Securitisation of Mezzanine Capital in Germany

Günter Franke and Julia Hein*

October 2007

Abstract

A recent trend in the German *Asset Backed Securities* (ABS) market is the securitisation of subordinated loans and profit participation agreements (PPAs) granted to medium-sized enterprises (MEs). This paper provides an overview of this growing market and analyses the benefits of such transactions for the portfolio companies as well as originators and potential investors. Simulations of ten recent transactions indicate that despite of relatively low interest rates charged on obligors, originators and investors can earn attractive returns at fairly low risk. In particular, the junior tranches of these securitisations exhibit quite attractive risk-return profiles.

Keywords: securitisation, middle market transactions, mezzanine loans, medium-sized enterprises, junior tranche

JEL classification: G10, G21, G24

*Chair of International Finance, University of Konstanz, Department of Economics, Box D 147, D-78457 Konstanz, Germany.
E-Mail: Julia.Hein@uni-konstanz.de, Phone: +49-7531-88-2346, Fax: +49-7531-88-3559
We are grateful to two anonymous referees for very helpful comments. We also thank Thomas Weber for many valuable comments.

In the subprime crisis which started in July 2007 many observers wondered how a rather limited number of defaults in the US-housing sector could trigger a worldwide crisis in financial markets. Some observers blame the rating agencies for too optimistic ratings, others put the blame on securitisation transactions being too complex and too intransparent. Alan Greenspan (2007) predicted that securitisation would never revive to the large volumes of the years before the subprime crisis. Given the different views about the subprime crisis and the lack of thorough analyses of the securitisation market, this paper aims to improve the knowledge about securitisation transactions by analyzing German securitisations of mezzanine loans. These loans are subordinated and, thus, more risky than standard loans. Hence securitisations of these loans may encounter strong skepticism in a financial market crisis. The main purpose of this paper is an empirical analysis of the German mezzanine securitisations to portray the benefits and risks inherent in these transactions. These securitisations do not use commercial paper for funding, they are funded with long term bonds. Hence they are not exposed to the funding risks of many structured investment vehicles which strongly contributed to the subprime crisis. The findings of this paper may help to evaluate these transactions with respect to financial stability.

1 Introduction

Within the European Asset Backed Securities (ABS) Market, securitisations of bank portfolios of commercial loans (*Collateralised Loan Obligation*s, CLO) saw strong growth in 2005. The issuance volume in this market segment more than doubled in 2005 as compared to 2004 (see *HSBC Bank plc.* 2006 or *Deutsche Bank AG* 2006a). This growth was primarily due to high issuance volumes in SME-related securitisations (26 billion €), which account for approximately 40% of the CLO sector. Beside of Spain and the Netherlands, Germany is strong within this sub-sector.

The growth in the German market is also driven by the new trend to securitise mezzanine loans granted to medium-sized enterprises (MEs). From May 2004 to July 2006 ten *mezzanine securitisations* were originated by several large German banks. Since these transactions are mainly focused on medium-sized companies, they are also called "*Middle Market*" securitisations. They emerged as an answer to serious problems in ME financing. Fairly high insolvency rates and thin equity capitalization of MEs together with high regulatory capital requirements due to Basel II and strong profitability pressure on banks, had led to a more restrictive lending policy (see *European Central Bank* 2005). Therefore MEs turn to alternative financial instruments, in particular, mezzanine debt.

Mezzanine loans are subordinated to standard debt and senior to equity. Dependent on the contractual features, mezzanine loans have the advantage that - under certain conditions - they account (partially) for equity in the MEs' balance

sheets or at least for economic equity capital ("*wirtschaftliches Eigenkapital*") in the rating process. Nevertheless, interest payments are tax deductible. Therefore MEs, which make use of these financial instruments, can enhance their equity capitalization at comparably low costs, which in turn facilitates the access to standard loans. Due to the new securitisation structures, in which mezzanine loans are directly granted by a special purpose vehicle (SPV), MEs get indirect access to the capital market.

This paper first describes German middle market deals and contrasts them to classical CLO-transactions. Since mezzanine securitisations are fairly new, former research (e.g. *Jobst* 2005, *GBRW Ltd.* 2004) focused on 'classical' SME loan securitisations. Second, this paper provides a simplified analysis of the portfolios underlying middle market transactions indicating that they are attractive to originating banks, investors and medium-sized obligor companies. Third, the main contribution of this paper is a detailed empirical analysis of the risks of these securitisations. This analysis uses simulation tools which are also employed by the rating agencies. Since the simulation results strongly depend on the input parameters which are controversial, the sensitivity of results with respect to these parameters plays a major role in the analysis. Therefore we perform several robustness checks. They reveal that the loss rate distributions of the transactions are fairly insensitive to the assumed recovery rate, but quite sensitive to the initial obligor rating. From the investors' viewpoint, it is more important to analyse the risks of the bond tranches issued in the securitisation process. The most risky tranche is the junior note which is effectively a First Loss Position. This note is at least partly sold to investors. Hence it is essential for investors to understand the benefits and risks of the junior notes. Therefore we analyse the junior notes in detail. The simulations show that the junior notes exhibit quite attractive risk-return profiles for investors. Particularly, these notes generate rather high internal rates of returns with low downside risk. This indicates that originating banks reward investors generously. This is presumably necessary for selling substantial parts of the junior notes to other banks which then incur high equity capital costs.

The remainder of this paper is structured as follows: In the next section current problems to ME financing are addressed and some mezzanine claims underlying Middle Market transactions are explained. Section 3 characterizes middle market transactions in Germany and contrasts them to classical SME loan securitisations. In section 4 the risk-return characteristics of the underlying portfolios are studied in detail. Section 5 discusses the tranching of the transactions and in particular the risk-return profiles of the junior notes. Section 6 concludes.

2 ME Financing in Germany

2.1 A brief Overview on the Current Situation

Medium-sized enterprises (MEs) can be defined as enterprises which employ between 50 and 500 people. Although MEs represent only around two percent of all German SMEs, they employed 50% of all employees in SMEs and realised around 50% of the SMEs' total investment volume in 2005. Whereas small enterprises reduced their investment volume from 2004 to 2005, they increased it.These figures illustrate the importance of MEs for the German economy.

MEs in Germany mostly finance their investment projects from internal funds. These funds accounted for more than 50% of the total investment volume in 2005. Although these enterprises increasingly use leasing and trade credits, standard bank loans accounted for about 20% of the total investment volume in 2005 and still represent the most important source of external financing.[1]

Until recently, a long-term lending relationship between a ME and its preferred bank, the so-called *Hausbank*, stabilized access to debt at fair terms. But the growing profitability pressure in the banking industry together with differentiated capital charges under Basel II and rather high insolvency rates in the ME sector induced banks to pursue a more restrictive, more risk-return oriented lending policy in recent years. As noted by *KfW Bankengruppe* (2006), around 30% of all loan negotiations failed in 2005. Whereas MEs rejected loan offers mostly because of high interest rates, banks were not willing to engage in a loan contract due to insufficient collateral and low credit quality.

German banks rely more and more on internal rating systems in order to assess the risk of a loan and to charge risk-adjusted interest rates. Because of high risks and low equity capital it is difficult for MEs to attain an investment grade rating and attractive loan terms. Low equity ratios are typical for German MEs, driven by low profitability and the unwillingness of owners to restrain their independence by sharing ownership with others. According to *Deutsche Bundesbank* (2007) more than 25% of all MEs have an equity ratio below 10 percent. The median equity ratio of around 17 percent is significantly lower than the median equity ratio of large enterprises (24%). The average equity ratio (slightly above 20%) is also very low as compared to the average equity ratios in other countries like France (35%), Spain (40%) or the US (45%). Consequently, more than 45% of MEs aim at increasing their equity ratios during the next years (see *KfW Bankengruppe* 2005).

Thinly capitalized, low rated MEs face strong difficulties getting standard bank loans. As a consequence, around 60% of all planned investment projects were postponed or even abandoned in 2005 due to the lack of capital.[2] Raising

[1] For all these facts see *KfW Bankengruppe* (2006).

