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## Credit securitization and credit derivatives: Financial instruments and the credit risk management of middle market commercial loan portfolios

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## **Credit Securitization and Credit Derivatives: Financial Instruments and the Credit Risk Management of Middle Market Commercial Loan Portfolios**

Sabine Henke / Hans-Peter Burghof / Bernd Rudolph\*

January, 1998

**Abstract:** Banks increasingly recognize the need to measure and manage the credit risk of their loans on a portfolio basis. We address the subportfolio "middle market". Due to their specific lending policy for this market segment it is an important task for banks to systematically identify regional and industrial credit concentrations and reduce the detected concentrations through diversification. In recent years, the development of markets for credit securitization and credit derivatives has provided new credit risk management tools. However, in the addressed market segment adverse selection and moral hazard problems are quite severe. A potential successful application of credit securitization and credit derivatives for managing credit risk of middle market commercial loan portfolios depends on the development of incentive-compatible structures which solve or at least mitigate the adverse selection and moral hazard problems. In this paper we identify a number of general requirements and describe two possible solution concepts.

Keywords: Credit derivatives, credit risk management, securitization

JEL classification: G21, G11

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## 1 Introduction

Banks are financial intermediaries originating loans and consequently facing credit risk. Credit risk can be defined as the risk of losses caused by the default of borrowers.<sup>1</sup> Default occurs when a borrower cannot meet his key financial obligations to pay principal and interest. Credit risk is driven by both unsystematic and systematic components. Unsystematic credit risk covers the probability of a borrower's default caused by circumstances that are essentially unique to the individual, whereas systematic credit risk can be defined as the probability of a borrower's default caused by more general economic fundamentals.

Banks increasingly recognize the need to measure and manage the credit risk of the loans they have originated not only on a loan-by-loan basis but also on a portfolio basis. This is due to the fact that only the aggregate credit exposure is the relevant factor for the future solvency of banks.<sup>2</sup> The loan portfolio of a typical bank can be divided in different subportfolios: large corporate, middle market, small business, commercial real estate, consumer, home mortgage, etc.<sup>3</sup> In this paper we address the subportfolio "middle market" which includes commercial loans to medium-sized firms.<sup>4</sup> The medium-sized business is of great importance for the German economy. 52% of the economic output and 44% of all investments are attributed to medium-sized firms. Moreover, about 60% of all employees work in medium-sized firms and 80% of all training facilities are provided by this market segment.<sup>5</sup> The reason for the focus on the middle market segment is not only its economic importance but rather the kind of credit risk banks face in this sector. Banks mainly absorb the unsystematic part of credit risk in the middle market segment because they tend to originate loans to many independent borrowers while avoiding lending large sums to a single borrower. But particularly troublesome for banks is systematic credit risk. Due to their business policy, banks frequently show credit concentrations on a regional or industrial basis in the middle market commercial loan

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<sup>1</sup> Credit risk can alternatively be defined as the risk that a borrower deteriorates in credit quality. This definition also includes the default of the borrower as the most extreme deterioration in credit quality.

<sup>2</sup> See Altman (1996), Bennett (1984), Gollinger/Morgan (1993), Kao/Kallberg (1994), Rudolph (1994), Stevenson/Fadil (1995), Credit Suisse Financial Products (1997), J.P.Morgan (1997b) and Wilson (1997a and 1997b).

<sup>3</sup> See Kealhofer (1995), pp. 27-28.

<sup>4</sup> An implication behind the separate credit risk management of the various subportfolios adjusted to their special characteristics is that the credit risk of the total portfolio can be managed by integrating the management of the subportfolios.

<sup>5</sup> See Creditreform Wirtschafts- und Konjunkturforschung (1997).

portfolio.<sup>6</sup> A sudden change in industry- or region-specific economic fundamentals may cause a confluence of defaults on loans. Concentrations of credit risk in the middle market loan portfolio can consequently result in a threat of sizable losses without necessarily any corresponding increase in prospective returns.<sup>7</sup> Hence, it is important for banks to systematically identify and measure their credit concentrations and reduce the detected concentrations through diversification.

A precondition for diversification after the origination of the loans is their transferability. But as it is wellknown transferring credit risk of loans is difficult due to severe adverse selection and moral hazard problems. That is why the use of existing tools like loan sales has not been very successful in transferring the credit risk of middle market commercial loans. However, in recent years, the development of markets for credit securitization and credit derivatives has provided new tools for managing credit risk. Like other financial innovations these products were first used in Anglo-American countries. In Germany, both credit securitization and credit derivatives are intensively discussed, but there has been little market activity so far. The bank-oriented German tradition in industrial financing produces specific obstacles in transferring credit risk to the capital market. Concerning the middle market portfolio, there are additional problems arising from special features of the lending business like the already mentioned adverse selection and moral hazard problems. In the following chapters we will discuss the latter problems.<sup>8</sup> We thereby focus on the question of whether and how German banks can set to work these financial instruments to better manage the systematic credit risk of their middle market commercial loan portfolio. Consequently, banks are viewed as end-users of credit securitization and credit derivatives. The banks' potential transaction functions and profits as a dealer in credit securitization and credit derivatives are ignored.

In the second section we start with some basic information about credit securitization and credit derivatives. Subsequently, we concentrate on the application of these new instruments

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<sup>6</sup> See Babbel (1989). Not only the middle market commercial loan portfolio of local and regional banks which tend to lend to a narrower market segment, but even the portfolios of quite large banks can be overexposed to particular regions or/and industries.

<sup>7</sup> See Bank for International Settlements (1991), p. 94.

<sup>8</sup> One main drawback of our investigation is that we do not deal with the pricing problem. Pricing risk is the precondition for an active risk management. And obviously, there will be no trade in credit risk if market participants are not able to assess its value. However, pricing based on a ceteris paribus assumption does not consider the changed incentives after a credit risk transfer. Both, the solution of the incentive problems and an general accepted pricing formula will be needed to allow an active credit risk management of middle market loans. We observe much scientific work done on credit risk pricing without taking the incentive problems into account explicitly, and we assume that concepts concerned with the incentive effects of credit risk transfer will be a needed complement to this work.

for managing the credit risk of the middle market portfolio. In section 3.1 we develop requirements for the usage of asset-backed securities and credit derivatives. Section 3.2 describes two possible designs and discusses them with regard to the requirements of section 3.1. Concluding comments are contained in the fourth section.

