to separate information on the rating level and size of structured holdings from other disclosed positions.

- *Methodological disclosures:* The rating agencies should continue to disclose details on their methodological approaches, together with additional information on ratings changes, to allow investors to better understand the analytics behind their structured finance ratings. Given the intrinsic conflicts of interest of their issuer fee-based business model, the agencies should also consider how to communicate more clearly the ways these conflicts are managed. In addition, as the riskiness of tranching investments cannot be sufficiently differentiated on the basis of ratings alone, the agencies may also want to further enhance their ongoing efforts to communicate the limitations of their ratings.<sup>41</sup>

A similar point applies for the information provided by those financial institutions that have started offering structured finance products to retail investors.<sup>42</sup>

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<sup>39</sup> The role played by the Bank of Japan in gathering monthly issuance data might serve as an example for the possible steps that can be taken by central banks to enhance market transparency: in Japan, market participants (eg arrangers and rating agencies) now voluntarily provide information on new securitisation deal issuance for compilation and publication by the Bank of Japan.

<sup>40</sup> See CGFS (2003) and Joint Forum (2004a) for a discussion of the state of financial disclosure and disclosure-related recommendations.

<sup>41</sup> Issuance of multidimensional ratings, in an attempt to better capture the risk properties of structured finance tranches, may not be a viable near-term alternative, given methodological difficulties and the departure it would represent from the agencies' established business models.

<sup>42</sup> See Dunbar (2004a) for coverage of the underperformance of a set of CDO-based retail products sold by Poste Vita, the life insurance division of Italy's BancoPosta and possible lessons for arrangers, rating agencies and investors.

## 7. Concluding remarks

Structured finance markets and the non-bank financial intermediation services they provide have become an important part of the financial system. Issuance volumes have grown strongly over recent years and the dynamics of market development, together with the benefits afforded to issuers and investors alike, suggest that growth is likely to continue. This will contribute to market completeness, yielding more efficient pricing and an improved distribution of credit risk.

Rating agencies play a key role in structured finance markets. As in other financial markets, the agencies act as providers of third-party opinions about the riskiness of debt instruments, thus helping to overcome asymmetric information problems and improving efficiency and transparency. Yet, the rating agencies' activities have the potential of being especially valuable in situations where investors face relatively high costs in assessing the structure and riskiness of a given instrument - that is, in structured finance. Indeed, ratings appear to play a more important role in structured finance than in traditional credit markets.

Complexity in structured finance - which arises from the pooling of assets, the detailed deal-specific structuring and documentation necessitated by tranching, and the involvement of third parties - may help to explain the particular role played by ratings in these markets. The rating agencies not only provide credit assessments of the underlying collateral pools. They also provide information on, and are involved in designing, the structural specifics of these securities. This involvement of the rating agencies at the "deal structuring" stage, together with the existence of structural as well as credit risks, sets structured finance apart from traditional credit ratings. Through their involvement in these markets, the rating agencies have contributed to developing accepted standards for markets that, by definition, had few prior standards. The agencies' role, therefore, is particularly pronounced in the formative years of markets and whenever structured finance technology is applied to new asset classes and jurisdictions.

Despite the "value added" by the rating agencies, market participants need to be aware of the limitations of ratings. This applies, in particular, to structured finance and the fact that, due to tranching and the effects of default correlation, 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. As the unexpected loss properties of structured finance products tend to differ significantly from those of traditional credit portfolios or individual credit exposures, structured finance tranches can be significantly riskier than portfolios with identical weighted average ratings. This, together with the fact that much of the yield pickup generated by tranche investments is a function of their increased riskiness, should be understood by market participants.

The Working Group's interviews suggested that most investors do not seem to rely on ratings as the sole source of information, which limits the potential for misunderstood risk exposures. Nevertheless, rating agency "approval" still appears to determine the marketability of a given structure to a wider market. A potential downside of such an arrangement is the possibility that rating agency involvement and the oligopolistic structure of the ratings industry may hamper innovation; however, there are currently no indications of such an outcome. In fact, the agencies appear to have flexibly responded to demands from originators and investors, introducing methodologies for rating innovative structures and improving the methodologies for rating existing ones.

Similarly, the Working Group believes that potential conflicts of interest in structured finance are not materially different from the issuer fee-induced conflicts, if any, that might exist in other parts of the ratings business, and the agencies appear to be fully aware of the role of reputation in dealing with adverse incentives that might arise in this context. On this basis, it is the Group's assessment that the complexity of managing these conflicts is not affected by the agencies' involvement in rating structured finance instruments. However, to the extent that truly separate advisory services provided by the rating agencies in other business lines were to develop into an important revenue source in the future, the question of advisory fee-related conflicts of interest potentially originating in those business areas could well affect the complexity of managing conflicts of interest going forward.

Despite all these favourable developments, mistakes have been made in the past - and will likely be made in the future - in assessing particular structures and asset classes, and important challenges remain. In particular, the Working Group believes that risks associated with investors that assume exposure to structured products without fully grasping the risk profile of these investments cannot be fully discounted. Unexpected losses on structured finance investments could thus become an issue going forward, particularly once the current environment of relatively low default rates and tight credit

spreads comes to an end. Similarly, with the performance of correlation books highly sensitive to the macroeconomic environment, uncertainties about this environment may translate into “model risks” for even the most sophisticated market participants. The occurrence of worst case scenarios on the basis of mispriced or mismanaged exposures might thus lead to situations in which extreme market events could have unanticipated systemic consequences. Given these issues and the fact that structured finance markets are still largely untested, continued growth in structured finance activity warrants ongoing central bank awareness.

## **Appendix 1: The role of ratings in structured finance - mandate**

The *Working Group on the Role of Ratings in Structured Finance* is to explore the role of rating agencies in the rapidly evolving markets for structured finance instruments. The character of these products is reflected in new requirements for the rating process, implying new challenges for the rating agencies themselves and for participants in structured finance markets. To facilitate a better understanding of this process, the Working Group will seek to identify and explain methodological differences that exist between the rating of structured finance instruments and more traditional credit products, such as corporate bonds, and how structured finance ratings are used. In this context, it will be necessary to develop an understanding of various methodological and organisational challenges involved in rating structured finance products, given their relative complexity and the model-driven nature of the rating process for these instruments.

More specifically, the Working Group will aim to characterise and assess:

- the use of ratings and the main differences in rating processes across traditional and structured finance markets (both cash and synthetic): ways in which agencies rate structured finance products as opposed to bonds, reasons for issuers and investors to rely on ratings, and the role of ratings for market development and improvement;
- methodological issues (such as “model/event risk”, the transparency of the rating process applying to structured finance instruments, and the extent of the information on their evolving creditworthiness), in the light of the rating agencies’ role as de facto standard setters in structured finance markets; effects of evolution of structured finance rating methodologies; and the consistency of ratings of structured finance instruments as compared with traditional debt instruments;
- the extent to which structures are designed to exploit (“arbitrage”) differences in regulatory and rating methodologies;
- potential conflicts of interest arising in the rating of structured finance products, as distinct from conflicts arising in other areas of the ratings business, and implications for markets and rating agencies; and
- implications, if any, for central banks in the light of their financial stability responsibilities.

It is envisaged that the Working Group will conduct a series of interviews with rating agency officials and other participants in the structured finance market. In addition, rating agency representatives could be invited to make presentations to the Working Group and for discussions of methodological issues. Furthermore, the Group would aim to collect and analyse relevant market data and would conduct a literature review which will be focused on the methodological aspects of the design and rating of structured finance vehicles as well as other relevant topics. The Group would aim to report to the CGFS at its meeting in September 2004.



## **Appendix 2: Summary of national investor interviews**

To better understand the forces behind ongoing developments in structured finance and the role of the rating agencies in these markets, the Working Group conducted series of interviews with structured finance investors in 13 countries.<sup>43</sup> The interviews took place between January and April 2004 and were held by national central banks with market participants from their respective countries, based on a joint interview guideline. Interviewees were drawn from a wide array of institutions and included large asset managers, insurance companies and banks. A number of institutions were members of financial conglomerates. As interviews were arranged independently and conducted on a national level, the answers are not necessarily representative, but may still provide a good overview of investor opinion in the countries covered by the Working Group.