[2] According to *KfW Bankengruppe* (2006) the realised investment volume of German MEs amounted to around 100 billion € in 2005.

money at the capital market, like issuing shares or corporate bonds, is hardly possible for most MEs because of their limited size. Also *private equity* is less attractive since the owners seek to retain their independence. Therefore MEs are looking for new financing alternatives, making *mezzanine debt* more and more attractive.

2.2 Mezzanine Loans

There is a large variety of mezzanine loans. In general, these instruments are debt instruments which also exhibit some equity characteristics. The loans are subordinated to standard debt, but senior to equity. Most of the mezzanine loans are repayable after 5 to 8 years, only very few instruments are perpetuals. Due to their subordination, mezzanine loans bear more default risk than standard loans. Therefore banks charge higher interest rates as compared to senior debt. Examples are subordinated loans and profit participation agreements (PPA, *Genuss-scheine*).[3]

Subordinated loans are typically unsecured claims with a fixed interest rate. Sometimes they also include a small profit-related interest component to be paid in addition to the fixed component if certain success triggers are reached. In this case the instrument can also be seen as a *debt-like PPA*. Since it neither allows for interest deferral nor for loss participation, it accounts for debt in the balance sheet. Nevertheless, a fraction might be recognized as economic equity capital ("*wirtschaftliches Eigenkapital*").

In contrast, interest deferral (e.g. if no profits are reported) is usual in (*equity-like*) **profit participation agreements**. Some PPAs even allow for loss participation of the principal. In this case the principal is reduced by losses of the current period, but may be replenished by profits in the following periods. Hence, they may account for equity in the ME's balance sheet according to German accounting rules.[4] Nevertheless, the interest payments, which are composed of a fixed component, interest deferral surcharges and often a profit-related component, are tax-deductible.

From the ME's point of view, mezzanine loans are attractive because the buyer of these claims has almost no management or control rights. This is important because most MEs are privately owned and the entrepreneur does not like to share decision-making power with others. Instead, mezzanine loan financing contracts usually require MEs to provide lenders annual financial statements and quarterly

[3]Further examples are convertible bonds and equity like claims in a *typische/atypische stille Gesellschaft*. This paper concentrates on subordinated loans and PPAs as typical instruments to be securitised.

[4]According to the German commercial code HGB, capital is classified as equity if it satisfies the following four conditions: (i) subordination, (ii) long-term capital investment (more than 5 years), (iii) loss participation, (iv) profit related compensation. According to IAS 32, PPAs do not count as equity due to a fixed maturity.

Table 1: Overview of 'Middle Market' securitisations in Germany

Transaction	Date of issue	Volume (million €)	Number of loans	Average Loan Volume (million €)	Average Loan Rating
PREPS 2004-1	May 2004	249.0	34	7.3	BBB-
PREPS 2004-2	Dec 2004	616.0	67	9.2	BBB-
PREPS 2005-1	Jul 2005	313.0	51	6.1	BBB-
H.E.A.T. I 2005	Aug 2005	220.0	32	6.9	BBB-
PREPS 2005-2	Dec 2005	360.0	62	5.8	BBB-
FORCE 2005-1	Dec 2005	370.5	57	6.5	BBB
CB MezzCAP	Apr 2006	199.5	35	5.7	BBB
H.E.A.T. II 2006	Apr 2006	280.0	47	6.0	BB+
StaGe Mezzanine	Jun 2006	175.8	51	3.4	BBB
PREPS 2006-1	Jul 2006	321.0	61	5.3	BBB
		3,104.8	**497**		

Source: Moody's New Issue/Pre-Sale Reports, Deutsche Bank AG, JPMorgan

reports. However, if the rating of the ME deteriorates below investment grade, the buyer of a mezzanine loan might be entitled to interfere in the management process.

Summarizing, mezzanine loans can help MEs to increase the (economic) equity ratio at comparably low cost. An improved equity ratio allows the ME to obtain standard bank loans at better terms. The new securitisation structures, presented in the next section, stimulate the supply of mezzanine loans which eventually should lower the interest rates charged.

3 Securitisations of Mezzanine Loans

In 2004 the Capital Efficiency Group together with HypoVereinsbank (HVB) initiated the first German securitisation of subordinated loans and profit participation agreements granted to German MEs (PREPS 2004-1). Several mezzanine transactions - also by other large German banks - followed during the last two years, which are all listed in Table 1.[5] Up to July 2006, around 500 mezzanine loans with a total volume of more than 3 billion € were securitised in 10 *true-sale* transactions.

In contrast to standard SME loan securitisations, the mezzanine loans are not granted to MEs by a bank and then transferred to a SPV, but by the SPV itself as illustrated in Figure 3 in the appendix. Since the SPV is not a bank, middle market transactions are not arranged to obtain regulatory capital relief as it is the case for standard SME CLO-securitisations. Instead the main motive for

[5]There are also some loans of MEs in other European countries (especially Austria, Switzerland and Italy) in the PREPS portfolios, but most loans are of German companies.

Table 2: SME loan securitisations versus 'Middle Market' securitisations

	Standard SME CLO	**Middle Market CLO**
Motivation	regulatory capital relief	arbitrage profit
Underlying	existing portfolio of bank loans (large part secured)	portfolio of new subordinated loans, PPAs (unsecured)
No. of claims	> 200	$30 - 70$
Loan Volumes	200,000 to 1.5 million €	1 to 18 million €
Transaction Volume	often exceeds 1 billion €	175 to 650 million €
Junior Note Coupon[6]	no	yes

Source: Own presentation based on J.P. Morgan (2006)

the originating bank is to earn an arbitrage profit (see Table 2 for a comparison between standard SME CLO- and middle market CLO-securitisations). Hence, these transactions do not transfer the default risk of existing loans, but of newly granted loans. So far all mezzanine transactions are static, true-sale deals while standard SME loan securitisations are often synthetic.

Usually, the SPV cooperates with one or more German banks acting as intermediaries. Besides, other financial experts may be engaged in the process. As usual, a trustee has to safeguard the interests of investors buying bonds issued by the SPV. Rating agencies certify the ratings of claims and of issued bonds. Other financial advisors my help in the screening of obligors and in the monitoring of the transaction. In some transactions, a recovery manager is involved to sell off distressed loans or to restructure the obligor companies so as to improve the value of distressed loans.

The obligors in middle market transactions have to pass a strong screening process before being selected for the portfolio. They should have an investment grade rating, generate an annual turnover above 50 million € (see *Maier* 2006) and have capital needs of at least 1 million €. In fact, relatively large loan volumes (1 - 18 million €) are a special feature of mezzanine transactions. Hence, until now small enterprises do not have access to middle market transactions. Moreover, as indicated in Table 1, the number of loans in these transactions is relatively small so that the loan portfolios are not well diversified making them more vulnerable to economic downturns. In contrast, securitisations of SME standard loan portfolios are more granular (often more than 200 loans) and characterised by small average loan volumes, mostly between 200,000 € and 1.5 million € (see *HVB Corporates & Markets* 2005). Furthermore, the volume of a standard SME loan securitisation usually exceeds 1 billion €, much more than the volume of middle market securitisations.

In a typical middle market transaction the underlying mezzanine loans have

a seven-year bullet maturity without any call provision of the obligor. In general, the claims are unsecured. The types of loan instruments differ across mezzanine transactions. For example, the portfolios underlying the PREPS transactions consist only of subordinated loans or debt-like PPAs without any loss participation or interest deferral possibilities. In these transactions obligors pay a fixed interest coupon plus a stepwise profit dependent component of 1% respectively 2%. For example, *Q-Cells AG* (2005), one of the portfolio companies in PREPS 2004-2 with a 15 million € obligation, states in its annual report that it pays a fixed interest of 7.5% as long as the adjusted net income of the same year is less than 45 million €, 8.5% if it is between 45 and 55 million € and 9.5% if it is above 55 million €. The transactions H.E.A.T. I and CB MezzCAP comprise a mixture of subordinated loans (approximately one third) and PPAs. The portfolio in FORCE 2005-1 is mainly composed of PPAs (91%) which allow for interest deferral and even loss participation. In this transaction the obligors must pay an additional interest if they do not provide annual statements in time.[7]

The fixed interest payable in all these transactions ranges between 6.5% and 9.5% depending also on the ME's rating. The average fixed interest rates of each transaction are given in Table 3. These rates are far below comparable interest rates required by mezzanine investment funds (between 13% and 16%, see *Dentz* 2006). This cost differential still remains substantial if the MEs have to pay profit-related premiums and/or a surcharge for interest deferral. This differential is presumably due to some standardisation of contracts which reduces transaction costs but which also implies less contractual flexibility for the obligors. Additionally, the securitisation of mezzanine loan portfolios may generate benefits which also justify lower interest rates.