## **2 Credit securitization and credit derivatives - structures and incentives**

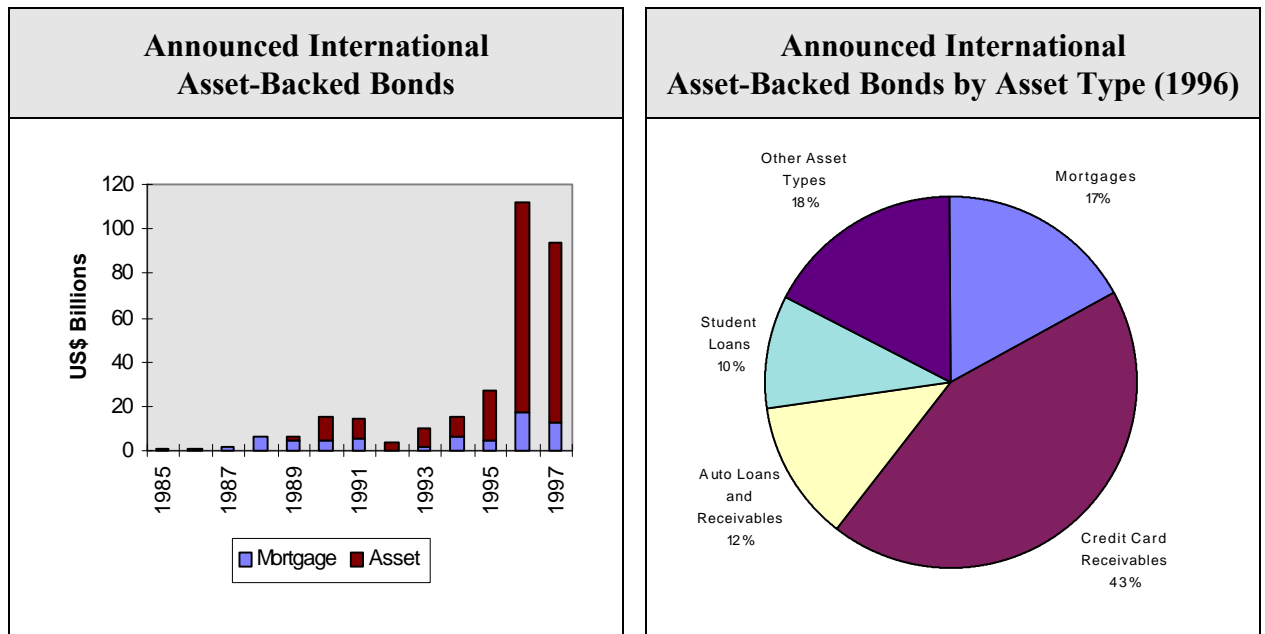
### **2.1 Credit securitization**

The term credit securitization refers to the transformation of illiquid, nonmarketed assets into liquid, marketable assets, i.e. securities.<sup>9</sup> The development of the credit securitization market started in the United States with the securitization of mortgage loans in the early 1970s, and a significant amount of the volume of credit securitization is still in mortgages. The first securitized mortgage transactions have been encouraged by the support of three U.S. Government-sponsored entities (GSEs) known as Fannie Mae, Freddie Mac, and Ginnie Mae which provide credit enhancement to investors.<sup>10</sup> Since the mid-1980s also non-mortgage assets like consumer loans, auto loans and credit card receivables have been increasingly securitized. In the last years the market for asset-backed securities (ABS) has grown explosively. This upward trend is expected to continue. The following graph gives an overview of the international ABS market.

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<sup>9</sup> See Berlin (1994), p. 433. In the following the terms credit securitization and securitization are used as synonyms.

<sup>10</sup> See Rudolph (1987), pp. 29-35, Arbeitskreis "Finanzierung" der Schmalenbach-Gesellschaft Deutsche Gesellschaft für Betriebswirtschaft e V. (1992), p. 499, and Hill (1997).

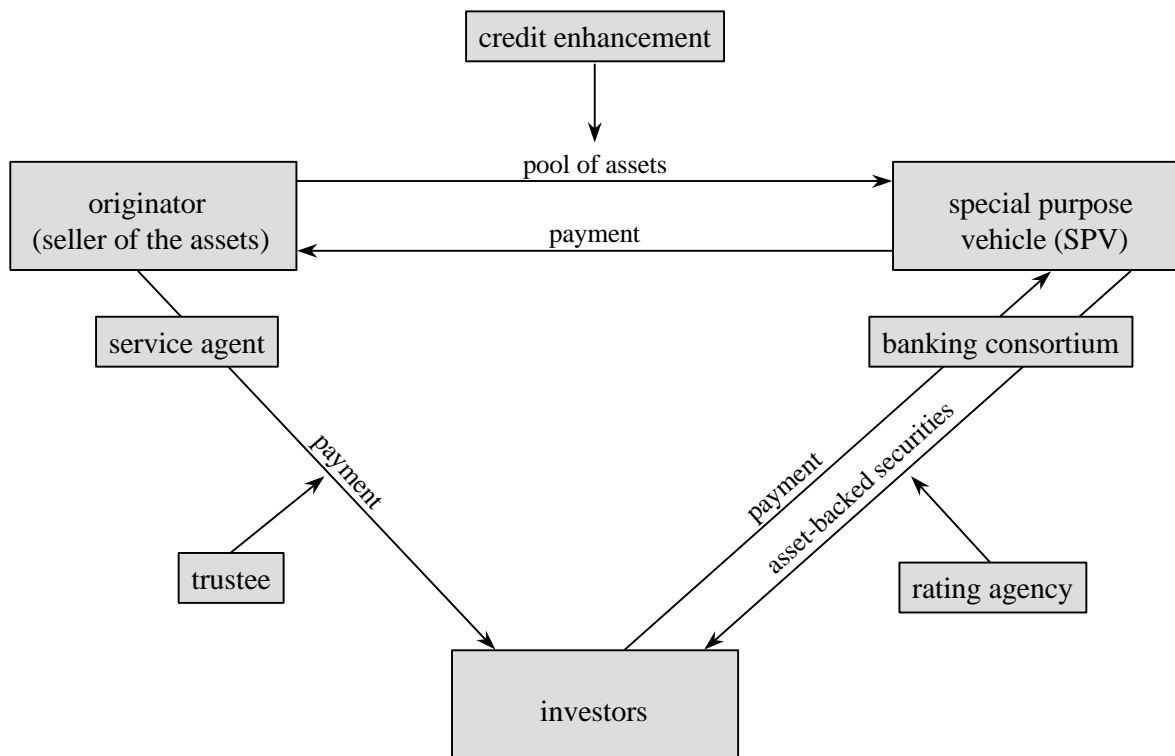
**Graph 1: Asset-backed securities - market overview<sup>11</sup>**

In the first step of the credit securitization process the originator pools a number of roughly homogeneous assets. The method of pooling in combination with the homogeneity of the assets enables a cost-efficient analysis of credit risk and the achievement of a common payment pattern. In the next step, the originator sells the assets to a special purpose vehicle (SPV), which is a trust or a corporation with the sole function of holding these assets. The SPV issues securities which are sold with the help of a banking consortium in private placements or public offerings. The payment of interest and principal on the securities is directly dependent on the cash-flows deriving from the underlying pool of assets. A service agent (who frequently is the originator) collects and manages these cash-flows and a trustee superintends the distribution of the cash-flows to the investors. The underlying pool of assets is usually provided with some form of credit enhancement, because investors are normally not willing to bear all the credit risk associated with the pool. Common forms of credit enhancement are e.g. overcollateralization, third-party insurance and insurance by the originator.<sup>12</sup> Often different forms of enhancement are combined. Additionally, the ABS issuance will generally be rated by a rating agency. Graph 2 shows the basic structure of an ABS issue.<sup>13</sup>

<sup>11</sup> See Bank for International Settlements (1996 and 1997).