### **Instruments**

While the investment universe in structured finance covers a wide variety of assets, a preference for traditional ABS, RMBS and CMBS pools emerged from the interviews. Many investors also buy ABCP, but CDOs are avoided by a substantial proportion of investors, apparently as a result of a reduced risk appetite, recent downgrades, or difficulty in analysing these instruments. In terms of investor interest, there seems to be a clear distinction between granular and non-granular asset pools. There is much more appetite for granular than for non-granular pools, primarily because adequate modelling of uncertain default correlations is more critical in the latter case. In general, investors with access to analytical capacity, either developed through their own operations or obtained from other divisions within the same financial conglomerate, were more likely to invest in CDOs. Investments are usually in local currency-denominated products but, due to limited supply of structured finance instruments in some countries, a number of investors have also invested in other currencies, mainly the US dollar.

For the majority of those interviewed, most of their structured finance investments are in senior tranches, with ratings in the range AAA to A. Super-senior tranches, however, were believed to offer relatively little value at the time of the interviews, given tight spread levels. Several investors expressed a clear preference for consumer or real estate-related asset pools, which have demonstrated a very stable performance over a long period. Most, if not all, investors would argue that they would never invest in a structure that they do not fully understand, or for which information is deemed inadequate.

Some investors stated that they avoid instruments with particular classes of low-quality underlying assets, such as non-investment grade corporate bonds, manufactured housing loans, or emerging market debt. Nevertheless, a few sophisticated investors noted that they concentrate on riskier structures and more non-standard asset pools. For example, one investor was an active buyer of CDOs with underlyings such as leveraged loans and distressed securities. More complex structures such as CDO-squared products, however, appeared to receive little attention because of the additional layers of complexity. Moreover, some investors expressed concern that multiple exposures to the same names could be created to an extent that would make these structures very difficult to analyse. Still, a few investors admitted that they had been attracted by the higher spreads offered by CDOs-squared and other ABS CDOs.

The Group's interviews did not indicate a clear preference for cash versus synthetic structures. Funded cash structures are apparently used to obtain exposure to high-quality liquid assets, while synthetic structures were seen as being more flexible. In this context, some interviewees particularly highlighted the rapidly expanding market for single-tranche CDOs, which offer investors the opportunity to determine and manage the underlying asset pool themselves. A similar conclusion could be drawn with regard to static versus managed CDOs. Some investors had incurred significant losses from static CDOs in the past and, as a result, have restricted their CDO investments to

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<sup>43</sup> Interviews were held in Australia, Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Switzerland, the United Kingdom and the United States.

managed structures. Their focus is thus on manager experience and past performance, as well as on implementing appropriate incentive structures. On the other hand, some investors appear to be sceptical of the value added by active management, reflecting the negative experience with particular managed structures.

The relative size of investments in structured finance varies widely, from only a few per cent of overall asset allocation for most investors to more than half of the investment portfolio for some, depending on the nature of the institution. Overall, however, the importance of structured finance investments is seen to be growing, although quite a few investors, in particular banks, emphasised that they had moved into less risky structures and asset pools. Those insurance companies that have not withdrawn from structured finance markets may have moved down the credit curve.

### **Supply/demand factors**

The process of selecting structured finance investments usually involves a two-way flow of information. Investors inform originators and investment banks of their investment needs/mandate. At the same time, investors receive regular visits from investment banks marketing new structures. Some investors were wary that the selection of names in the asset pool might sometimes be driven by the hedging needs of the investment bank, rather than by investors' needs.

Secondary market-type activities hardly influence investment decisions. In fact, outside the United States and the United Kingdom, the secondary market is considered illiquid or non-existent in several market segments. Consequently, most structured finance products, at least at the more senior end of the capital structure, are bought to be held until maturity. In the United States, the secondary CDO market was also very illiquid until a few years ago, but liquidity has improved substantially.

### **Motivations**

To some extent, the motivation to invest in structured finance products is similar to that for any investment decision: the attempt to improve the risk-return profile of the investment portfolio. Against this background, the spread over corporate bonds with similar ratings was perceived as an attractive feature of structured finance products, despite recent spread narrowing. This spread is considered by some as a premium for complexity, which sophisticated investors seem to be eager to pick up. In addition, some insurance companies cited increasing competition as motivating a need to search for yield and invest in structured finance instruments. At the same time, there is the impression that the spread is not always well understood, making inappropriate risk-adjusted returns a potential problem for investors.

The diversification benefits of structured finance investments were believed to be better than for traditional credits. The reasons that were mentioned were that correlations between structured finance instruments and other investments are lower and that exposure to new markets may be obtained, which cannot be achieved with traditional investments. However, it was acknowledged that the diversification benefits are sometimes illusory, for example when there is duplication of names in structured finance products and the existing portfolio. A "look-through" tool which consolidates these name exposures was mentioned as a solution to avoid this problem.

Some investors stressed the stability of structured finance ratings, with the exception of CDOs, as one of their main attractions. The argument of liquidity is used in multiple ways, depending on the type of structure and underlying that investors concentrate on. First, there are investors who argue that liquidity is lower in structured finance and that the spread over traditional credits can be partially attributed to illiquidity. However, other investors have chosen particular structured finance products precisely for their higher liquidity, with some US investors now using (floating rate) ABCP as a substitute for cash.

Interestingly, several investors have deliberately decided not (or no longer) to invest in structured finance. The main arguments cited in this context were the risks of high leverage in mezzanine and equity tranches, complexity, and bad previous experience. To these investors, the costs incurred through the analysis of structured finance products thus appeared to outweigh the possible yield pickup. Instead, they argue that resources are spent more efficiently on analysing other asset classes. For banks, an additional argument was the high risk weighting of structured finance investments in the context of internal or regulatory capital requirements. Apparently, several investors had incurred heavy losses on CDO investments in the past. Although these problems were driven mainly by the

performance of the collateral pool, and not the structure itself, some of these investors decided to stop investing in CDOs altogether. Similar points were made regarding manufactured housing and auto loans-based ABSs and with regard to CDO pools containing these assets.

### **Transaction assessment**

Investment decisions are usually based on external ratings as well as internal credit assessments. The assessment of transactions in the primary market often starts with the rating agencies' pre-sale reports, which are thought to give a fairly objective overview of the transactions' structural features and their strengths and weaknesses. However, few respondents said that they rely solely on external ratings, but instead use them as independent second (or third) opinions. Those that do rely on ratings are typically smaller AAA investors, which do not have the capacity to develop their own models. All others have developed, or have access to, in-house credit assessment techniques, suggesting that the influence of rating agencies on investment decisions tends to be smaller for the more junior tranches.

The in-house assessment covers all relevant components of a structure, albeit to different degrees: quality of the asset pool, granularity, correlations, deal structure, legal issues, third parties involved, and sometimes macroeconomic assessments. In RMBSs, an important factor of asset quality is the average loan-to-value ratio; in a CDO, the investor will typically want to look at every single name. For static deals and for traditional ABS pools, the quality and expertise of the servicer/originator are considered critical, while for managed deals the manager and the investment mandate are deemed more important. Most investors mentioned that they look at the experience and past performance of the asset manager. Some investors also indicated that it is important to know whether the manager is invested in the structure, although there was some disagreement as to whether it is desirable for the manager to hold the equity tranche, due to the possibility of conflicts of interest. The creditworthiness of the monolines is relevant when the deal is wrapped. Importantly, several investors pointed out that they enquire into the motivations of the originator to create the structure before an investment decision is made.

As part of their assessments, some investors make use of the models that the rating agencies have made available to stress-test the assigned ratings with more conservative assumptions, for example on default correlations. Sometimes the models are also used to simulate ratings of agencies that were not involved. One investor said that they would normally contact the rating agency that did rate the deal, because the rating agency may have demanded more credit enhancement and may be able to provide valuable additional information.

The quality and availability of surveillance data during the life of a structure were generally felt to be inadequate, especially in Europe, though improving rapidly. Investors often rely on quarterly reports by the trustee and the rating agency. Sometimes these are sent to the initial investor only. A few investors also pointed out that, as a result of their fee structures, rating agencies sometimes cared less about surveillance than about initial ratings. Lack of reliable daily information has so far hampered the development of the secondary market. A few participants noted that investment banks were currently developing specialised structured finance indices, which were expected to improve secondary market liquidity.