The SPV obtains the funds for the loans by issuing bonds. These bonds have the same maturity as the loans. Hence the securitisation is not exposed to liquidity risks induced by revolving short-term commercial paper funding. Several tranches of bonds are issued. Usually, these tranches are strictly subordinated, i.e. a tranche suffers from default losses only if all subordinated tranches are completely exhausted by default losses. The most subordinated tranche, which first absorbs all default losses up to its par value, is the *First Loss Position* (FLP). It is non-rated and also called *equity tranche* or *junior tranche*. In a typical loan securitisation transaction the FLP absorbs more than two thirds of the expected default loss of the underlying loan portfolio (*Franke, Herrmann and Weber* 2007).

Due to profit-related components in interest rates, interest deferral and loss participation, the performance of mezzanine portfolios is difficult to forecast. Therefore, rating agencies require high FLPs for middle market transactions. They range between 9.9% and 21% - apart from 4.5% in CBMezzCAP. Usually,

[6]In contrast to standard SME CLOs, the junior note of a middle market CLO receives a coupon which is explicitly stated in the offering circular.

[7]Typical instruments used in the FORCE 2005-1 transaction are further explained in appendix A.

the FLPs are not retained by the originator, but split between the originating parties and a third party or even completely sold to third-parties. A full sale of the FLP may raise investor concerns about moral hazard of the originator. Given a full sale, the originator bears no default risk. Hence he has little motivation to monitor the obligors. This may raise the risks in those transactions.

The originating bank benefits from the transaction in various ways. It collects initial and ongoing fees from the SPV for structuring the transaction, servicing the loans and managing the SPV. Often it acts as a swap counterparty, thus it may also extract a swap rent. For example, an interest swap is required to match the gap between the predominantly fixed interest income from the loans and the typically floating interest payments to the tranches. More importantly, if at the termination of the transaction a surplus remains in the SPV, this surplus is distributed to the originating bank, other parties involved in the SPV and, perhaps, the owners of the FLP.

4 Risk-Return Characteristics of the Underlying Portfolios

We now analyse the risk-return characteristics of the portfolios underlying mezzanine securitisations. This helps to answer the question why it is possible for SPVs to charge much lower interest rates in middle market transaction-loans as compared to other mezzanine loans.

4.1 Some Portfolio Data

Offering circulars and Moody's New Issue respectively Pre-Sale reports about the transactions contain information about volumes of the mezzanine loans, obligor ratings in the underlying portfolios as well as the weighted average coupons. Based on this information, we derive some rough measures to evaluate the underlying portfolio. The first measure is the present value of the portfolio using a standard bond valuation model. The second measure estimates the annual profit margin a bank would earn on buying the portfolio at par value.

The present values of the portfolios at the issuance date of each transaction are calculated assuming that each loan has a bullet maturity of 7 years and is charged the weighted average interest coupon. Since the securitisation of loans causes transaction costs, these costs are subtracted from the annual contractual payments. The assumed annual transaction costs are depicted in Table 3, based on information given in some offering circulars.[8] To account for the risk, the net payments are discounted at the risk-free rate plus the credit spread of comparable

[8]The present analysis does not distinguish between senior and subordinated expenses. Instead the sum of those two is taken for the calculations.

corporate bonds. In particular, the risk-free rate is assumed to equal the index value of the *iBoxx € Eurozone 5-7 years* (Sovereign Index) at the issue date of each transaction. As a credit spread, we take the spread of the *iBoxx Corporate BBB 5-7 years* index. This index contains mainly senior bonds with an average rating of BBB.[9] In contrast the portfolios considered here contain only subordinated instruments with a higher loss given default and a lower average rating of BBB-. To account for the higher expected loss, we take twice the corresponding iBoxx spread at the issue date for discounting.[10] The doubled spread ranges between 130 and 170 basispoints.

The results are shown in Table 3. As can be seen, the present values at issuance clearly exceed the nominal value by 7% up to 13%. This means that the interest paid by the obligors more than compensates for the risk of the mezzanine loans provided that our spread assumptions are correct. The excess value is presumably to a large part due to liquidity premia incorporated in the interest rates charged on the loans. In fact this surplus is earned by the originating parties when securitising the loan portfolios and issuing bonds amounting to 100% of the nominal value. It is extracted from the transaction partly by swap rents and partly by the right to withdraw excess spread, i.e. the annual difference between interest income paid by obligors and interest expense paid on issued bonds net of transaction costs.

In order to study the costs and the corresponding profit margins of the underlying portfolios in more detail, we next take the view of a bank evaluating such a portfolio. In particular, the expected annual costs, which have to be covered by the portfolio interest rate, i.e. the weighted average loan interest rate, are composed of the weighted average expected annualized default loss, a default risk premium, perhaps a liquidity premium, the transaction costs of securitisation and the funding costs of buying the portfolio. An annual profit margin defined as the portfolio interest rate minus the expected annualized default loss, minus the transaction costs and minus the funding costs can be derived for each transaction. This profit margin should cover the default risk premium and the liquidity premium.

The expected annualized default loss can be inferred from the information on the obligor ratings. For each obligor we use the initial rating stated in the offering circular and derive the probability of default according to the idealized table of Standard & Poor's. This table assigns to each rating and each maturity a probability of default. Dividing this probability by the maturity yields the annualized default probabilities. These are weighted with the volumes of the loans to obtain the weighted annualized default probability. Since MEs might exhibit higher default probabilities than given in these tables, we stress our results by repeating

[9] The iBoxx index does not differentiate for notches within one rating class.

[10] According to *Standard & Poor's* (2005) a bond rated BBB- exhibits a default probability roughly twice as high as a bond rated BBB given a maturity of 7 years. Together with a high loss given default this justifies doubling the iBoxx spread.

Table 3: This table presents the present values of the portfolios underlying the ten mezzanine transactions. The first column denotes the transaction. The second column shows the risk-free rate, assumed to equal the *iBoxx € Eurozone 5-7 years* at the issue date of each transaction. Then the weighted average coupon taken from the offering circular is given. The next two columns depict the assumptions about the annual transaction costs, split into senior and subordinate expenses, based on the offering circulars. If such information is not available, it is assumed that the costs are equal to those of similar transactions. Set-up costs are irrelevant since they are charged separately to the obligors. (Exception: In FORCE 2005-1 the originator has a super-senior claim of 150 bps in the first period to cover set-up costs.) The sixth column depicts the present value at the issuance date, which is derived by discounting the contractual cashflows minus transaction costs at the risk-free rate plus twice the *iBoxx Corporate BBB 5-7 years* credit spread at the issuance date. The last column denotes the present value in percent of the initial nominal value.