<sup>12</sup> For a discussion of the different forms of credit enhancement see Ohl (1994).

<sup>13</sup> For a detailed description of the mechanics of the entire securitization process see Bank for International Settlements (1992).

**Graph 2: The basic structure of an asset-backed securities issue<sup>14</sup>**

There are mainly two incentives for the application of ABS transactions by banks. Firstly, banks use credit securitization as an alternative funding mode to emitting deposits.<sup>15</sup> The second motive for the application of asset-backed securities is that they enable banks to transfer both market risks and credit risk out of the bank.

In the following, we focus on the second incentive and address the question of whether asset-backed securities can also be used to transfer the credit risk of middle market commercial loans. So far there has been little activity in securitizing pools of middle market commercial loans.<sup>16</sup> Securitizing middle market loans is a tricky proposition due to the special characteristics of this loan type, which will be discussed in chapter 3.1. However, the description of the credit securitization process shows not only that asset-backed securities issues are a complex vehicle, but also that they can be flexibly structured to meet the endusers', i.e. the banks' needs. In addition, credit securitization structures are not static. Innovative securitization techniques are invented to enlarge the type and composition of loans suitable for pooling and securitization.

<sup>14</sup> See Ohl (1994), p. 22 and Paul (1994), p. 130.

<sup>15</sup> See Greenbaum/Thakor (1987).



## 2.2 Credit derivatives

Credit derivatives are financial instruments used to transfer credit risk of loans and other assets. There are various types, but the basic structures of all credit derivatives are options, forwards and swaps. Due to their high flexibility credit derivatives can be structured according to the endusers' needs. For instance, the transfer of credit risk can be effected for the whole life of the underlying asset or for a shorter period, and the transfer can be a complete or a partial one. Delivery can take place in the form of over the counter contracts or embedded in notes. Moreover, the underlying can consist of a single credit-sensitive asset or a pool of credit-sensitive assets.<sup>17</sup>

The market for credit derivatives arose during the early 1990s and is apparently developing quickly, as measured by both increasing activity and declining spreads.<sup>18</sup> As table 1 shows, credit default swaps, total return swaps and credit default linked notes have so far been the most commonly transacted forms of credit derivatives in general and in particular with loans as underlying. Thus, we concentrate on these product types.<sup>19</sup>

**Table 1: Credit derivatives - market survey**<sup>20</sup>

Types of credit derivative products used in the London market		Estimates of the size of the market (\$ million) for credit derivatives with corporate loans as underlying	
Default swaps	35 %	Default swaps	500
Total return swaps	17 %	Total return swaps	5000
Spread products	15 %	Price/Spread options	50
Credit default linked notes	27 %	Notes	500
Hybrid products	6 %		

The credit default swap<sup>21</sup> is an agreement in which one counterparty (the protection buyer) pays a periodic fee, typically expressed in fixed basis points on the notional amount, in return for a contingent payment by the other counterparty (the protection seller) in the event of de-

<sup>16</sup> See Edwards (1995), p. 24 and Deutsche Bundesbank (1995), p. 25.

<sup>17</sup> For more detailed information on the characteristics of credit derivatives see Hattori (1996) and Das (1996).

<sup>18</sup> See Duffee/Zhou (1997), p. 3.

<sup>19</sup> For the definitions of different credit derivatives products see for example Bank of England (1996), Federal Reserve System (1996), Office of the Comptroller of the Currency (1996).

<sup>20</sup> See British Bankers' Association (1996) for the survey of certain types of credit derivatives used in the London market, and Smithson/Holappa/Rai (1996) for the estimates of the size of the market (\$ million) for credit derivatives with corporate loans as underlyings.

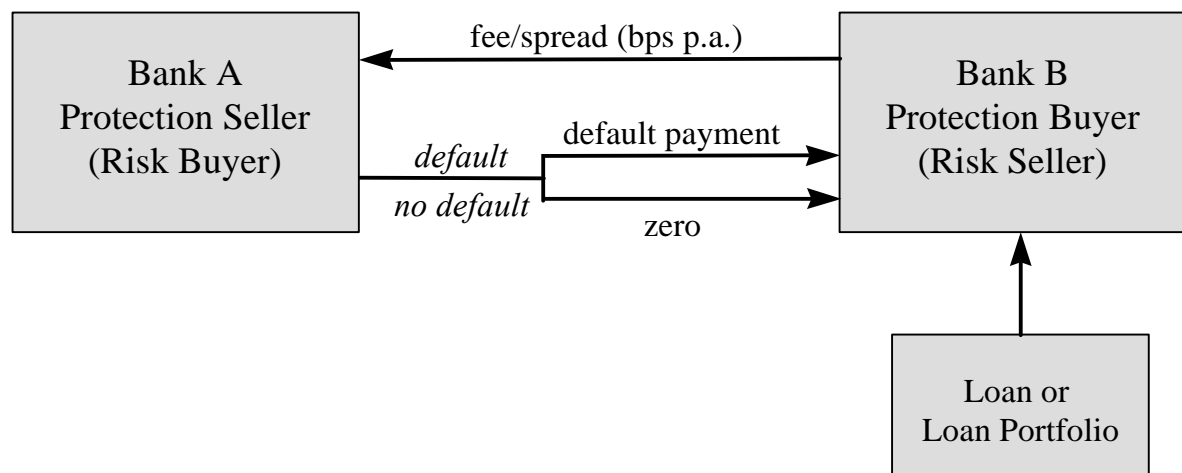
<sup>21</sup> The credit default swap is also known as credit default put, credit swap, default swap, credit put or default put.

fault of the underlying. A default is strictly defined in the contract to include, for example, bankruptcy, insolvency, and/or payment default. The contingent payment in the event of default (default payment) can be defined as either

- a payment of par by the protection seller in exchange for physical delivery of the defaulted underlying
- a payment of par less the recovery value of the underlying as determined by a dealer poll
- a payment of a binary, i.e. fixed, amount.