Many investors have been in a position to modify a deal's structure while it was being put together. The possibilities to influence the structure are usually confined to large mezzanine or even equity investors. Moreover, it was felt that the possibilities to do so have diminished over recent years as a result of strong demand.

### **Risks**

Most investors seem to be fully aware that structured finance poses different and more complex risks than ordinary credit investments. Prepayment risk in MBS portfolios is generally well understood, but legal risks are regarded as being more difficult to assess. Model risk was highlighted by many respondents, in particular the risk that default correlations in non-granular asset pools (CDOs and CMBSs) are under- or overestimated. High leverage of mezzanine and equity tranches adds to this complexity and risk.

A source of concern for risk management is the lack of reliable pricing data. In addition, it is sometimes difficult to identify multiple exposures to the same names through different structures. It

was mentioned that the rapid development of the CDS market permitted synthetic CDOs to include more names, which might help to ease the problem of the inability of CDOs to provide adequate diversification. In response to greater complexity, most investors have established specialised teams for structured finance. Sometimes, they also rely on expertise in other areas of the firm, for example from the origination desk. One respondent said that they promote rotation between the investment and the origination desk.

### **Rating agencies**

Overall, investors appeared to hold the view that rating agencies are more important for structured finance than for traditional debt instruments. Interviewees cited several factors at play: the rating agencies' role in modelling the risks of complex structured finance instruments; their key role in deal structuring; and a clear information advantage, in particular over less sophisticated investors. An important reason for the reliance on ratings seems to be that many client mandates and internal investment guidelines prescribe minimum rating levels. When asked, several asset managers acknowledged that they were aware of the different riskiness of structured finance and corporate finance products with identical ratings. The difference was seen as being especially acute in mezzanine and equity tranches, which are more leveraged and thus riskier than bonds with similar ratings. One investor said he had explicitly asked the rating agencies why the spread on a CDO over a bond with a similar rating was so high, but was not entirely satisfied with the responses.

In general, investors appear to be satisfied with the services provided by the rating agencies. While sophisticated investors claim to have better models, the transparency of rating agencies is highly appreciated and their ability to improve models is seen as impressive. Conflicts of interest are seen to be less of a concern now than they used to be in the past. However, there is less confidence in the agencies' ability to adequately rate granular CDO structures; some investors have argued that the models of the rating agencies are too crude and do not capture default correlation very well. Other concerns included the rather high turnover of staff at rating agencies, the perceived inability to attract the best people (who would rather work for investment banks), and also the fact that structured finance analysts do not seem to communicate all that well with "traditional" analysts.

Investors find comfort in identical ratings by more than one rating agency. Yet, there is more information if agencies have different opinions. Several investors felt that the similarity in ratings was remarkable, given differences in methodology, ie expected loss versus probability of default, and different assumptions regarding recovery rates and default correlations.

### **Market assessment**

All in all, the market for structured finance has met or exceeded investors' expectations, possibly with the exception of CDOs. Most classes have generated high returns on investments. Also, abstracting from certain CDO types and particular ABS pools, the stability of ratings has pleasantly surprised investors, especially during the turbulent market circumstances in recent years. The issued volume has increased substantially and the investor base has widened. Looking forward, many investors intend to maintain or increase their exposure. A necessary condition for increasing exposure, however, is that supply, in particular opportunities for diversification, can keep up with demand.

### Appendix 3: Summary of group interviews in London

From 12 to 14 May 2004, members of the Working Group on the Role of Ratings in Structured Finance met with a number of structured finance practitioners in London.<sup>44</sup> The programme included visits to Moody's, S&P and Fitch as well as meetings with a number of originating banks, a monoline and a trustee.

#### The economics of structured finance

Rationales for market players' participation in SF markets have evolved over time and by type of market (cash or synthetic). Initially, funding and economic/regulatory capital management were the main catalysts for the market (which was largely cash). Funding was identified as an early driver of the market, with ABSs, ie collateralised lending, regarded as a cost-efficient means to obtain funds and diversify funding sources (eg ability to tap different investor types, such as financial institutions, corporates, and dedicated ABS/MBS investors). In the early 1990s, BBB tranches of credit card ABSs were bought by a small number of banks (eg private). Originators then decided to begin marketing them more broadly. Insurance companies began buying them because they were straightforward to analyse and liquidity was not very important. Now, the BBB market is much more liquid. The European market, however, is still much less commoditised and developed than the US market.

In terms of investor communities, insurance companies were identified mainly as mezzanine investors in granular asset pools, such as credit card receivables, with current spreads on the highly rated, liquid tranches presumably not sufficient to attract their attention. In addition, however, they appear to also invest in mezzanine tranches of CDOs, for example in the context of so-called "combo notes", as described below.

Whereas funding and capital management were early drivers of SF markets, spread arbitrage became a driver for the CDO part of the market, which was then still a cash market. The arbitrage occurring via these early CDOs was using the fact that observed spreads are high relative to historical default rates for any given rating level, and development of this segment of the market was also facilitated by participants' increasing comfort with securitisation technology.

Although cash CDOs were initially used, inefficiencies with respect to these instruments, together with the development of CDS markets, contributed to the appearance of synthetic CDOs. (Other reasons, particularly in the European market, were limited funding needs on the part of banks and the limited availability of corporate debt securities.) Drivers of these instruments have moved beyond the narrow spread arbitrage motivation to include correlation-driven trades. The ability to invest in levered instruments has drawn into these markets some investors (such as hedge funds) who do not participate in cash markets and also do not need ratings. Thus, the synthetic and cash markets have become somewhat segmented. A recent development in synthetic structures has been a movement towards use of "combo notes", designed to help arrangers to market equity tranches. In such a structure, the equity piece is combined with a AAA tranche, with the repackaged deal rated mezzanine. Insurers were cited by one interviewee as being among the investors purchasing these notes.

Recent spread compression has made rating arbitrage in CDO markets more difficult. Partially reflecting this shift and also due to earlier underperformance, CDOs are now more of an investor-driven market, with investors trying to maximise the spread that can be earned for any desired rating level. Market participants, therefore, have become more willing to assume exposure to complexity/model risk, but also appear to take it for granted that there are certain inefficiencies that can be exploited by use of securitisation technology/repackaging of assets.

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<sup>44</sup> The group included: Janet Mitchell (National Bank of Belgium), Isabel von Koeppen (ECB), John Kiff (Bank of Canada), Colin Miles (Bank of England), and Allen Frankel and Ingo Fender (BIS). In addition, Peter Praet (National Bank of Belgium), the Working Group Chairman, joined in for some of the interviews.

Other developments leading to more investor-driven markets have included incentive problems arising with managed CDOs. Single-tranche CDOs, now the most important part of the synthetic CDO market (274 out of 356 (ie 77%) S&P-rated European synthetic CDOs in 2003 have been single-tranche), are one of the main outcomes of this tendency. One of their principal advantages is the active involvement of only one investor, which helps to limit the conflicts of interest between managers and debt holders experienced in earlier deals. As investors are now generally very active in terms of portfolio selection, there is less scope for adverse selection. Single-tranche structures tend to be static or “lightly” managed, either by the investor himself or by a third-party manager (ie the manager can replace only one or two downgraded credits in a given year, typically at the request of the investor). With the single-tranche located in the mezzanine region, the originator will (at least implicitly) hold the equity and senior tranches, which will serve as an additional check on incentives. Another advantage of single-tranche synthetic CDOs is the very short ramp-up period. While a European CLS deal will take some six to nine months to be ramped up, a single-tranche CDO can be done within hours or days, essentially making it resemble an OTC derivative contract. As a result, the market now has a two-tiered structure, with professional correlation trades done in the largely unrated interbank market, while the customer segment has remained rated. (While CDOs in general are largely a two-ratings market, single-tranche deals reportedly tend to have only one rating.)

Overall, interviewees regarded structured finance as part of a broader disintermediation development in the banking system, ie a non-bank way to intermediate corporate (and other) credit.