Transaction	**Risk-free Rate**	**Average Coupon**	**Transaction Costs**		**PV at issuance (in million €)**	**Percentage of Nominal Value**
			Senior Exp. (bps)	**Subord. Exp.** (bps)		
PREPS 2004-1	3.75%	7.90%	30	50	273.14	109.70%
PREPS 2004-2	3.15%	7.50%	30	50	693.90	112.65%
PREPS 2005-1	2.90%	6.80%	50	50	342.84	109.53%
H.E.A.T. I 2005	2.90%	7.40%	50	50	248.84	113.11%
PREPS 2005-2	3.15%	6.91%	40	65	387.63	107.68%
FORCE 2005-1	3.15%	7.90%	40	60	416.40	112.39%
CB MezzCAP	3.80%	7.74%	50	50	217.15	108.85%
H.E.A.T. II 2006	3.80%	7.96%	40	60	308.36	110.13%
StaGe Mezzanine	3.90%	8.14%	30	65	191.63	109.00%
PREPS 2006-1	3.90%	7.78%	30	65	343.42	106.98%

the calculations assuming an initial rating two notches below the original rating (*notching approach*). The annualized expected default loss is then calculated by assuming a loss given default of 80%, i.e. a recovery rate of 20%, which accounts for the highly subordinated character of the underlying mezzanine loans and the fact that there is no collateral for these loans. Alternatively, a recovery rate of even 0 is assumed to stress also this assumption. In fact the rating agencies also use recovery rates close to 0 (see *Standard & Poor's* 2005 or *Moody's New Issue Reports*). *Acharya et al* (2007) find recovery rates on junior subordinated claims with an average of 18.28% and a median of 6.25%. Concerning the transaction costs we take the same assumptions as in Table 3. The funding costs are assumed to equal the risk-free rate plus a spread of 30 basispoints. This spread is slightly above the mean spread of the *iBoxx € Corporates AA 5-7 years*.

The derived expected annualized default loss and transaction costs plus funding costs are subsequently subtracted from the portfolio interest rate to derive the annual profit margin of the portfolio. The corresponding results for all ten middle market transactions are shown in Table 4.

As Table 4 shows, the annual profit margins are quite high, using the original obligor ratings. In fact, they are far above comparable corporate bond spreads. As noted before, the spread of the *iBoxx Corporate BBB 5-7 years* index ranges between 65 and 85 basispoints. Doubling this spread yields 130 and 170 basispoints. The profit margins are always higher except for some transactions in the case of assuming an initial rating two notches below the original rating.

Interestingly, the change from a recovery rate of 20% to 0% has only a small effect since the average probability of default is low. Given, for example, an annual default probability of 0.69% for the PREPS 2004-1 transaction (fourth column in Table 4), an increase of the recovery rate from 0 to 20% reduces the expected loss only by $0.69\% * 0.2 = 0.138\%$ to 0.552%. The picture changes when the original obligor ratings are downgraded by two notches. Then the average portfolio rating is around BB+/BB- and the annual profit margin declines by about 60% and more. Hence a rating error has much more serious implications than an error in estimating the recovery rate.

Returning to the question why mezzanine loans are so much cheaper in securitisation transactions than otherwise, the previous results indicate that originating banks still earned a substantial profit. However, the picture looks different in view of the doubling of many credits spreads in the subprime crisis. Relative to these spreads, some mezzanine loans maybe underpriced in securitisation transactions.

4.2 Simulation of Portfolio Cashflows

The previous results provide a first guess about the portfolio characteristics, ignoring diversification effects as well as effects of timing of default. In the following we therefore simulate the portfolio cashflows taking these effects into account. The cashflow simulation model is explicitly described in appendix C. Basically, we

Table 4: The table provides figures on the annual profit margin of portfolios underlying middle market transactions, defined as the weighted average loan interest rate minus the expected annualized default loss and the transaction costs. The first column denotes the transaction. The next columns depict the expected annualized default loss and the annualized profit margin assuming a recovery rate (RR) of 20% resp. 0%. The last columns illustrate the results for the notched ratings, starting two notches below the original rating.

Transaction	**original obligor ratings**				**notched obligor ratings**			
	20% Recovery		**0% Recovery**		**20% Recovery**		**0% Recovery**	
	Exp. Loss	Profit margin	Exp. Loss	Profit margin	Exp. Loss	Profit margin	Exp. Loss	Profit margin
PREPS 2004-1	0.552%	2.498%	0.690%	2.360%	1.160%	1.890%	1.450%	1.600%
PREPS 2004-2	0.482%	2.768%	0.602%	2.648%	1.033%	2.217%	1.291%	1.959%
PREPS 2005-1	0.478%	2.122%	0.598%	2.002%	1.056%	1.544%	1.319%	1.281%
H.E.A.T. I 2005	0.421%	2.779%	0.527%	2.673%	0.956%	2.244%	1.195%	2.005%
PREPS 2005-2	0.478%	1.927%	0.598%	1.807%	1.057%	1.348%	1.321%	1.084%
FORCE 2005-1	0.396%	2.840%	0.495%	2.741%	0.897%	2.338%	1.122%	2.114%
CB MezzCAP	0.483%	2.157%	0.604%	2.036%	1.094%	1.546%	1.368%	1.272%
H.E.A.T. II 2006	0.457%	2.406%	0.571%	2.292%	0.994%	1.869%	1.242%	1.621%
StaGe Mezzanine	0.597%	2.393%	0.746%	2.244%	1.300%	1.690%	1.625%	1.365%
PREPS 2006-1	0.544%	2.089%	0.680%	1.953%	1.146%	1.488%	1.432%	1.201%

Source: Own calculations and assumptions based on information in the Offering Circulars.

model annual rating migrations of the loans in the underlying portfolio. Again, a recovery rate of 20% is assumed in the base case in order to account for the highly subordinated character of the mezzanine loans. This assumption is stressed by assuming a recovery rate of 0% in an alternative simulation. Thus we derive annual cashflows from the underlying portfolio and compound them to the maturity date after seven years.

Up to now, there exist no reliable data of rating transitions in the ME sector. In order to account for possibly higher default rates of MEs, a notching approach is again used as it is also done by the rating agencies (e.g. *Standard & Poor's* 2006). In particular, the simulation results derived from the original ratings are stressed by repeating the simulation starting from a rating two notches lower than the original rating. For example, a claim with an original rating of BBB starts with BB+ in the second simulation. This notching approach should also - at least partially - account for possible interest deferral and loss participation, which have a similar impact on the value of a claim as an increase in the default probability.[11] The corresponding weighted average annualized default probabilities are also shown in Table 4 since for a recovery rate of 0%, that is a loss given default of 100%, the annualized expected loss equals the annualized default probability.

Given the simulated realised cashflows of each simulation run the total portfolio loss rate at the termination date is subsequently calculated as

$$Terminal\ Loss\ Rate = 1 - \frac{accumulated\ received\ payments}{accumulated\ contractual\ payments} \quad .$$

Thus the *Terminal Loss Rate Distribution* of the underlying portfolio is derived by simulation.

The simulated terminal loss rate distributions of the portfolio underlying PREPS 2005-2 for different model specifications are illustrated in Figure 1. As can be seen, again the effect of increasing the recovery rate from 0% to 20% is much smaller than the effect of increasing the default probability by starting two notches below the original rating.

Table 5 presents some descriptive statistics of the simulated loss rate distributions for the original as well as the notched rating approach given a recovery rate of 20%. Whereas the expected terminal loss rate is between 2.5% and 3.5% starting with the original obligor ratings[12] (given the time horizon of seven years), it more than doubles when departing from two rating notches below. Also the standard deviation is substantially increased. Additionally, the table gives the 99%-quantile of the loss rate distribution.

It should be noted once more, that the model does not explicitly account for the typical mezzanine characteristics of the portfolio claims such as profit-related

[11] Ratings given in the offering circulars are company ratings and not claim specific.

[12] These figures differ from those in Table 4 because the simulation also includes interest.

Figure 1: The Figure illustrates the Terminal Loss Rate distribution of the portfolio underlying PREPS 2005-2. Different simulation specifications are considered: The first simulation takes the original ratings as a departure point and assumes a recovery rate of 20%. Alternatively, the second simulation uses ratings two notches below the original ones as a starting point. The same simulations are repeated for a recovery rate of 0%.