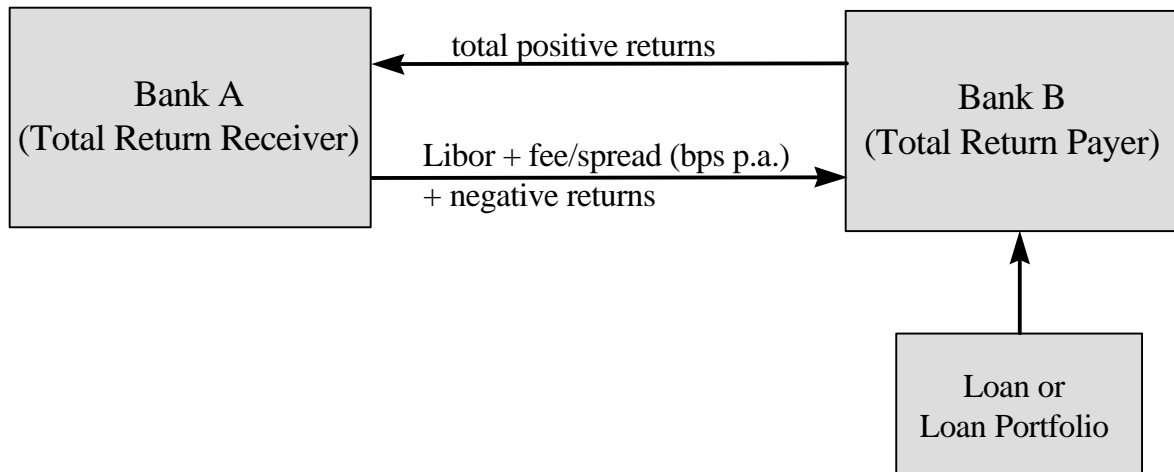
Credit default swaps can be viewed as an insurance against the default of the underlying or as a put option on the underlying. Graph 3 exhibits the basic structure of a credit default swap.

**Graph 3: Credit default swap**

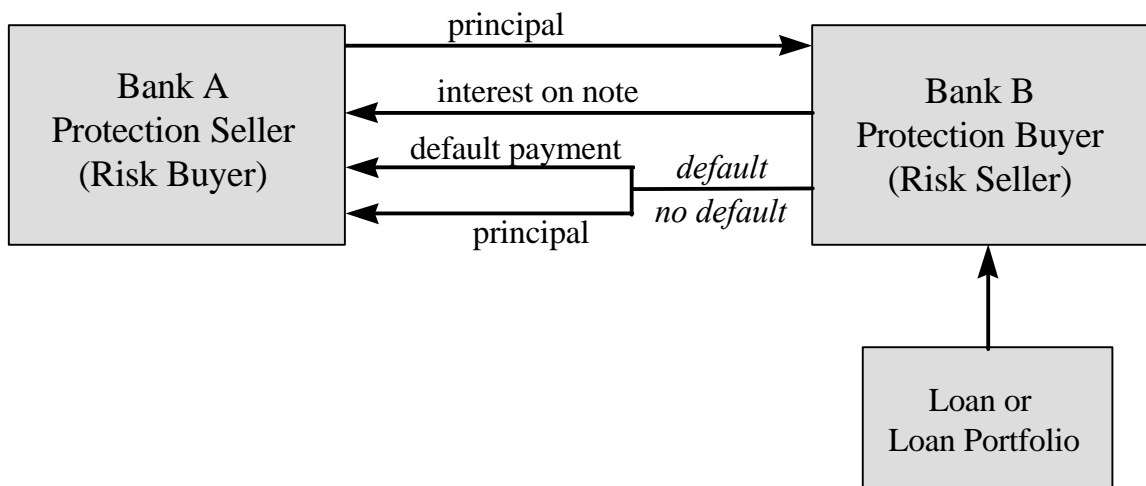


The total return swap<sup>22</sup> is an agreement in which one counterparty (total return payer) pays the other counterparty (total return receiver) the total return of the underlying, while the total return payer receives a Libor related amount in return. In contrast to the credit default swap, the total return swap does not only transfer the credit risk but also the market risk of the underlying. Total return swaps effectively create a synthetic credit-sensitive instrument. Graph 4 shows the basic structure of a total return swap.

<sup>22</sup> Also known as total rate of return swap.

**Graph 4: Total return swap**

Credit linked notes are created by embedding credit derivatives in notes. While credit default swaps and total return swaps are off-balance sheet instruments, credit default linked notes and total return linked notes are their on-balance-sheet equivalents.<sup>23</sup> Off-balance-sheet credit derivatives have the benefit that funding is not necessary, whereas credit linked notes have the advantage of avoiding counterparty risk.<sup>24</sup> Graph 5 shows the structure of a credit default linked note.

**Graph 5: Credit default linked note**

<sup>23</sup> See Hüttemann (1997), pp. 35-36. The term credit linked note is also frequently used as a synonym for credit default linked notes in contrast to the basket term use for all credit derivatives embedded in notes.

<sup>24</sup> The costs and benefits of designing a credit derivative as off-balance- or on-balance-sheet instrument are discussed in Bank of England (1996) and Das (1996).

An interesting aspect is that total return linked notes with a basket or a pool of loans as underlying can be viewed as a substitute for an asset-backed securities issue. As in the case of asset-backed securities, basket total return linked notes are created by pooling loans into a special purpose vehicle that issues securities.<sup>25</sup>

As endusers, banks have different incentives for the application of credit derivatives. For example, they can use credit derivatives

- to hedge dynamic counterparty credit exposure in their derivative portfolios
- to reduce future funding costs or
- to manage the credit risk of their loan portfolios.<sup>26</sup>

Reducing credit concentrations in loan portfolios is commonly viewed as the main use of credit derivatives.<sup>27</sup> However, to date credit derivatives are generally referenced to assets which are widely traded, i.e. for which market prices are readily available, or for which a rating by an international agency is at hand. The credit derivatives market has so far not been extended to middle market commercial loans as they do not meet either the first or the second feature.<sup>28</sup>

### **3 Using credit securitization and credit derivatives for managing credit risk of middle market commercial loan portfolios**

#### **3.1 Requirements for the usage of asset-backed securities and credit derivatives**

As long as credit securitization is used for the credit risk management in the commercial real estate, consumer or home mortgage subportfolio and credit derivatives are applied to manage the credit risk of the large corporate business, arising problems can be solved and the respective markets already have evolved. However, if banks want to use these tools to manage the credit risk of the middle market subportfolio, they have to overcome additional significant obstacles. In the following, we will describe these hurdles and develop a set of corresponding requirements for a sound middle market commercial loan risk management.

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<sup>25</sup> See Ogden (1997), p. 7.

<sup>26</sup> See Reoch/Masters (1996). Banks also have incentives to use credit derivatives as dealers. Moreover, not only banks but also other institutions can benefit from the use of credit derivatives. See for example Parsley (1996), p. 28.

<sup>27</sup> A sizable percentage of the literature about credit derivatives supports this thesis and addresses their use in managing credit exposure on banks' loan portfolio. See for example Parsley (1996), Wong/Song (1997), Whittaker/Frost (1997) and Mahtani (1997).