### ***Reliance on and added value of structured finance ratings***

An issue that received particular attention in the interview process was reasons for the market's continued reliance on ratings. As markets have become more investor-driven and with investors becoming increasingly sophisticated, demand for ratings might have been expected to decline. However, SF rating activity has remained strong, and even the single-tranche market, at least outside the inter-dealer segment, continues to be a rated market. Part of this was explained by “mechanical” demand factors, with ratings being required because of investment mandates or internal risk and capital management systems. Yet, the value - to investors and originators alike - of an independent assessment was emphasised by virtually all interviewees. According to one interviewee, even “Gaussian copula” (ie those who have a grasp of correlation modelling) investors need ratings. Originators appear to value ratings, and the third-party evaluation of their own models embodied in them, primarily for reputation risk management purposes.

Finally, structural features, particularly in some transactions in the RMBS segment, have become increasingly complex, adding to the burden imposed by cash flow modelling. Two interviewees explicitly mentioned the “trade-off” between the costs of detailed cash flow analysis and the yield pickup for certain SF investments; current low spreads may limit investors' willingness to devote significant resources to due diligence efforts, particularly for higher-rated tranches, and may thus contribute to an increased reliance on ratings.

The agencies' capacity to deliver this analysis, as well as the knowledge accumulated with respect to the legal viability of SF structures and the loss history for underlying credits across asset classes and jurisdictions, seems to be an important aspect of the “value added” by the agencies. A number of interviewees noted that the value of the rating agencies' ability to “look across” asset categories and countries seems to apply particularly for the European market, where differences across jurisdictions and the limited availability of historical loss/performance data put extra value on the fact that the ratings agencies “get to see every deal” (a phrase used by several interviewees), even many private ones and those that do end up not being marketed. This, in turn, allows them to aggregate and assess relevant information more completely than other market participants and to evaluate SF deals with more confidence than most of the arrangers.

Another source of value in ratings cited by two interviewees is the rating agencies' surveillance of transactions, since (according to one of the interviewees) financial institutions often have short “memories”. It may be interesting to note in this context that no users suggested that the agencies did not monitor credits closely after issue. One rating agency cited its efforts to develop surveillance tools that can be used as early warning devices and noted the need to communicate this type of activity to the marketplace. A final source of value of the rating agencies noted by some interviewees was that they have usually been quick to adapt to market developments and set up viable frameworks in the first place, thereby putting a “standard” out into the market.

There was a general perception on the part of all interviewees that the investor community has overall become “more expert” over time and that the increasing importance of mark to market, relative to buy and hold, investors has further reduced the degree of investors’ reliance on ratings. Several interviewees noted, for example, that investors no longer treat all AAAs equally. For most investors, therefore, ratings are now one check in a broader due diligence and risk management process. Also, many investors now need to understand, among other things, the mark to market sensitivity of SF instruments, which is something that ratings cannot deliver. As a result, mark to market investors, particularly those who invest in mezzanine tranches, will tend to do their own due diligence - and have the necessary capabilities - while senior and buy and hold investors may rely more closely on ratings (although one interviewee noted that some AAA investors undertake just as much due diligence as mezzanine investors). Similarly, investors in cash flow deals, which tend to have more complex structural features, were deemed to rely more on ratings than do investors in synthetic products, at least those which are more prevalent in professional inter-dealer markets. (Real money was seen as the marginal driver of the cash, but not the synthetic, market; also, given the limited overlap in names, only weak feedback effects were sensed in the pricing across segments.)

Despite the growing sophistication of investors and the growing ability of investors and arrangers to estimate portfolio credit risk with the agencies’ own models, it was stressed by several interviewees that all categories of investors need ratings, although perhaps to differing degrees. One example provided by an interviewee was that the AAA investor is buying structure and the BBB investor is buying the manager. Each needs ratings, but for different reasons.

### ***Structured finance ratings/rating process***

According to the rating agencies, the organisation of the rating process for traditional and structured finance products, as well as across structured finance products, is essentially the same. For all of these products, rating decisions are made by a credit committee on the basis of an assessment of the relevant instrument’s documentation. The Committee’s opinions may then feed back into the rating process, for example in the form of changes/haircuts applied to standard assumptions. Complexity, however, was generally seen to be higher for structured finance instruments - more comparable to project finance and leveraged finance than to traditional corporate or sovereign bond ratings.

As a result, although, according to one of the rating agencies, structured finance does not seem to involve more analysis than do corporate ratings, a larger proportion of SF analysis is devoted to assessing structural features, ie the “moving parts” of SF deals. In this regard, one of the key features of SF ratings is that the controlled environment “defined” by the deal’s documentation lends itself more readily to a model-based rating approach, allowing for a rather clean, analytical separation of the relevant risks.

In rating SF deals, all three major agencies follow a two-step process, which applies equally to CDOs as well as traditional ABSs. First, analytical models are used to assess pool credit risk (analytical tools used for analysing CDO and ABS pools will differ, with the latter relying on so-called “actuarial approaches”), followed by a detailed structural analysis as the second step. The latter will crucially depend on deal specifics, as laid out in the transaction’s documentation, and includes detailed cash flow modelling based on the results of the credit risk analysis, legal assessments and evaluations of collateral asset managers and other third parties involved in the deal. (It was noted that better IT and use of credit register information now may make it possible to look at cash flows on individual credits in ABS collateral.) The results of this analysis, in turn, may feed back into the credit model in the form of haircuts applied to some of the model assumptions, eg PD adjustment in response to details regarding default event definition. The specifics of many of these “stresses”, however, appear to remain rather arbitrary and based on ad hoc assumptions (although one rating agency cited statistical analysis as motivating some of the assumptions); however, the assumptions are generally considered by market participants to be conservative.

As the rating agencies’ approaches are now well documented, and with their core rating “engines” publicly available, originators tend to approach them with fairly well developed structures, designed on the basis of the agencies’ analytical models and desired tranche ratings. While the agencies insist on not providing formal advice on how to structure a deal, they will still engage in an iterative process regarding the credit enhancement level needed to achieve desired tranche ratings. CDO structuring, in particular, was seen as an interactive process - much more now than in the past, given increased investor influence. (In fact, it was mentioned by one interviewee that investors have been the driving force between recent structuring changes, with CCC discounts mentioned as an example.) The

decisive shift in the market occurred in 2001-02, when, in response to underperformance in particular segments, investors started to choose the assets to be included in the collateral pool.

Fee schedules set out in the rating agencies' engagement letters are fairly standardised, with the originator charged once the rating is issued. Should no rating be assigned, which does seem to happen at least occasionally, a break-up fee will be charged to cover the costs the rating agency has already incurred - though not under an "hours worked" formula.

Ratings are reviewed on a regular basis, either monthly or quarterly, depending on the availability of trustee/asset manager reports, which are the main input into the rating agencies' review process. The transaction performance data from the reports are rerun through the agencies' models, with the underlying deals thus being at least partially "rerated". As a result, the surveillance frequency for structured finance ratings may be somewhat higher than for US corporate bonds, given the latter's partial reliance on quarterly financial reporting. (Two interviewees mentioned that services provided by the trustees had improved over time, with trustee reports now being sent on a more timely basis and being more reliable.) While the rating agencies used to assume that the trustees are contractually liable to actively enforce contracts, they have recently changed their assessment and now see the trustee as having a more limited role. As a result, at least one of the agencies will now do additional analysis on its deals that goes beyond the services provided by the trustees, ie independent checks of contractual triggers. However, it was also noted by one rating agency that it does not want to take over the role of the trustee.<sup>45</sup>

### ***CDO ratings/rating methodology***

In the area of CDO ratings, it was confirmed that the treatment of default correlation remains the main focus of the rating agencies' efforts to improve their methodologies, although more emphasis is also being put on systematic variation in recovery rates. Moody's, for example, has just moved to a new methodology for rating static synthetic CDOs, joining Fitch and S&P in applying Monte Carlo simulations to estimate the pool's loss distribution. As a result, all three agencies are now using explicit (asset) correlation assumptions.

A key difference, however, remains in the basis of assumed asset correlations. While S&P's assumptions are based on historically observed default correlations, with asset correlation then calibrated to default correlation observed over the cycle, Moody's and Fitch use assumptions based on equity return correlations. (According to one agency, adjustments might be made to correlation assumptions depending on pool specifics, eg in the case of country or industry concentrations that are deemed too high.) In terms of correlation among recovery rates, assumed recoveries remain essentially static, although the new Moody's methodology appears to introduce some degree of correlation as part of its modelling of recoveries. Otherwise, stresses are applied to deal with systematic recovery rate variation, with stress and correlation assumptions apparently seen as addressing the same phenomenon (ie presumably extreme, correlation assumptions and stress tests are part and parcel of the same "tail risk" analysis).