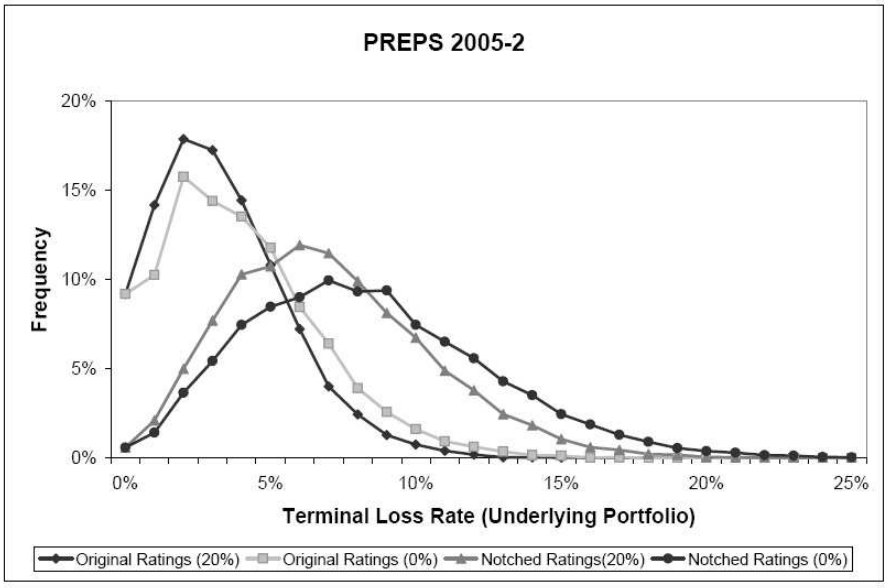
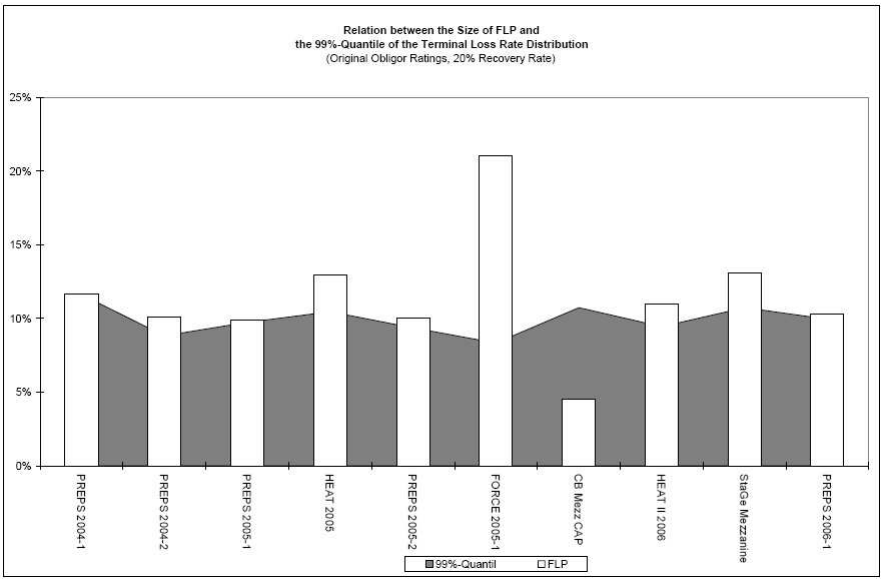


Table 5: This table presents some descriptive statistics concerning the Terminal Loss Rate Distribution of the underlying portfolio. These are the expected terminal loss rate over seven years, the corresponding standard deviation as well as the loss rate at the 99%-quantile. Columns 2 to 4 depict the results starting from the original obligor ratings and assuming a recovery rate of 20%. The last three columns present the same statistics starting from an initial rating two notches below the original rating.

Transaction	**original obligor ratings**			**notched obligor ratings**		
	Exp. Loss Rate	**Std. Dev.**	**99% Quantile**	**Exp. Loss Rate**	**Std. Dev.**	**99% Quantile**
PREPS 2004-1	3.226%	2.853%	11.605%	7.034%	4.272%	18.932%
PREPS 2004-2	2.839%	2.012%	8.823%	6.282%	3.072%	14.726%
PREPS 2005-1	2.857%	2.304%	9.738%	6.488%	3.579%	16.422%
H.E.A.T. I 2005	2.506%	2.526%	10.455%	5.858%	4.012%	17.651%
PREPS 2005-2	2.862%	2.214%	9.364%	6.505%	3.421%	15.848%
FORCE 2005-1	2.294%	1.905%	8.341%	5.416%	3.013%	13.766%
CB MezzCAP	2.801%	2.586%	10.726%	6.587%	4.157%	18.523%
H.E.A.T. II 2006	2.666%	2.278%	9.440%	5.991%	3.489%	15.405%
StaGe Mezzanine	3.510%	2.497%	10.735%	7.815%	3.880%	18.723%
PREPS 2006-1	3.172%	2.305%	9.940%	6.889%	3.483%	16.332%

Figure 2: The Figure illustrates the relation between the volume of the junior notes in percent of the transaction volume and the 99%-quantile of the terminal loss rate distribution starting from the original ratings and assuming a 20% recovery rate.



interest components, interest deferrals, deferral surcharges and loss participations. The notching approach accounts for the value impairing characteristics excluding the value enhancing characteristics. These may be captured, to some extent, by the assumed higher recovery rate of 20%.

5 Analysing Tranching

Having analysed the risk-return characteristics of the underlying portfolios, we now turn to the tranching of the middle market transactions. Most of the transactions have two rated tranches (AAA and A+/A) and one non-rated junior note. In contrast, in PREPS 2004-1 only one rated tranche (AA), in FORCE 2005-1 four rated tranches (AAA, AA, A, BBB) and in CB MezzCap even five rated tranches (AAA, AA, A, BBB, BB) are issued. Table 6 presents the sizes of the best tranche as well as the junior note size defined by the par value of the tranche over the total transaction volume. The best tranche is smallest for those transactions with more than two rated tranches and highest for PREPS 2004-1 with only one rated tranche. The hard credit support (i.e. the portfolio loss rate above which a tranche incurs losses) for the best tranche varies between 11% and 36%.

The size of the junior note depends on the properties of the loss rate distri-

Table 6: This table presents some facts on the tranching of middle market transactions. In the second column the size of the super-senior tranche defined as the par value of the tranche relative to the par value of the transaction is depicted. The third column shows the size of the Junior Notes. Column 3 gives the Junior Note Coupon. This Coupon increases for the PREPS and H.E.A.T. transactions. The first (last) number denotes the initial (final) interest rate. In column 4 the profit participation of the junior note holders is given, if such exists. This can be a terminal repayment agio (RA, in percent of the initial par value) or an annual share in the profits (PS) after the Junior Coupon is paid (in percent of the remaining surplus).

Transaction	**Super Senior**	**Junior Note**	**Junior Note Coupon**	**Add. Profit Participation**
PREPS 2004-1	88.35%	11.65%	22%	-
PREPS 2004-2	75.94%	10.07%	18.10% to 19.71%	RA: 36%
PREPS 2005-1	75.08%	9.90%	17.00% to 18.34%	RA: 43%
H.E.A.T. I 2005	71.55%	12.96%	17.15% to 19.10%	RA: 25%
PREPS 2005-2	75.00%	10.00%	14.50% to 16.26%	PS: 100%
FORCE 2005-1	63.70%	21.00%	20.19% resp. 19.14%	-
CB MezzCAP	69.07%	4.51%	17.00%	PS: 99.9%
H.E.A.T. II 2006	78.00%	11.00%	17.15% to 19.10%	RA: 25%
StaGe Mezzanine	75.54%	13.08%	23.9%	PS: 49.95%
PREPS 2006-1	74.46%	10.28%	14.50% to 16.67%	PS: 99.99%

Source: Offering Circulars.

bution and the lowest rating of the notes above the junior note. A first rough guess shows that the size of the junior note is, on average, slightly above the 99%-quantile of the loss rate distribution, given the original rating and a 20 percent recovery rate. This is also illustrated in Figure 2. The striking exceptions are FORCE 2005-1 and CB Mess CAP. Not surprising, in the latter transaction the lowest rating of the note above the junior tranche is BB allowing for a small junior tranche. Puzzling is that in FORCE 2005-1 with the lowest tranche rating being BBB the junior tranche is much higher (21 percent) than the 99%-quantile of the loss rate distribution given the *notched* rating and a 20 percent recovery rate (13,8 percent). Perhaps risk factors, not publicly known, matter.