<sup>28</sup> See Duffee/Zhou (1997), p. 4.

First, banks need to solve or at least mitigate adverse selection and moral hazard problems caused by their role as financial intermediaries. Recent theories of financial intermediation predict that the credit risk of middle market commercial loans can not easily be transferred out of the bank due to the particular relationship between banks and their borrowers which arises from the special abilities that banks have in comparison to a multitude of individual investors.<sup>29</sup> The first considerable characteristic of banks is their ability to solve or at least alleviate information asymmetries caused by a lack of public information about the borrowing firm. Banks produce private information about the creditworthiness of their borrowers by screening potential borrowers and monitoring existing borrowers.<sup>30</sup> The production of information is especially important for medium-sized firms. They are generally not well-known to the public, besides they are unlikely to be monitored by rating agencies. Rating is too expensive because the costs of rating are largely independent of scale. As a consequence of the resulting information asymmetries between medium-sized firms and their potential public investors, the firms cannot borrow directly in the public capital markets. If they need external capital, they depend on banks as financial intermediaries.<sup>31</sup>

Furthermore, banks carry out corporate control and enable flexible long term relationships by providing a mechanism of commitment. These abilities help banks to mitigate problems caused by the absence of comprehensive contracts.<sup>32</sup> Banks may not write and implement binding contracts which specify all future actions and outcomes due to problems of verifiability, enforceability and observability or prohibitive costs.<sup>33</sup> So financial intermediation includes not only delegated monitoring but also delegated corporate control and an adequate mechanism of commitment by implementing a close long term firm-bank relationship.

Reducing informational problems, controlling borrowing firms and implementing a close relationship are complementary and interdependent functions. For example, close firm-bank relationships also facilitate the production of information and therefore play a significant role in mitigating the information asymmetries. Besides, other important characteristics of close firm-bank relationships are their confidentiality and flexibility. Medium-sized firms are generally reluctant to publish information about their business. They will consequently not tolerate that

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<sup>29</sup> See Gorton/Pennacchi (1995) and Neuberger (1994), pp. 31-92.

<sup>30</sup> See Stiglitz/Weiss (1981), Diamond (1984) and Boyd/Prescott (1986) for respective theoretical approaches to the information production of banks.

<sup>31</sup> See Kaufmann (1997) and Petersen/Rajan (1994).

<sup>32</sup> See Neuberger (1994).

<sup>33</sup> See Hellwig (1991), p. 51-52 and Mayer (1988), pp. 1178-1179.

their privately given information is spread around to a multitude of investors.<sup>34</sup> The close firm-bank-relationship allows not only the renegotiating of loan terms, but also permits the financing of temporarily loss-producing investments like restructuring actions without spreading private information about the firm to the market. Therefore, this relationship is valuable for the borrower because the bank provides a tailor-made and renegotiable credit program while keeping information private.

The banks' special abilities solve informational problems and problems caused by incomplete contracts but constrain their ability to transfer the credit risk of the originated loans. The private information banks produce on the creditworthiness of their borrowers creates an adverse selection problem between the lending bank and outside investors.<sup>35</sup> According to the well-known lemon problem, which is applicable also in this situation, banks with high-quality loans will tend to refrain from transferring part of the credit risk of their portfolio if outsiders cannot distinguish such loans from low-quality loans. Hence, only loans of lowest quality can be traded.<sup>36</sup> Besides there is a moral hazard problem, because a bank which has transferred the credit risk of a loan will no longer have an incentive to provide the services of monitoring, corporate control and renegotiation.<sup>37</sup>

A potential success of applying credit securitization and credit derivatives for managing the credit risk of the middle-market commercial loan portfolio depends on the development of incentive-compatible structures which solve or at least mitigate the adverse selection and moral hazard problems without disturbing the valuable firm-bank relationship. We therefore define the following requirements:

- (1) The adverse selection problem caused by the bank's information advantages at the moment of the credit risk transfer has to be solved or at least mitigated to attract potential investors.
- (2) The specific incentives for delegated monitoring and delegated corporate control have to be retained to minimize the unsystematic risk.
- (3) From the standpoint of the borrowing firm the borrower-bank-relationship should be kept flexible and individual.

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<sup>34</sup> See Kaufman (1997), p. 143.

<sup>35</sup> See Duffee/Zhou (1997).

<sup>36</sup> See Akerlof (1970) and Petersen/Rajan (1994).

<sup>37</sup> See Gorton/Pennacchi (1995), p. 390-391.

(4) Information about the borrowing firm must be treated confidentially.

As we will show in the next chapter, these requirements can be met by the creation of specific structures of financial instruments. Moreover, the development of markets for credit risk of middle market loans is dependent on market requirements which can not be influenced by the structuring process of a single bank:

- (5) The relevant parts of credit risk must be traded, i.e. products for the management of regional or industrial credit concentrations must be developed. There must be sufficient liquidity in the evolving markets.<sup>38</sup>
- (6) Regulatory standards must take into account the ability of banks to manage their credit risk.<sup>39</sup> All solution concepts demand the availability of an appropriate database and the application of modern portfolio theory. Portfolio management techniques have to be reflected in the regulatory capital requirements, because otherwise the advantages of an improved risk control are offset by overregulation.<sup>40</sup>

It is important to consider that both adverse selection and moral hazard problems will make the transfer of credit risk out of the bank's middle market portfolio costly. These costs might be prohibitively high and can prevent the development of markets for the credit risk of these assets. Additionally, insufficient market liquidity and inaccurate regulatory standards produce further costs. All these costs have to be considered in an overall cost-benefit analysis.

### 3.2 Basic solution concepts

The key for the credit securitization and credit derivatives market is the development of solution concepts which are efficient in achieving the transfer of credit risk. We deduce two particular solutions. Conclusive designs consist generally of a combination of several building blocks and correspondingly exhibit a high complexity. In the following we will show that the creation of a pool or an index of middle market commercial loans are the basic building blocks.

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<sup>38</sup> See Babbel (1989), p. 491.

<sup>39</sup> One of the main intentions of the publication of CreditMetrics and CreditRisk<sup>+</sup> is to encourage regulatory standards that reflect the risk of credit portfolios more closely. See J.P.Morgan (1997a), p. 3, and Credit Suisse Financial Products (1997), p. 3.

<sup>40</sup> See Duffee (1996).

### 3.2.1 Creating a pool

The first solution to the problem of transferring credit risk is based on the creation of a pool which contains the credit risk of a greater number of middle-market loans. Feasible financial instruments resting upon a pooling technique are asset-backed securities, total return swaps or total return linked notes and credit default swaps or credit default linked notes. In the beginning we focus on asset-backed securities because the other mentioned instruments can be viewed as equivalent or related. After the discussion of the applicability of asset-backed securities we will deal with the advantages and disadvantages of the different credit derivatives in comparison to asset-backed securities.