S&P and Fitch both explicitly account for historical performance of asset managers when assessing managed deals, although only Fitch assigns asset manager ratings. Both agencies claim to actually refuse to rate a given deal if the "quality" of the asset manager is deemed insufficient. The agencies confirmed that asset managers have in the past "played" structures to prevent downgrades (eg through inclusion of discounted assets, with additional constraints being introduced in return). However, one interpretation offered was that by engaging in this behaviour, managers had hoped to "gain time" under the assumption that the macroeconomic situation would improve quickly enough to avoid defaults in the underlying portfolio. There appeared to be no significant perception among the interviewees of a bias in CDO managers' incentives that would provide an institutional explanation for the higher proportion of downgrades (relative to upgrades) observed for CDOs than for ABSs. One interviewee did note, however, that managerial quality is critical in the CDO market, and that one observes very few "first-time" managers in this market.

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<sup>45</sup> The Group's interviews also highlighted an important difference between the roles performed by trustees under UK and US law. In the United States, the trustee will also serve as paying agent and listing agent and will perform portfolio monitoring services. Not so in the United Kingdom.



One feature of rating agencies' CDO (and more generally SF) methodologies that was noted by several interviewees is the constant evolution of the models. The agencies' continuing model development is motivated both by ongoing advances in portfolio credit modelling in general and by the need to keep up with the evolution of models used by arrangers. In addition, as SF products have evolved, so have the models necessary to analyse them. For example, "correlation-intensive" SF transactions have motivated a reassessment of the ways in which correlations are being modelled. In earlier structures, which had thick tranches, performance was less sensitive to correlation than in current structures.

Challenges perceived by the rating agencies in the CDO market include keeping up with developments in credit risk modelling and with the fast growth and innovation in the market (including keeping up with flow of business, and keeping good staff). One arranger noted a weakness for the entire synthetic CDO market as being the fact that there is much reliance (on the part of all market participants) on models that have not yet been tested. (Small changes in model parameter values and assumptions can lead to large changes in prices.)

### ***ABS ratings/rating methodology***

The rating agencies claim that, conceptually, their rating methodologies for ABSs are not substantially different from their CDO rating methodologies. Given the more granular nature of the underlying collateral pool, they say that correlation and modelling of the higher moments of the loss/default rate distribution are seen as less of an issue. Another difference is the apparently more active use of "stresses", which play the same role as some of the model-determined features in CDO analysis - while being arguably more arbitrary in aggregating a lot of information. Analysis of pool credit risk, contrary to CDOs, is based on an "actuarial approach", using historical data on a pool basis obtained from originators. Given this approach, rating "new" asset classes and industries can be a challenge, as historical data may be unavailable or hard to come by. In this regard, it was highlighted that European data (seasoning, prepayments) are much harder to obtain than data for the United States, possibly putting a premium on the data and expertise accumulated by the rating agencies.

In response, the rating agencies tend to initially apply very conservative standards when rating "new" ABSs, essentially leading to excess overcollateralisation. Over time, however, pressure will build up from the arrangers and investors to adjust credit enhancement levels. It was remarked that RMBS markets in a number of countries are likely to experience significant downturns in the future. Although it was acknowledged by some interviewees that a large downturn could lead to some downgrades in RMBS transactions, most interviewees deemed the ratings conservatism to have been sufficient to cushion any large-scale deterioration in fundamentals in European RMBSs, at least for investment grade tranches.

Interviewees pointed to various examples of disagreement among the rating agencies in their assessment of structural specifics and/or particular asset classes and jurisdictions. As a result, particular agencies are known by the market to be (or to have been) more/less conservative with regard to particular structural features than others, given the jurisdiction of the deal. Italian RMBS markets and different views on priority of payment provisions in an environment with long foreclosure periods were mentioned as an example. Similar differences in views appear to have occurred in other European MBS markets. In this context, it may be worth emphasising the importance attached by the agencies to legal risks in their rating assessment.

As many ABS deals tend to have relatively complex structural features, more so than most CDOs (now that the synthetic market dominates and CDO deals have become somewhat more standardised), cash flow modelling is a very, if not the most, important part of the ABS rating process (at least in jurisdictions where sufficient historical data have been accumulated to estimate loss distributions). Some RMBS deals, in particular, appear to have become increasingly "complex" over recent years, with the number of classes increasing and additional structural features being added. The need to improve cash flow modelling was thus mentioned as one of the main challenges going forward. (It was noted in this context that, as RMBS and ABS transactions offer only a small yield pickup, investors may not be able to afford modelling deal waterfall themselves and do thus rely to a large extent on the rating agencies.)

Other challenges mentioned in the context of ABS rating methodology, in addition to data availability and cash flow modelling, were the need to monitor underwriting standards (in RMBS/ABS transactions, underwriting standards are the equivalent of the initial portfolio selection in CDOs; in revolving transactions, use is made of covenants, which try to ensure that the original portfolio quality

is maintained) as well as servicer risk. Given their importance in the ABS market, the attention paid to ABS servicers is comparable to the importance of asset manager quality in rating CDOs. Attention to servicers is particularly pronounced in the European market, given the lack of experience in Europe regarding servicer transfer and the relative absence of a market for third-party servicing (the servicer will tend to also be the originator, leading to concentration in the European servicing market). Deals, therefore, need to have added liquidity in the structure to enable such a switch to take place. Servicer performance was also suggested as having been one of the reasons for the downgrades affecting Conseco/Green Tree Manufactured Housing (MH) securitisations. However, although there was a servicing aspect to the downgrades (the contracts made provision for replacement servicer fees to be given seniority over payments to note holders), Moody's documentation suggests that the deterioration of the performance of the underlying pools was the fundamental reason for the rating downgrades. (However, assessments seem to have differed somewhat among rating agencies.)

Final challenges cited by the rating agencies in the ABS market include mobilising the resources necessary to analyse new transactions arising in countries in which no ABS market has previously existed, monitoring the steadily increasing number of outstanding transactions in established markets, and the difficulty of obtaining the performance data.

### ***Monolines/reputation risk***

Circularity issues with regard to monoline involvement in CDO markets were downplayed by both the rating agencies and monoline staff. There was agreement that a downgrade from AAA would affect the monoline's business going forward, but that any impact on the CDO market would probably be limited, given that super-senior wraps are now less important than they used to be. (CDOs accounted for some 14% of MBIA's net par outstanding at end-2003; however, one rating agency noted that well below 10% of European SF deals last year had a monoline guarantee). Also, financial guarantees were not necessarily seen as strictly a AAA business, with CDO markets (and SF markets in general) likely to be able to function without (or with lower-rated) monoline involvement - though presumably with lower ratings for a given spread. (The rating agencies regarded monoline wraps as just one of several potentially equivalent forms of credit enhancement and claim to be neutral as to which was chosen by the arranger.) Finally, as monolines are just stepping in for the issuer in case of inability to pay interest or principal, not all payments on a wrapped deal would have to be made at once, containing any liquidity issues arising for the monoline.

Importantly, once agreed triggers are breached, monolines have additional control rights, which may allow them to substitute the manager or servicer, restrict trading or approve trades on a trade by trade basis to make sure that actual default does not occur. As a result, deals will tend to see some ratings transition, but will not necessarily default. (In fact, realised monoline losses are far lower than what is indicated by the average rating of the insured portfolio.) In this context, interviewees mentioned enhanced monitoring incentives for the monolines, which will tend to do their own due diligence of third parties, such as managers and servicers, and engage in a thorough ongoing analysis of wrapped deals. Monolines thus tend to add an additional layer of third-party surveillance for the deals they are involved in - in addition to what is provided by the rating agencies. This will tend to add value for mezzanine investors, particularly for somewhat more exotic SF deals (eg non-prime asset classes). However, while monolines think they have more control over the response to a trigger event than other creditors, they are careful not to become fiduciaries, ie owing any kind of obligation to other creditors.