5.1 Modelling the Tranche Payments

We determine tranche payments at annual payment dates by applying the typical "CDO-waterfall" as described in appendix C. Thereby we account for several peculiarities of middle market transaction. In particular, it is a special feature of middle market transactions that the junior note, which is often (at least partially) sold to outside investors, bears a *Junior Note Coupon* which is explicitly

stated in the offering circulars and which is paid after all expenses and interest payments to rated tranches. For example, in the PREPS and H.E.A.T. transactions the junior note gets a steadily increasing coupon according to a specified schedule given in the offering circular. The initial and the final coupons of these schedules are depicted in Table 6 together with the junior note coupons in the other transactions.[13]

Concerning the excess cashflow after paying this junior note coupon, that is after paying all expenses and all interest claims, we have to differentiate between the analysed transactions. In CB MezzCap and StaGe Mezzanine the excess cashflow is first used to replenish a reserve account up to a specified cap.[14] In all other transactions, there is no reserve account. Instead the remaining excess spread is directly paid out to the general and limited partners of the SPV. In some transactions this surplus is also shared with the junior note as additional interest. The corresponding junior note participation rates (in percent of the remaining surplus), are presented in column 5 of Table 6 (indicated by PS). In fact this remaining part of the portfolio cashflow can be a substantial amount. If no losses in the underlying portfolio occur, that is in the best case, this surplus accounts for 6% up to 8% of the transaction volume in most of the transactions.

At maturity, a further peculiarity of middle market transactions concerning the junior note needs to be taken into consideration. In some structures the repayment amount of this non-rated tranche after seven years is raised by an agio defined as a percentage of the par value of the junior note. As shown in column 5 of Table 6, in those transactions with repayment agios (indicated by RA), the repayment amount exceeds the initial nominal value by 25% up to 43%. This agio can also be interpreted as an additional profit participation.

Based on these assumptions we can derive the accumulated tranche losses at maturity in each simulation run by comparing the received payments with the contractual payments. Hence, the payoff profiles and risk characteristics for each tranche including the junior note are determined.

5.2 Simulated Junior Note Characteristics

As mentioned before, part or all of the junior tranche in a middle market transaction is sold to outside investors. Therefore, we ask whether this tranche is a profitable investment. To answer this question, some payoff characteristics of the junior note are derived based on the simulations. The key figures describing the junior note of each transaction are presented in Table 7 and 8 for four simulation scenarios. The base case is again defined by the original obligor rating and a

[13] In FORCE 2005-1 20.188% p.a. are paid for the first 18 months followed by 19.138% p.a. Regarding StaGe Mezzanine the Junior Note gets EURIBOR + 20%. For the simulation a constant risk-free rate at 3.9% is assumed.

[14] E.g. 4 million € in CB MezzCap resp. 5% of the outstanding volume of rated tranches in StaGe Mezzanine.

recovery rate of 20%. In order to test for the robustness of our results these assumptions are stressed by reducing the recovery rate to 0% and/or reducing the obligor ratings by two notches. Altogether four scenarios are studied.

(a) The Expected Internal Rate of Return

First, an investor may be interested in the expected internal rate of return (IRR), which is defined as the rate, that solves:

$$\sum_{t=1}^{T} \frac{E[Payoff_t]}{(1+IRR)^t} \stackrel{!}{=} Price_{Issue\ Date}$$

where $T = 7$. In general, the junior tranche is issued at par.[15]

In the simulations, which start from the original obligor ratings and a recovery rate of 20%, the junior notes exhibit high expected internal rates of return between 15% and 25% (Table 7). Assuming a recovery rate of 0%, the expected IRRs are only slighty reduced. The highest possible internal rates of return range between 17% and 29% (last column of Table 7).[16] These results are due to a high excess spread, that is a high interest differential between the asset and the liability side of the transactions, which is around 3%. In fact, the portfolio companies pay interest much higher than the interest paid on the tranches. Even after accounting for transaction costs of around 1%, this high margin is enough to cover a large part of default losses and to pay high interest to the junior tranche and sometimes even an additional performance premium.

The simulated returns depend on the assumptions concerning the portfolio performance. As noted before, it might be too optimistic to start with the original ratings in the simulation. Therefore the results given the notching approach, in which the portfolios' default probabilities are approximately doubled, are also shown in Table 7. But even in this stressed scenario the expected internal rate of return on the junior note is still above 10% for a recovery rate of 20%. If, however, the recovery rate is reduced to 0%, then the expected internal rate of return is below 10% for half the transactions.

(b) The Sharpe Ratio

In order to relate the expected IRR of the junior note to its risk, the Sharpe Ratio given by

$$Sharpe\ Ratio = \frac{Exp.\ IRR - riskfree\ rate}{annualized\ standard\ deviation} \quad ,$$

is also depicted in Table 7. Given the original ratings and a recovery rate of 20 percent, all transactions except CBMezzCAP have a Sharpe Ratio above 2, with a

[15] One exception is FORCE 2005-1. In this transaction, the issue price of the junior note is actually 101.17%. Therefore the IRR is calculated based on this issue price.

[16] For the PREPS 2004-2 transaction, *J.P. Morgan Securities Ltd.* (2004) arrives at similar results in their presentation for potential investors.

Table 7: The table presents some return characteristics of the Junior Notes for different simulation specifications. The first column denotes the transaction. The next four columns depict the results departing from the original obligor ratings and assuming a recovery rate (RR) of 20% resp. 0%. For each specification, the expected internal rate of return and the Sharpe Ratio is presented. Columns 6 to 9 illustrate the results for the notched ratings, starting two notches below the original rating. The last column shows the maximum possible internal rate of return. This figure is the same for all specifications. Only the probability of this return changes.

Transaction	**original obligor ratings**				**notched obligor ratings**				
	20% Recovery		**0% Recovery**		**20% Recovery**		**0% Recovery**		
	Exp. IRR	Sharpe Ratio	Exp. IRR	Sharpe Ratio	Exp. IRR	Sharpe Ratio	Exp. IRR	Sharpe Ratio	**Max IRR**
PREPS 2004-1	16.15%	2.00	14.88%	1.32	10.98%	0.70	7.61%	0.27	19.76%
PREPS 2004-2	16.90%	3.06	15.96%	2.11	12.57%	1.22	9.63%	0.59	19.91%
PREPS 2005-1	15.19%	2.24	14.02%	1.46	10.32%	0.79	6.76%	0.27	18.39%
H.E.A.T. I 2005	16.51%	3.06	15.74%	2.09	13.22%	1.29	10.90%	0.69	18.63%
PREPS 2005-2	23.25%	4.09	22.54%	3.25	17.94%	1.78	16.40%	1.45	26.68%
FORCE 2005-1	15.83%	5.00	15.51%	4.00	13.38%	2.26	12.50%	1.66	17.43%
CB MezzCAP	17.15%	1.68	15.42%	1.06	10.37%	0.46	5.83%	0.10	20.00%
H.E.A.T. II 2006	16.12%	2.58	15.16%	1.71	12.13%	1.00	9.24%	0.44	18.82%
StaGe Mezzanine	22.09%	4.21	21.35%	3.22	16.98%	1.61	14.96%	1.12	25.01%
PREPS 2006-1	24.95%	4.26	24.18%	3.40	19.53%	1.93	17.95%	1.59	28.71%

maximum of 5 for FORCE 2005-1. A Sharpe Ratio higher than 2 clearly indicates a profitable investment. Comparable investments, like investing in a diversified equity index (SDAX or TecDAX) exhibit Sharpe Ratios below 1, Private Equity Funds usually exhibit Sharpe Ratios below 2.[17] Even for the notching approach and a high recovery rate most Sharpe Ratios stay above 1, which is still attractive to outside investors. But for the notching approach and a zero recovery rate, the Sharpe Ratio is very low in three transactions.