In principal, asset-backed securities can be applied for credit risk management. However, in practice such securities are not used to transfer the credit risk to a multitude of investors. As the normal investor is generally not willing to take on all credit risk associated with a pool of loans, asset-backed securities are provided with credit enhancement which transfers the credit risk from the investor to a credit enhancer.<sup>41</sup> In the context of credit risk management, it is necessary to look at asset-backed securities from a different perspective. It must be carefully assessed that the credit risk is transferred out of the bank. This is the case if a true sale takes place. A true sale is ensured by excluding seller recourse and credit enhancement by the originator.<sup>42</sup> The key question for the construction of securities backed by middle market loans with the objective of credit risk management is whether and under what conditions outside investors are willing to take on the credit risk.<sup>43</sup> In this context, a risk sharing between different types of investors seems sensible. The structured pools discussed in this chapter will generally spread market risk and credit risk to several parties. For example, asset-backed securities can be issued as senior/subordinate multiclass structures.<sup>44</sup>

Before dealing with the incentive problems, some remarks are necessary about the preconditions for the pricing of a commercial loan pool. The pool has to be structured in a way so that outside investors can evaluate the aggregated credit risk of the underlying assets. On first sight, one might be tempted to try a valuation based on the payment characteristics of the

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<sup>41</sup> See Bank for International Settlements (1992), p. 113.

<sup>42</sup> Other credit enhancement techniques which can be used are third party credit enhancement and credit enhancement generated by the cash flow structure of the pool.

<sup>43</sup> An argument for the existence of these investors is that third party credit enhancers can also be viewed as a special kind of outside investors in credit risk who have advanced abilities to evaluate credit risk and are willing to take on credit risk for an adequate premium.

<sup>44</sup> See Goldstein (1996), p. 63.



individual loan contracts. Then, to facilitate the calculation of the pool's aggregate cash flow, the loans should be as homogeneous as possible with regard to loan terms.<sup>45</sup> But any single loan is usually part of a lending exposure towards one borrower consisting of many different loans and short-term credit accounts. Even if the volume of the total exposure changes only gradually, the weights of the different loan contracts can shift due to recontracting, changing financing policy of the borrower or manipulation by the bank.<sup>46</sup> Thus, securitization of middle market loans should indeed deal with the exposure to one borrower as a whole.

The computation of the cash flow structure for a pool consisting of total exposures seems to be a difficult task. Middle market loans are very heterogeneous due to the flexible and individual negotiation of loan terms. They vary with respect to duration, collateral, interest rate, amortization, covenants and documentation. The calculation must be based on the average cash-flow structure of each borrower and could rely on historical data. The techniques used up to now in the structuring of asset pools do not seem sufficient to provide reliable data. But an innovation process combining statistical methods and better data management in banks might lead to an adequate solution.

In the following we will analyze whether the idea of pooling loans is a sensitive approach to managing the credit risk of middle-market commercial loans with respect to the incentive problems they create. Therefore we check which structuring techniques are necessary to meet the requirements (1) to (4) of chapter 3.1.

According to the law of large numbers, the payoff structure of a pool is less volatile than the payoff structure of an individual loan, and it is less dependent on the characteristics of the individual loan. Thus, the pooling procedure itself helps to reduce informational disadvantages of the outside investor. However, there are various concerns about the efficiency of the pooling procedure. One concern is, that the law of large numbers is not valid if one loan (or total exposure) constitutes a relatively large percentage of the pool. The loans must consequently be as homogeneous as possible with regard to size.<sup>47</sup>

A further consideration about asset-backed transactions with the objective of credit risk transfer is that banks might select only borrowers of a very low credit quality. For that reason

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<sup>45</sup> See Cocheo (1994), p. 38, Paul-Choudhury (1997) and Draper/Rosenberg/Kravitt (1994).

<sup>46</sup> The decision of banks to accept interest payments on long-term loans from overdrawn short term accounts at the same bank might then get strategic significance.

<sup>47</sup> See Draper/Rosenberg/Kravitt (1994), p. 94. See also Bank for International Settlements (1992), p. 112.

the exposures have to be selected within the scope of fixed sample criteria by a random sampling procedure and not by cherry (or more precisely, lemon) picking.<sup>48</sup> The regularity of the sampling procedure has to be monitored by an objective third party. Considering that banks face credit concentrations in their middle market commercial loan portfolio, pools that contain loans of a specific industry or region are of special interest for banks. However, the creation of industry- and/or region-specific pools is unproblematic, if the sample is randomly drawn out of a prespecified population.

Public rating helps to improve objectivity. Rating agency classifications play a key role in the structuring and pricing of asset-backed securities. A rating of the individual credit exposure in the middle market, however, is too costly. In this context, rating can only analyze and evaluate the process of originating loans, the credit risk management of existing loans and the regularity of the transaction's implementation, e.g. the selection of the borrowers, the structuring of the pool and the characteristics of the involved parties.<sup>49</sup> An essential element of bank rating is the evaluation of the credit portfolio in general. Thus, the additional effort to comply with the first two aspects should be limited in rated banks. With respect to the structuring of the pool, the quality of the database as well as the calculation method should be scrutinized by the agency.

In addition to the adverse selection problem, the moral hazard problem has to be solved.<sup>50</sup> Due to the fact that the trade in credit derivatives and asset-backed securities takes place in different departments of a bank, a simple solution to the moral hazard problem seems to be the introduction of Chinese walls. The reasoning is as follows: If lending officers cannot distinguish between credit risk sold to the market and credit risk remaining in the portfolio of the bank, they will handle all borrowers in the same manner. It is naïve to expect them not to know that their bank usually sells part of its credit risk. But if they do not know the status of the individual borrower, they can only form expectations about the average credit risk remaining with the bank and will treat all borrowers accordingly.

The main problem of Chinese walls is their credibility to outsiders. Chinese walls can be enforced by law or promised voluntarily by the bank to its customers. However, a violation is

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<sup>48</sup> The lemon problem leads to incentives with the opposite effect of those expected by the Bundesaufsichtsamt für das Kreditwesen (1997), which assumes that banks will sell their high-quality loans. See Bundesaufsichtsamt für das Kreditwesen (1997) and Deutsche Bundesbank (1997).

<sup>49</sup> See Goldstein (1996) and Hyder/Bolger/Leung (1996).

<sup>50</sup> Above we have already addressed a special kind of moral hazard which occurred if single loans were considered as basic building blocks of pools. In the following we concentrate on moral hazard problems arising if total exposures are used as basic building block.

hard to prove. The credibility therefore depends crucially on the bank's interest to honour these restrictions. The gains from a violation should be smaller than the value of potential losses through the damage in reputation and possible penalties if a contract or law has been disregarded.<sup>51</sup> Otherwise, in a world of incomplete contracts, the protection of outside buyers of credit risk through Chinese walls is of small value.