All three rating agencies pointed to the very close surveillance that applies to the monolines, with each deal rated on a separate, deal by deal basis and incremental capital charges applied accordingly. In this context, it was noted that these incremental capital charges, not regulatory capital requirements, tend to be the constraining factor for the monolines' business. The approach used for rating monolines, therefore, was described as a very conservative one, guaranteeing high and stable ratings despite the monolines' high leverage. Capital charges are exponential in the rating level in order for the monolines to be able to absorb rating migration. Also, capital charges can be relatively high for particular business sectors, and the rating agencies may differ significantly in their assessments of particular deals, due, for example, to country rating ceilings that depend on a country's sovereign debt rating. Capital relief can be obtained via reinsurance, with the degree of the relief depending on the credit rating of the reinsurer. Overall, circularity issues in rating monolines (which also extend to reinsurers, given the potential impact of a reinsurance downgrade on monoline portfolios) were seen by the rating agencies as no different from, for example, rating sovereigns, implying that the agencies' problem with regard to managing potential conflicts of interest is not a new one. Similarly, rating agency staff did not feel that the agencies' increased involvement in SF markets in general had

changed their approach to reputation risk or made reputational capital more difficult to manage than it used to be.

### ***Investor issues***

Most interviewees agreed that, despite the more “expert” nature of the investor community now than in the past, investor education remained an important issue. This was seen to apply in particular to the sensitivity of ratings to specific model assumptions and the fact that, although calibrated to the same EL/PD levels, structured finance ratings should not necessarily be expected to show the same transition behaviour as corporate bond rating. (although at least one agency seems to aim for and expect to eventually achieve the same transitions in the aggregate). Investors, therefore, need to realise that ratings do not provide information on transition/spread risk.

Also, given the current interest rate environment, it was acknowledged in some of the interviews that less sophisticated investors may have been lured into the market by relatively high yields. To the extent that some investors may have come to expect price as well as ratings stability, they may eventually misjudge the relatively large effects small changes to credit spreads may have on a mark to market basis - although the relevance of this would depend on whether investors actually mark to market or might otherwise be forced to sell their holdings once a certain rating threshold has been crossed. In this connection, accounting changes were mentioned by one interviewee as a big risk to market development going forward, should they force investors to more frequently recognise variations in value.

## Appendix 4: Alternative CDO rating methodologies<sup>46</sup>

This appendix provides a short overview of two different quantitative approaches to assessing the credit risk in CDOs, the so-called *binomial expansion technique (BET)* and a variant of an alternative methodology based on *Monte Carlo (MC) simulation*, similar to those now used by the major rating agencies. In order to illustrate the concept of model risk in CDO ratings, both methodologies are then applied to the senior tranche of a simple, hypothetical CDO pool.

### Binomial expansion

One early quantitative methodology used to assess and rate CDOs is Moody's primary approach for generating expected loss (EL) estimates for CDO tranches - the BET model. The BET was introduced in 1996 and, along with a number of other methodologies, continues to be used in CDO analysis.<sup>47</sup> The method employs a simple diversification measure, the "diversity score" (DS), which is used to map the underlying CDO portfolio into a hypothetical portfolio of homogeneous assets. That is, for the purpose of calculating expected loss distributions, the actual, correlated CDO portfolio is replaced with a hypothetical portfolio of homogeneous, uncorrelated securities with identical default probabilities (assumed to equal the weighted average probability of default of the original pool) and equal par values. The BET approach, therefore, uses the observation that credit loss distributions of such portfolios of uncorrelated assets will best be approximated by the binomial distribution.

As the number of assets in the hypothetical pool is assumed to equal the diversity score, the behaviour of the asset pool can then be described by DS+1 default scenarios (ie with default occurring for 0 assets, 1 asset, ... DS assets), where the probability of each scenario is calculated using the binomial formula.

When applying its BET method, Moody's first calculates the diversity score for the underlying collateral portfolio of the CDO that is to be rated. For this purpose, all credits in the pool are grouped by obligors/issuers and are allocated to the appropriate industry sector. Diversity scores are then grouped by industry and added up to arrive at the diversity score for the total collateral pool. Currently, two methodologies exist to calculate industry-level DSs, the newer of which relying on explicit default correlation assumptions within and across obligors in each of the industries. Once the DS for a given portfolio has been established and with the cash flows (and losses) under each of the DS+1 default scenarios worked out, these and the default probabilities from the binomial distribution are then turned into estimates of the portfolio loss distribution. Expected losses for each of the CDO's tranches can then be calculated and, taking the structural specifics of the respective CDO into account, ratings will be assigned on this basis.<sup>48</sup>

### Monte Carlo simulation

An alternative methodology, widely, but not universally, employed to rate CDOs, applies Monte Carlo simulation techniques to estimate the default properties of the underlying CDO asset pool on the basis of repeated trials of random defaults with an assumed correlation structure. The model's main inputs are asset-level probabilities of default and pairwise asset value correlations, which are turned into an estimate of the entire collateral pool's loss distribution.

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<sup>46</sup> This appendix draws on Fender and Kiff (2004).

<sup>47</sup> In May 2004, Moody's introduced a new Monte Carlo simulation-based methodology, CDOROM, to assess expected losses of static synthetic CDO tranches. The BET and its modifications, however, remain in use for cash CDOs and managed structures. See Debuysscher and Szego (2003) for more information on which of Moody's various approaches is going to be applied and under what conditions.

<sup>48</sup> See Cifuentes and O'Connor (1996).

For this purpose, default events are simulated within a simplified Merton-type "structural" credit risk model, where default occurs whenever the value of an obligor's assets falls below that of its liabilities. Individual marginal asset value distributions are combined with a so-called "copula function" - a set of assumptions describing the dependence relationship between individual asset values - to produce a joint asset value distribution of the portfolio.<sup>49</sup>

To facilitate implementation, it is conventionally assumed that the log of the proportional change in the value of the underlying assets in the CDO pool is normally distributed, so that the normalised distance to default can be inferred from asset-level probabilities of default (PDs) associated with the underlying obligations' credit ratings. Each simulation run involves drawing a correlated random variable for each obligor in the portfolio, which is taken to represent the standardised range in the obligor's asset value over the appropriate horizon. For this purpose, MC trials are used to generate a vector of N uncorrelated standard normally distributed random variables, which is then transformed into a vector of N correlated random variables by multiplying the Cholesky decomposition of the N\*N asset correlation matrix. The vector of correlated asset value changes is then matched with the corresponding vector of default thresholds to determine which of the assets in the portfolio will default over the assumed horizon. Once a default is indicated, an appropriate loss-given-default assumption will be used to calculate realised losses. For each simulation run, default losses are then accumulated for the N assets in the pool to arrive at a total loss, and the simulation process is repeated as many times as appropriate to generate an estimate of the entire pool's loss/default rate distribution. This distribution, finally, is used to determine the required subordination level (ie level of credit enhancement) for each CDO tranche, given desired tranche ratings.<sup>50</sup>

### **An illustration of model risk in CDO ratings**

Model risk relates to potential errors made in modelling and pricing the exposures arising from financial transactions. In the context of rating structured finance instruments, model risk has two principal components. The first is related to the quantitative models (and assumptions) the rating agencies use to estimate portfolio credit risk. The second relates to the arranger's proprietary structuring techniques and other determinants of "deal structure".

Table A1 illustrates the concept of model risk on the basis of EL estimates for the most senior tranche of a hypothetical, ultra-homogeneous, single-period CDO pool. The focus of the example presented in the table is on the first component of model risk, ie quantitative modelling, and on how differences in correlation assumptions, in particular, can affect tranche ratings and valuations. Overall portfolio size is assumed to be \$600 million, with 60 individual holdings of \$10 million each equally distributed across 10 industry sectors. Holdings are assumed to have an identical rating of "BB-" on the S&P/Fitch scale, and estimates of tranche EL are based on the two alternative methodologies described above.<sup>51</sup> Due to tranching, the subordination level determines the amount of loss protection provided to the senior CDO note holders. Therefore, a protection level of \$25 million (4.2% of pool notional) implies that the first \$25 million of losses will be borne by the subordinated note holders, while the remaining \$575 million of the pool is being held in the senior tranche. Estimates are shown for three different subordination levels and different sets of correlation assumptions.