(c) The Downside Risk

Since the return distributions are skewed to the left, the downside risk of the junior note is important for the value at risk. To illustrate this risk, (1) the probability that the terminal payoff is less than the payoff which could be generated by investing at the risk-free rate, and (2) the internal rate of return at the 1%-quantile are presented in Table 8.

The downside risk is very low starting from the original ratings. In most of the transactions, the probability to get less than the risk-free rate on the initial investment is less than three percent and therefore almost negligible. For the original obligor ratings and a recovery rate of 20 percent, the internal rates of return at the one percent quantile are always positive (except for CB MezzCap) indicating that an investor does not lose money. The exception is explained by the very small size of the junior note. Although the downside risk substantially increases using the more conservative notching approach, downside risk remains low as compared to other investments. In three transactions the probability to earn less than the risk-free rate is still less than 3 percent, regardless of the assumed recovery rate. However, given the notching and a zero recovery rate, the 1%-quantile-IRR indicates a loss of more than 50 percent of the investment in 7 transactions. Apart from CB MezzCap with a very small junior note, among the other 6 transactions are those with a small number of loans implying little diversification. This demonstrates the strong impact of size and diversification on the risk of the junior tranche. Small size and low diversification not only imply a strong risk for the junior note, but also a high probability that the rated tranches suffer default losses.

To sum up, the simulation results support the view that an investment in the junior note of the analysed mezzanine transactions is mostly attractive for outside investors. Even in the scenario where the original ratings are stressed by two notches this position mostly exhibits quite favourable risk-return characteristics as long as the recovery rate is at 20%. The favorable risk-return characteristics of junior notes are presumably induced by the fact that junior notes are partly sold to other banks. These have to support the investment in junior notes with high equity capital which is considered costly. According to the Basel II banks have

[17] For example, the Oppenheim Private Equity Fonds or Deka Private Equity Fonds usually exhibit Sharpe Ratios around 1.8 (see www.boerse-online.de).

Table 8: The table presents some figures describing the downside risk of the Junior Notes in different scenarios. First the probability that the terminal payoff (TP) is less than the payoff which could be generated by investing in the risk-free rate (RF) is shown. Second, the internal rate of return, which corresponds to the 1%-Quantil of the terminal payoff distribution, is given.

Transaction	**original ratings**				**notched ratings**			
	20% Recovery		**0% Recovery**		**20% Recovery**		**0% Recovery**	
	$Prob$ $(TP < RF)$	1% IRR	$Prob$ $(TP < RF)$	1% IRR	$Prob$ $(TP < RF)$	1% IRR	$Prob$ $(TP < RF)$	1% IRR
PREPS 2004-1	2.85%	0.68%	8.65%	-10.14%	23.48%	-13.61%	41.02%	-47.96%
PREPS 2004-2	0.21%	7.13%	2.11%	0.51%	6.93%	-2.16%	25.49%	-20.07%
PREPS 2005-1	1.41%	1.65%	5.83%	-5.69%	19.58%	-8.85%	39.07%	-49.04%
H.E.A.T. I 2005	0.55%	6.18%	2.41%	-1.31%	7.98%	-5.22%	20.73%	-34.02%
PREPS 2005-2	0.02%	11.29%	0.03%	8.74%	1.30%	2.86%	2.24%	1.97%
FORCE 2005-1	0.00%	10.71%	0.03%	9.03%	0.58%	4.68%	2.53%	0.56%
CB MezzCAP	5.79%	-8.26%	14.24%	-22.92%	31.77%	-30.14%	53.04%	-30.14%
H.E.A.T. II 2006	0.75%	5.19%	3.73%	-2.97%	12.89%	-5.23%	30.23%	-23.11%
StaGe Mezzanine	0.12%	12.39%	0.42%	7.36%	5.45%	-1.24%	11.86%	-9.61%
PREPS 2006-1	0.02%	13.30%	0.03%	10.38%	1.11%	3.93%	1.80%	2.87%

to deduct the volume of the junior note from their equity capital (see *Bank for International Settlements* 2005). Hence banks are unlikely to buy junior notes with low expected IRRs.

Furthermore, it should be noted that so far observed default rates in SME pools are quite low (see *J.P. Morgan* 2006). Additionally, one has to bear in mind the reputational costs for the originating banks in case of bad portfolio performance. This might explain why Commerzbank repurchased the NICI exposure from the CB MezzCap transaction after NICI's insolvency. Thereby a downgrade of the transaction was avoided (see *FINANCE* 2006a).

6 Conclusion

This paper analyses mezzanine transactions, which represent a new trend in the German securitisation market.

The findings indicate that these transactions are attractive to originators and investors. The estimated present values of these transactions indicate a sizable "arbitrage profit" for the originators. Securitisations are also attractive for originating banks, because they often earn fees for administering the transaction and may benefit from swaps with the SPV. Additionally, they get part of the profits earned by the SPV. Regarding the junior tranches, even under pessimistic assumptions and ignoring profit participations, they mostly yield high expected internal rates of return at low downside risk. This indicates a strong desire of the originators to sell part of the junior notes to outside investors, including banks. Given bank equity costs, the return needs to be high to render the junior note an attractive investment for banks.

Also MEs gain from middle market securitisations because these transactions fuel the supply of mezzanine loans and stimulate the competitive pressure in the market for these instruments. This may also explain why the interest rates charged on these loans are relatively low. Mezzanine loans can strengthen (economic) equity and thus increase MEs' creditworthiness. But a stringent screening process has to be passed to get into the pool of such a transaction. Looking at statistics concerning current portfolio companies, for example in PREPS 2004-2, only 15% of the enterprises reported an annual turnover of less than 50 million €, 20% were even above 300 million € (see *JPMorgan* 2004). Furthermore, only about 39% of all obligors in the FORCE 2005-1 portfolio employed less than 400 employees, but 21% more than 1000. Hence, the portfolios consist not only of MEs but also of large enterprises.

Middle market securitisations will presumably grow further. Up to July 2006, only 432 different obligors, 396 German enterprises and 36 from other European countries, joined one or more of the current transactions (see *FINANCE* 2006). Therefore, a large pool of companies is still in the pipeline. Whether the subprime crisis puts a strong brake on these transactions, needs to be seen. The strong

increase in credit spreads will induce higher interest rates on mezzanine loans and, thus, reduce MEs' appetite for these loans. More importantly, to foster financial stability, these transactions should include a higher number of loans so as to improve diversification. Also, the junior tranches should absorb a large fraction of default losses and the originator should retain a substantial portion of the junior tranche to improve investor confidence.

Appendix

A Mezzanine Instruments underlying FORCE 2005-1

The offering circular of FORCE 2005-1 generally allows for three different types of underlying instruments, called **equiNotes**, which will be presented in the following:[18]

- **equiNotes Type A** (Profit Participation Agreements, *Genussrechte*)

  These notes build the main part of the portfolio and pay a fixed interest coupon except if one of the following conditions for interest deferral is fulfilled:

  (i) no annual surplus according to §266 HGB

  (ii) no balance sheet profit according to §268 HGB in the relevant fiscal year or

  (iii) no distributable reserves available.

  In case of interest deferral, the cumulative interest payments plus a *surcharge due to payment pattern* are due at the next payment date at which the company reports a profit or has distributable reserves available. If there are deferred interest payments left after the first seven years, the maturity of the claim can be extended up to 29 years. Furthermore Type A equiNotes allow for loss participation if there are no distributable reserves left. But even in case of loss participation the interest stays payable and the notional amount has to be refilled in the subsequent years if there are any profits.

- **equiNotes Type A*** (Subordinated Loans)

  In contrast to Type A, these notes pay a fixed coupon, independent of obligors' profits, and an additional, but very small, variable component (0.25%) for which the same conditions hold as for the Type A interest. Interest deferral and loss participation are excluded. Therefore equiNotes Type A* are not recognized as equity under the German accounting rules in contrast to the Type A equiNotes.