A closer look at the relationship of banks with medium-sized firms reveals incentives not very much in favour of credible Chinese walls.<sup>52</sup> As long as borrowers show no apparent weakness, banks' monitoring is routine and based on cheap signals observed over a long period of time, e.g. data from balance sheets. A differential treatment does not promise much gains.<sup>53</sup> However, if a firm gets into trouble and the bank tries to save it, the level of banks' activities is many times higher than usual, now consisting of very close monitoring, consulting activities and intensive recontracting with many partners. A borrower in distress draws heavily on the resources of a credit department. The opportunity costs are very high, because the bank cannot offer every endangered borrower such privileged treatment. Of course, banks can be expected to invest their restricted reorganisation capacity first of all in borrowers still in their risky portfolio. The temptation for senior managers of banks to give lending officers a hint must therefore be very strong.

Hence, credible monitoring incentives must rely on financial commitment. Banks should not sell the entire credit risk of the underlying loans, but retain a certain exposure. In this case, they will keep some incentives for delegated monitoring and delegated control.<sup>54</sup> Bank practice shows that pooling only part of each underlying loan is a feasible concept for transferring the credit risk of commercial loans. For instance, Rabobank has developed a program where packages of corporate loans are bundled into a credit-linked note giving investors a risk-package in a specific economic sector. Thereby, Rabobank is obliged to keep a certain

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<sup>51</sup> See e.g. Bülow (1997), p. 291.

<sup>52</sup> See for the following Burghof/Henschel (forthcoming 1998).

<sup>53</sup> See Haubrich (1989).

<sup>54</sup> For example, Gorton/Pennacchi (1995) show that the moral hazard associated with loan sales is reduced if a bank can commit to keep a fraction of the exposure. According to Duffee/Zhou (1997), their model could also be applied to other mechanisms which transfer credit risk out of the bank, including credit securitization and credit derivatives. However, it considers a setting where the bank has an incentive to sell loans because of relatively high costs of internal funding. In the context of this paper, banks have another motive for loan sales which is the diversification of their credit risk.

percentage of the underlying loans but still achieves a significant reduction in its risk concentration in specific sectors.<sup>55</sup>

What are the economic consequences of reduced incentives to monitor? According to conventional economic wisdom, the bank will choose a low level of monitoring. This follows because the outsiders who bought part of the credit risk now freeride on the banks' efforts.<sup>56</sup> Seemingly, a first best monitoring level is guaranteed only if firms are financed by one single provider of funds with monitoring skills. In reality, most firms are financed by a greater number of investors, and only some of these investors have monitoring skills.

Some theoretical work has been done about the coexistence of capital market financing and bank financing.<sup>57</sup> The arguments in this literature might also be useful in the discussion of a partial sale of mid-market credit risk to the capital market via asset-backed securities. Especially Besanko/Kanatas give an insightful analysis of the efficient level of monitoring and bank interference in credit relationships.<sup>58</sup> They show that if banks cannot commit themselves to a certain level of monitoring, their monitoring will cause external effects burdening the borrower.<sup>59</sup> Hence, they choose an inefficiently high level of monitoring. Therefore, a reduction of banks' monitoring incentives by a partial sale of credit risk could enhance overall efficiency.

What are the consequences of a pooling of fractions of total exposures with respect to the flexibility of the bank-borrower-relationship? One concern is the changing volume of the total exposures in the pool due to the variable credit supply to the borrowers. Alternative solution concepts are an adjustment via market transactions leaving the fraction sold to the market constant, or the variation of the percentage of credit risk retained by the bank. Therefore, the ability of the bank to reduce or widen credit lines must not be restricted if part of the credit risk is sold to the market. But the effects of these adjustments on banks' incentives and on overall credit quality are quite unclear. Extreme changes reducing the commitment of the bank to a low level should be avoided by introducing particular rules. If the percentage falls below a certain number, the bank could be obliged to repurchase some asset-backed securities, or to

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<sup>55</sup> See Gheerbrant/Sol (1997), p. 46.

<sup>56</sup> For this classical free rider argument see Olson (1965)

<sup>57</sup> See e.g. Diamond (1991) and Seward (1990).

<sup>58</sup> See Besanko/Kanatas (1993).

<sup>59</sup> According to Besanko/Kanatas (1993), by "monitoring" the bank forces the borrower to an inefficiently high level of effort. But this argument can be understood in a very general sense, meaning an inefficient reduction of discretion of the borrower.

enhance its incentives by giving additional credit exposures from a prespecified population into the pool. Both ideas seem complicated and might have specific setbacks.

Reputation could be a substitute for such explicit retainment rules.<sup>60</sup> If investors observe no differences between loan losses in the pool and in the equivalent part of the bank's credit portfolio, they can assume that the bank efficiently keeps its incentives for delegated monitoring and control either directly through reputation effects or indirectly through an internal retainment rule. However, it takes a long time to establish reputation, and, as mentioned above with respect to Chinese walls, reputation will be destroyed voluntarily by the bank if the expected short term gains exceed the long term losses caused by the lack of trust.

The confidentiality of the bank-borrower-relationship is not at stake if the data needed by third parties (e.g. rating agencies) is kept anonymously. In Germany, the Bundesaufsichtsamt für das Kreditwesen (BAKred) has published requirements for the transfer of loans through asset-backed securities transactions by banks.<sup>61</sup> Among other aspects, these requirements enforce the confidentiality of the borrower-bank-relationship. If the originating bank is also the service agent of the asset-backed issuance, the borrowers do not even have to be informed that their loans are part of an ABS transaction. In so far, the pooling concept does not constrain the close firm-bank relationship as a mechanism of commitment.

In summary, the requirements of chapter 3.1 can approximately be met if specific structuring techniques are applied. However, these structuring techniques are complicated and presumably expensive. A market for asset-backed-securities with the objective of credit risk management will only evolve if the costs of the ABS structuring procedure are offset by its benefits.

In the context of cost analysis a comparison of asset-backed securities and the different credit derivative structures is important, because credit derivatives generally produce fewer operational costs.<sup>62</sup> Just as with asset-backed securities, all credit derivative structures permit a confidential transfer of credit risk. An advantage of credit derivatives is their flexibility. For example, with the application of credit derivatives the loan pool can easily be stripped in two components, e.g. a basket credit default swap and a risk free loan pool, which are then distributed to different investor groups.<sup>63</sup> Together with the exposure retained by the bank the

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<sup>60</sup> See Duffee/Zhou (1997), p. 21.

<sup>61</sup> See Bundesaufsichtsamt für das Kreditwesen (1997)

<sup>62</sup> See Hattori (1996), p. 17, and Neal (1997).