Importantly, the reported estimates highlight the importance of assumed default correlation for EL results based on both, the BET and MC methods. For example, when intra- and inter-sector default correlation are set to 7.56% and 4.29% (ie for assumed asset correlations at 30% intra- and 20% inter-sector), the BET-induced EL will be 0.229%, about 5.5 times higher than the EL for an inter-sector correlation assumption of zero (ie 0.042%) and more than 11 times higher than the EL for a collateral

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<sup>49</sup> See Bund et al (2003) and Standard & Poor's (2002) for descriptions of their respective methodologies.

<sup>50</sup> See Morokoff (2003) and Kiff (2004) for details.

<sup>51</sup> The single-period assumption obviates the need to consider various default timing scenarios. Calculations also assume zero coupon and discount rates. Recovery rates are assumed fixed at 30%. It should be noted that the analysis in Table A1 abstracts from any stress factors that might be applied to EL estimates before ratings are assigned (as is done by Moody's under the BET), from differences in recovery rate assumptions or from other features of the rating process that might affect the ultimate rating. It also ignores the fact that S&P and Fitch assign their ratings based on PD, not EL. The results documented in the table should thus be taken as indicative and do not suggest that actual ratings will follow the patterns indicated.

pool with completely uncorrelated assets (ie 0.02%). Similar results emerge for MC-based EL estimates.

Table A1  
**Expected loss estimates: hypothetical \$600 million asset pool**

Sector default (asset) correlation		Subordination level	Expected loss on senior tranche		
Intra	Inter		BET	MC	MC/BET
0% (0%)	0% (0%)	\$0	1.546%	1.546%	1.00
		\$25	0.020%	0.020%	1.00
		\$50	0.000%	0.000%	–
7.56% (30%)	0% (0%)	\$0	1.546%	1.546%	1.00
		\$25	0.042%	0.053%	1.26
		\$50	0.000%	0.000%	2.85
2.96% (15%)	0.48% (3%)	\$0	1.546%	1.546%	1.00
		\$25	0.042%	0.057%	1.36
		\$50	0.000%	0.001%	8.80
20% (55%)	0% (0%)	\$0	1.546%	1.546%	1.00
		\$25	0.093%	0.118%	1.28
		\$50	0.002%	0.004%	2.51
7.56% (30%)	4.29% (20%)	\$0	1.546%	1.546%	1.00
		\$25	0.229%	0.288%	1.26
		\$50	0.017%	0.068%	4.00

Source: Fender and Kiff (2004).

On this basis, Table A1 suggests that correlation effects on estimated EL can be rather large, implying that incorrect assumptions about default correlation can cause the rating agencies to meaningfully underestimate the risk of the collateral pool or any given CDO tranche. In addition, as default correlation is time-varying, any static correlation assumption may end up distorting tranche loss estimates. Investors, therefore, need to understand the model risk they are taking in order to demand appropriate compensation or else risk earning inappropriate risk-adjusted returns.

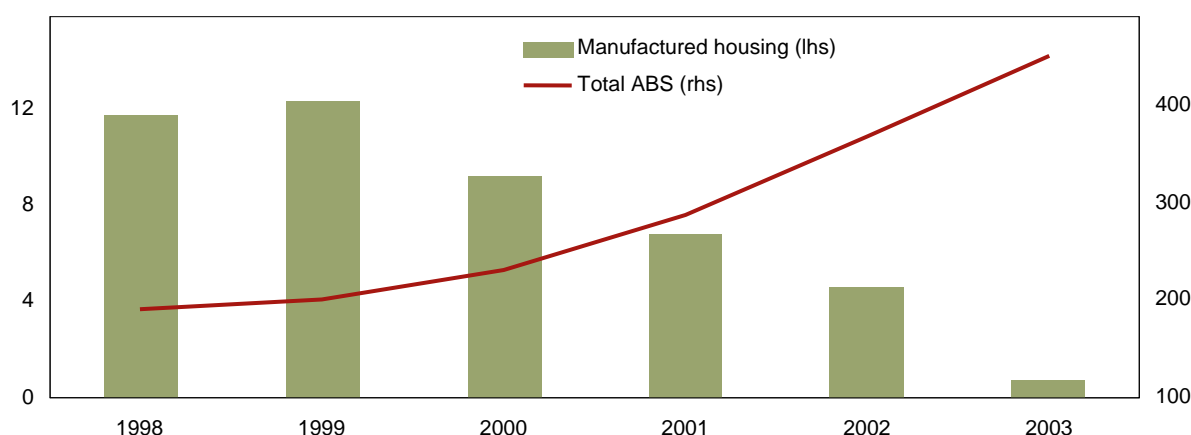
## Appendix 5: Manufactured housing ABSs: Caveat emptor? An example of the interaction of default and structural risks in ABS transactions

This appendix illustrates the possible interaction of third-party, legal and default risks and their joint impact on the robustness of structured finance transactions, using a case study documenting the performance of certain manufactured housing (MH) ABS transactions. MH ABSs are asset-backed securities collateralised by portfolios of MH-related loans. MH purchases are also financed via mortgages, but such transactions are not an element of this discussion.

Graph A1

### Manufactured housing and total ABS issuance

In billions of US dollars



Note: Total ABS data exclude CDOs.

Source: JPMorgan Chase.

MH pools and other non-traditional collateral classes became a popular ABS sector in the late 1990s. The sector emerged during a period of strong economic growth with robust performance in the consumer and real estate markets. Backed by this performance, MH securitisations became a well established funding vehicle for MH loans, and issuance volume grew steadily, from \$1 billion in 1990 to a peak at around \$12 billion in 1998, according to data from JPMorgan Chase. During this period, the market was dominated by a few large issuers, with the top five accounting for almost 80% of issuance activity, while MH lending has been geographically concentrated in the south and southeast of the United States.<sup>52</sup>

Subsequent performance of certain MH vintages, however, has been disappointing. According to S&P, 45% of US ABS downgrades in 2003 and 56% of total US ABS life-to-date defaults originate from this sector alone. Overall, the three major rating agencies downgraded some 40% of their rated MH tranches, with ratings on the same tranches by different rating agencies diverging significantly - to more than 10 notches in some cases (see below).<sup>53</sup> MH ABS volumes dropped in the process, with issuance down to less than \$1 billion in 2003 and market access by lenders limited because of higher

<sup>52</sup> See Abrahams et al (1998) and Gjaja et al (2001).

<sup>53</sup> Flanagan et al (2003) argue that the majority of the observed downgrades were due to overly aggressive underwriting in conjunction with rating agencies' underestimation of losses and structures that were not as robust as first thought.

credit enhancement levels and wider spreads demanded by ABS investors.<sup>54</sup> At least in retrospect, industry commentators have attributed this poor performance of MH pools to the interaction of two factors: slipping *underwriting standards*, ie the documentation and credit standards used to originate MH loans, and *servicer risk*.

**Underwriting standards:** In ABS transactions, underwriting standards are the equivalent of initial portfolio selection in CDOs. The rating agencies, in turn, put a particular emphasis on monitoring underwriting standards and their impact on expected portfolio losses. For this purpose, they rely on the loss history of a given (or comparable) issuer to project future losses, ie to estimate foreclosure frequency and loss severity, and aim to identify the impact of changes in underwriting policies by segregating the collateral by vintage.<sup>55</sup> Apparently, major MH originators began to adopt more aggressive lending practices starting in the mid-1990s, eg by reducing required down payments and increasing loan-to-value (LTV) ratios.<sup>56</sup>

**Servicer risk:** In a structured transaction, the servicer agrees to service and administer the assets included in the collateral pool in accordance with agreed practices. Importantly, the servicing function is regarded to be a more important determinant in controlling losses for MH portfolios than for more traditional asset pools. This is because of the lower-income nature of the pool's obligors, which puts a premium on efficient servicing and the servicer's ability to limit losses, eg by contacting delinquent borrowers quickly and by securing vacated MH units.<sup>57</sup>

**A tale of two tranches:** Ex post, the extent and consequences of the ongoing change in underwriting standards may have been slow to show up in loss projections. Similarly, servicer risk turned out to play an exceptional role in MH transactions, as servicers started to delay foreclosures and delinquencies were allowed to build, ultimately resulting in higher loss severities. In the wake of the economic downturn starting in 2000, pool deterioration became increasingly apparent, triggering downgrades of existing structures and increased credit enhancement levels for newly issued deals.