- **equiNotes Type B** (perpetual PPAs, *Vorzugskapital*)

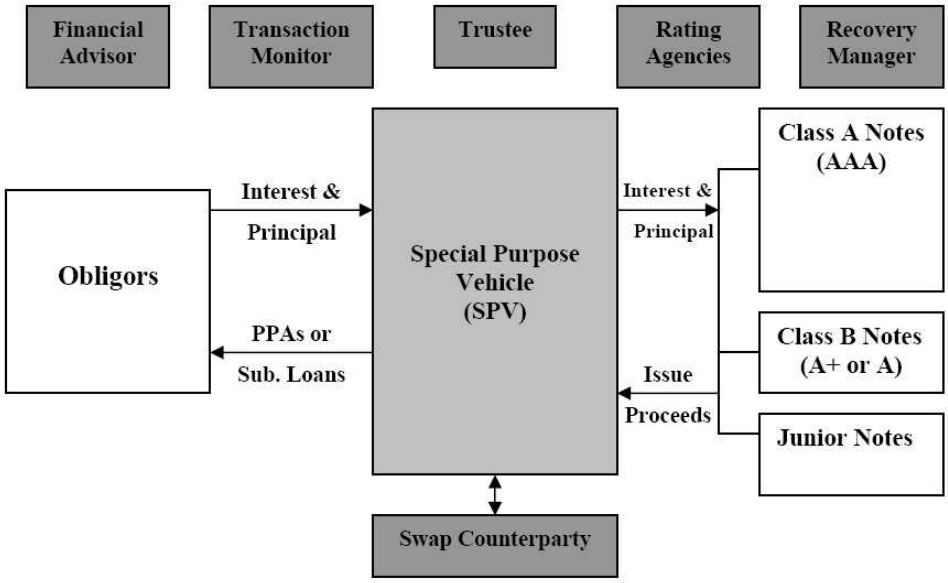
  These notes exhibit no final maturity but are callable by the obligor at any date after seven years. Therefore they are recognized as equity even under IAS. For the first seven years these claims pay a fixed coupon, afterwards a variable coupon is paid with the possibility of interest deferral.

For all types of equiNotes, the ME has to pay a surcharge if it does not provide the annual financial statement and quarterly reports in time.

[18] Actually, the portfolio contains only two Type A* and one Type B equiNotes.

B Transaction Scheme

Figure 3: Simplified Scheme of a Middle Market Transaction



C Simulation Model

Modelling the Underlying Portfolio

For the analysis in this paper we use the same simulation model as in *Hein (2007)*. This model resembles the *Standard & Poor's CDO Evaluator* and is similar to the simulation model used in *Franke/Krahnen* (2007). Given the bullet maturity of seven years for each loan, rating migrations of the loans in the underlying portfolio are simulated for each year starting with the initial obligor ratings.[19] For simplification annual payments are assumed. For each loan a normally distributed random number is drawn at each annual payment date. This number determines the one-year rating migration of the loan by comparing it to the threshold values of a normal distribution derived from the one-year transition matrix of Standard & Poor's. If the new rating of a claim stays above D, the full interest is paid at the next payment date. If the rating of a claim moves to D, default occurs. In this

[19] This approach of simulating rating transitions differs from the approach of using factor models, which is also widely used in the literature on securitisation. E.g. *Hull/White* (2004), *Gibson* (2004) and *Weber* (2007) use a one-factor model to model loan defaults. *Duffie/Garleanu* (2001) and *Longstaff/Rajan* (2007) even apply multi-factor models in their analysis.

case a recovery amount is paid immediately and there are no further payments on this loan.

The portfolio loss rate strongly depends on default correlations. In fact, rating migrations of obligors are assumed to be correlated. Particularly, for two obligors within the same industry the asset migrations are assumed to be correlated with 0.1, for two obligors from different industries the correlation is assumed to be 0.04. These are the assumptions made also in the CDO Evaluator by S&P (see *Standard & Poor's* 2005). The levels of these asset migration correlations are controversial as are the binary default correlations. The higher these correlations are, the wider is the dispersion of the loss rate distribution. The asset migration correlations are accounted for in the simulation by multiplying the vector of uncorrelated normal random numbers with the Cholesky decomposition of the correlation matrix.

Based on these assumptions, the portfolio cashflows at annual payment dates are simulated. These cashflows are composed of the interest payments of those loans, which do not default until this date, plus the recovery payments of loans defaulted at this date. Since there is no information about loan specific interest coupons available, it is again assumed that each loan pays the average fixed interest coupon stated in the reports (see Table 3). At final maturity (after seven years) the portfolio cashflows also include the repayments of all non-defaulted claims. All payments are compounded to the termination date at the assumed funding cost.

In each simulation run the total portfolio loss rate at the termination date is then calculated as

$$Terminal\ Loss\ Rate = 1 - \frac{accumulated\ received\ payments}{accumulated\ contractual\ payments} \quad .$$

The accumulated contractual payments equal the accumulated received payments in case of no default.

Modelling the Tranche Payments

As for the portfolio, we also model the tranche payments explicitly with the simulation model. In particular, the simulated portfolio cashflows and losses are allocated to the different tranches at annual payment dates according to the payment structure described in the offering circulars. All transactions use a '*single waterfall*' structure, i.e. not differentiating between principal and interest losses respectively payments. In fact, two allocations take place at the same time: (1) the allocation of default losses and (2) the allocation of cashflows.

Default losses (interest and principal losses) are allocated to principal as well as interest claims from the bottom to the top of the structure.[20] First, the reserve

[20]For a discussion of different loss allocation rules see *Hein* (2007).

account (if it exists) is reduced by the total period loss. The remaining loss is subsequently allocated to the excess spread of the current period, then to the interest claim of the junior tranche, then to the principal of the junior note, then to the principal of the lowest rated tranche, then to the interest claim of the lowest rated tranche and so on. If the principal of a tranche is reduced, then also its future interest claims are reduced pari passu.

The portfolio cashflows are allocated as follows. First, the incoming payments are used to cover senior expenses. Together with the subordinate expenses these expenses should cover all servicing, rating and administration fees as well as trustee expenses.[21]

The senior expenses rank senior to the interest payments on the rated tranches, which are paid next from the remaining cashflow starting with the most senior tranche. In order to determine the exact payments, we derive the contractual interest payments to the rated tranches assuming a constant risk-free rate and adding the launch credit spread, which is given in the prospectus. The risk-free rate is again assumed to equal the *iBoxx € Eurozone 5-7 years* at the issue date of each transaction. Since the issue dates of the transactions differ, also the assumed risk-free rate for the simulation differs (see Table 3). The payments to the tranches are then given by the contractual payments adjusted for realised losses.

After the interest payment to the rated tranches, subordinate expenses are paid. The remaining cash is then used to pay interest on the non-rated tranche. The excess cashflow then is distributed as described in the offering circular of the corresponding transaction (see section 5.1).

For simplification we do not account for the possibility of early amortisation of tranches in case of bad portfolio performance or scheduled amortisation of tranches. Instead bullet repayments for all tranches are assumed.[22] In particular, all incoming payments at final maturity (accumulated recovery payments plus loan principal repayments and interest payments for the last period) are used to pay back tranche principal and last period's tranche interest from the top to the

[21] The explicit assumptions concerning the senior and subordinated expenses are depicted in Table 3. Except for the FORCE 2005-1 transaction, no set-up costs need to be covered by the portfolio cashflows. Instead these costs, which include legal costs, rating costs, placement costs and structuring costs, are paid by the obligors through an additional up-front fee or a disagio between 4% and 5%. For the FORCE transaction, set-up costs of 150 bps are assumed, which are due at the first payment date.

[22] All structures make use of a *Principal Deficiency Ledger* (PDL). This means, that in case of a default in the underlying portfolio, the senior tranche receives principal prepayments amounting to the corresponding loss given default. Since in the simulation default losses are assigned first to the reserve account, then to the current period's excess spread and then are allocated to the junior tranche, the PDL-induced additional protection of the senior tranche should be quite small.
Additionally, there exists an amortisation schedule for the super-senior tranche in all PREPS and H.E.A.T. transactions. But the effect of ignoring this feature should be negligible because the annual amortisation amount is only between 0.25% and 0.4% of the tranche's volume.

bottom of the structure as long as cash is available.

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