<sup>63</sup> See Drzik/Kuritzkes (1997).

following risk sharing scheme for pool structures, both ABS and credit derivatives, might arise:

- Risk averse and not well informed parties bear no or index related credit risk.
- Institutional investors assume a relevant portion of credit risk of the pool.
- Banks retain the residual credit risk to keep their monitoring incentives.

The usage of credit derivatives even enables a bank to transfer credit risk in isolation from market risk by issuing only the basket credit default swap component.

The consideration of counterparty exposure is also important. The application of asset-backed securities and credit linked notes has the advantage of not acquiring counterparty risk. In contrast, if a bank uses credit derivatives to hedge the credit risk of its loan portfolio, the bank will be exposed to the risk that the counterparty of the derivative contract will default on its obligations. Hence, banks must take care to use high quality counterparties and to diversify their credit derivative transactions among various counterparties.<sup>64</sup> A key question for the usage of credit derivatives is whether this market can develop sufficiently so that banks will be able to spread part of the risk of their loan portfolios to many different counterparties.

### **3.2.2 Creating an index**

The second basic solution requires the formation of indices which include standardized middle market commercial loans from particular industries and/or geographical regions. An example is an index for German middle market commercial loans which could be segmented in several industrial subindices (constructed analogously to the German equity index CDAX).<sup>65</sup> Each industrial sector could further be segmented into debt-rating categories and/or geographic regions. These indices can then be used as underlying for credit derivative instruments which allow to transfer specific parts of the credit risk. A broad-based index with corresponding subindices and derivative products tied to these indices allows banks to balance the composition and benchmark the performance of their middle market commercial loan portfolio.<sup>66</sup>

In principle, this solution allows a bank to retain only the idiosyncratic component of a loan, thus reducing the total credit risk while avoiding problems of moral hazard and

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<sup>64</sup> See Duffee (1996), p. 391.

<sup>65</sup> For the construction of the CDAX see Deutsche Börse AG (1994).

<sup>66</sup> See Edwards (1995), p. 25.

adverse selection.<sup>67</sup> Neither the retaining of a portion of each underlying loan nor the construction of Chinese walls is necessary. And, in comparison with the pooling solution concept, the index solution seems to be easier to handle because idiosyncratic and macroeconomic components of credit risk are unbundled. Moreover, this solution concept does equally not constrain the close firm-bank relationship. Setting an index to work seems cheaper than the management of a pool. Lastly, as a consequence of the high level of standardization, a liquid over-the-counter market (or even exchange-based trade) for options and other derivative products tied to these indices should be able to develop.<sup>68</sup> Nevertheless, in over-the-counter markets it is indispensable to consider counterparty exposure.

But unfortunately there are other significant obstacles to this solution. A basic problem of a loan index for the middle market segment is the availability of rating and loan pricing data.<sup>69</sup> In contrast to large corporates, pricing the credit risk of medium-sized firms cannot be based on data about publicly traded bonds of the respective or similar firms. Alternatively, prices could be achieved by price quotations of several banks. This practice has already been used in the United States by the Loan Pricing Corporation. Banks are asked to estimate the price at which standardized loans from various industries would be made.<sup>70</sup> Corresponding to the low price efficiency and transparency of the middle market for commercial loans the number of samples per item has to be high. For example, the Loan Pricing Corporation collects 15-30 samples per type of loan. The same practice could be used to obtain loan ratings. As long as all banks use the same rating system or agree on compatible systems, it is possible to aggregate the rating calculation of the different banks.<sup>71</sup>

An implicit assumption of this solution is the idea that the best way to hedge the systematic credit risk of middle market commercial loans is by instruments which are as closely linked as possible to this kind of credit risk. This is obviously the case for equivalent middle market loans. However, also the credit risk of middle market loans and of large corporate loans can be closely linked.<sup>72</sup> In this case, the credit risk of middle market loans can be hedged by credit derivatives on large corporate loans or bonds which are less affected by asymmetric information.

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<sup>67</sup> See Duffee (1996).

<sup>68</sup> See Whittaker/Frost (1997).

<sup>69</sup> See for example McAllister/Mingo (1994) and Duffee (1996).

<sup>70</sup> See Snyder (1989), p. 445.

<sup>71</sup> See Altman (1996).

Moreover, credit risk is also tied to market risks like interest rate, currency or commodity risk, so that it is also possible to use traditional derivative instruments on interest rates, currencies or commodities for managing the credit risk of middle market loans.<sup>73</sup> For some other types of loans this may be very efficient. For example, the banking sector's exposure to LDC debt may be hedged by positions in FX markets or commodity markets, because the financial health of the respective country will typically be tied to the strength of its currency and its export sector. But in the middle market sector empirical evidence indicates that credit risk is generally not closely related to actively traded traditional derivative instruments.<sup>74</sup>

A high correlation is necessary to achieve an efficient hedge. The banks' ability to measure the correlations of their own loan positions and potential credit risk management instruments is therefore a precondition for a sound credit risk management. To use efficiently credit derivatives with a loan index as underlying, banks need to know the sensitivities of their credit risk to the loan index. But evaluating these sensitivities is a very difficult and data-intensive process. Actually banks do not have databases which provide them with sufficient information. "At present, if a bank were to attempt to hedge its credit risk with positions in financial instruments, it would also be speculating - speculating that its hedge is constructed properly."<sup>75</sup>

#### 4 Conclusions

Creating a pool or an appropriate index seem to be alternative feasible solutions although some technical intricacies are involved. In both concepts systematic risk is transferred to the market, whereas idiosyncratic risk should remain with the bank to reduce incentive problems. From the perspective of applicability index concepts show some advantages in comparison to pools. Derivatives based on indices are more suitable for solving the incentive problems, but they might not be able to hedge accurately the systematic risk of a specific middle market loan portfolio. At present it is not possible to favor clearly one of these two concepts.

For German universal banks it might become crucial in the growing international competition to combine their special skills in handling of credit relationships with the superior opportunities

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<sup>72</sup> For example, the credit risk of medium sized firms of the automotive supplying industry is generally dependent on large automotive corporates.

<sup>73</sup> See Duffee (1996), Kürsten (1991) and Kirmße (1996), pp. 251-253.

<sup>74</sup> See Duffee (1996), p. 382.



of diversification on international capital markets. Consequently, banks need to develop an active credit risk management using innovative capital market instruments like credit derivatives and asset-backed securities. Although many problems have not yet been solved, especially in the mid-market portfolio, German banks should timely begin to develop products and concepts which meet their specific needs.

Among these problems, some have an external character, e.g. the development of adequate rules of banking supervision taking the credit management techniques of the bank into account. Others must be solved internally, mainly through the development of the needed database. The main obstacles are conceptual, among these being above all pricing by the bank and by potential investors. Maybe a growing general experience in securitization and credit derivatives will contribute to the solution of the remaining problems in somewhat difficult market segments like middle market loans.

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<sup>75</sup> Duffee (1996).

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