Oakwood 2000-D, an MH ABS structure issued by Oakwood Mortgage Investors Inc, is an extreme example of the MH downgrades observed in this context. The deal, issued in December 2000 with an original balance of \$208 million, consisted of 10 classes of securities with original maturities of between 12 and 30 years. The M1 class, the most senior mezzanine tranche, was rated AA by all three major rating agencies at origination. Three years later, in December 2003, the tranche had been downgraded by two rating agencies, by 11 and 13 notches, respectively. The third rating agency, while maintaining the original rating, had placed the tranche under negative credit watch. By April 2004, all three agencies had downgraded the tranche, by between 13 and 21 notches all in all, placing it firmly into sub-investment grade territory. The maximum difference between any two rating pairs, which had peaked at 13 notches, remained at an unusually high eight notches as a result.

A similar, though less extreme, example is offered by Conseco Finance 2000-6. This deal, also issued in December 2000, consisted of nine classes of securities with an overall issue amount of \$445.5 million, backed by MH loans originated and serviced by Conseco Finance. The M1 tranche, with an original issue amount of \$27 million, was rated AA by all three major rating agencies at the time of issuance. Subsequently, following continued performance deterioration of Conseco (later renamed Green Tree, following the sale of Conseco's MH business to CFN Holdings) pools and significant erosion of credit enhancement, the tranche was downgraded by between 10 and 15 notches. As a result, by March 2004, it had migrated to sub-investment grade, being rated BB-, B and CCC, respectively.

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<sup>54</sup> Nevertheless, investors in equity tranches of MH ABSs (often retained by the originators, which were in some cases affiliates of the manufacturers) appear to have borne the brunt of the problems that emerged in this sector. A comparison of the total return on Merrill Lynch's ABS indices suggests that investment grade fixed rate MH ABSs outperformed other ABS sectors for the 1990-2004 period, with the credit deterioration in the MH sector more than offset by wider initial yield spreads, on average. Accordingly, well diversified portfolios of senior MH tranches would have held their values fairly well. Because the shocks to the MH sector are regarded as having been quite extreme, this outcome could be regarded as evidence that ABS structures generally are effective at insulating senior claims from most of the underlying portfolio risk.

<sup>55</sup> See Raynes and Rutledge (2003) for a detailed description.

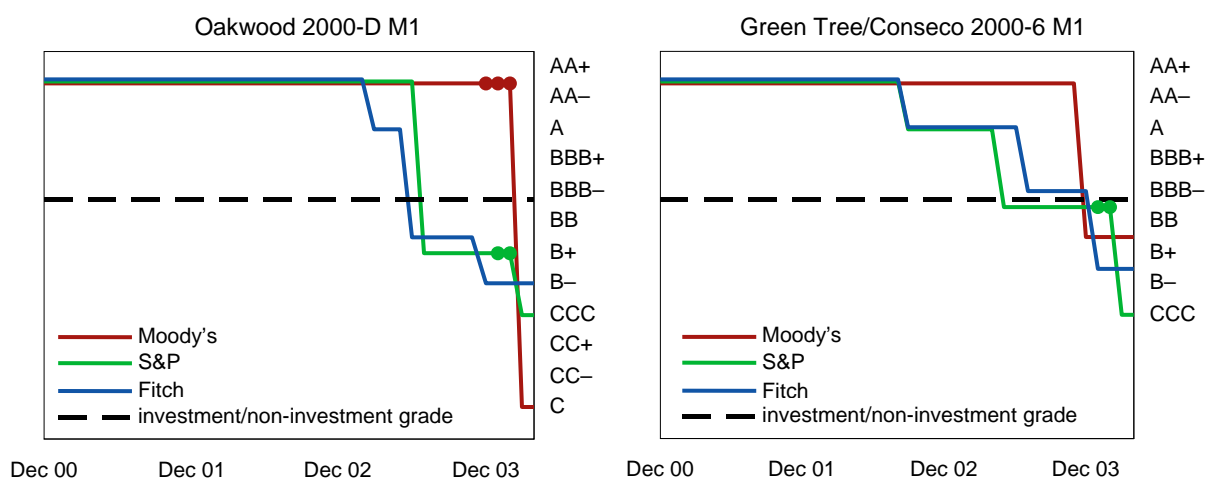
<sup>56</sup> For more detail, see Person and Reddy (2003) and Thompson and Callahan (2004).

<sup>57</sup> See, for example, Standard and Poor's (2000) for a detailed description of the rating agencies' approach towards servicer risk in MH securitisations, and Perelmuter and Binz (2004) for an analysis of observed problems for certain MH vintages.



Graph A2

**Manufactured housing ABSs: selected rating transitions**



Note: A dot indicates a "negative watch" situation.  
 Source: Bloomberg.

Interestingly, while the deterioration of the performance of the collateral pool was the fundamental reason for these downgrades, the deal was also hit by a manifestation of servicer and legal risk. Following the bankruptcy of Conseco Finance, the bankruptcy court issued an interim order amending the deal's pooling arrangements in an effort to protect Conseco's creditors. As a result, Conseco retained servicing under the MH deals affected, the servicing fee increased to 125 bp per annum (up from the original 50 bp servicing fee), and fees became senior to the allocation of cash receipts to note holders (formerly subordinated to the payment of interest and principal to each class of the certificates). This was despite the fact that the pooling agreements did not allow for a 125 bp servicing fee, with any successor servicer entitled to an additional fee of only 50 bp per annum.<sup>58</sup>

<sup>58</sup> See Wolf (2001) for pre-sale information on the Conseco deal.

## Appendix 6: Glossary of structured finance terms

asset-backed security (ABS)	a securitised interest in a pool of assets; includes (tranching) structured finance transactions as well as untranching securitisations
asset correlation	a measure of co-movement of the asset values of different firms; often proxied by equity price correlations
attachment (detachment) point	the proportion of losses in an underlying portfolio that must occur before a particular tranche starts to lose (loses its entire) value
cash CDO	a CDO whose collateral comprises cash positions in bonds, loans or other forms of debt
collateralised debt obligation (CDO)	a structured finance transaction backed by a relatively small pool of heterogeneous debt instruments, such as bonds or loans
credit default swap (CDS)	a credit derivative contract in which one counterparty pays a premium in exchange for compensation when a default event occurs
credit enhancement	any methodology that reduces the credit risk of a transaction with a counterparty
default correlation	a measure of co-movement of defaults of different credit risk exposures
excess spread	the difference between the income earned on the collateral pool of a structured finance transaction and the contracted payments to the tranching liabilities issued against the pool
first-loss tranche	the most junior tranche in a structured finance transaction; equity tranche
Gaussian copula	a statistical method linking distributions of individual credit defaults to a joint loss distribution for a portfolio containing these credits
mezzanine tranche	a tranche in the middle of a structured finance transaction's liabilities structure
monoline	specialised insurer providing bond investors with guarantees of timely payment of interest and principal, including protection on super-senior structured finance tranches
Monte Carlo simulation	repeated trails of random defaults to establish an estimate of the loss distribution of a portfolio
senior tranche	a tranche at the top of a structured finance transaction's liabilities structure
single-tranche CDO	a structured finance transaction where only one single tranche, usually at the mezzanine level, rather than the full capital structure is sold to investors
special purpose vehicle (SPV)	a finite-lived, standalone financing vehicle used to hold the assets underlying a structured finance transaction

structured finance	a form of financial intermediation involving the pooling of assets and issuance against this pool of tranching liabilities; commonly based on an SPV
super-senior (“wrapped”) tranche	a tranche at the very top of a structured finance deal’s liabilities structure, the credit risk of which is transferred to an external counterparty via a CDS contract or a financial guarantee (“wrap”).
synthetic CDO	a CDO that creates credit exposures for investors primarily through CDSs
traditional ABS transaction	a structured finance security backed by large homogeneous asset pools; this contrasts with CDOs, which are backed by smaller pools of more heterogeneous assets
tranching	issuance of several classes of securities against a pool of assets, each with distinct risk-return profiles

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