



European RMBS: Cashflow dynamics and key assumptions

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Structured credit research

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RMBS cash flow model

Attractive opportunities in distressed asset sales if models, underlying assumptions and risks are well understood

- ▶ Forced sales, lack of liquidity and of investor demand have pushed European Prime RMBS spreads to unprecedented levels. Currently AAA European RMBS are offering secondary spreads between 450-600bp. Launch spreads (pre-crisis) were in the range of 10-25bp
- ▶ Several distressed funds, and some real money investors, are increasingly looking at this sector with the aim of identifying good quality paper trading below fundamental value with the aim of monetising on the current dislocation and thereby capturing the large liquidity premium that markets are presently pricing in. We expect this theme to emerge strongly in the first half of 2009
- ▶ However, unlike standard corporate bonds, the increased cashflow complexity of RMBS means that it is important to understand the underlying model framework and the impact of key assumptions on future returns. In our view, ratings are just a starting point
- ▶ With this in mind, we have build an excel-based European RMBS model, incorporating all the key features of a typical cashflow model used to structure deals. In addition to showing how S&P and Fitch model the key assumptions, we have also provided the flexibility for user specific assumptions to understand sensitivities of different tranches
- ▶ With this model, after having recently published a series of CDO models, we continue our effort to increase transparency in the market. Going forward we also plan to release CLO, CMBS and Longevity Risk models
- ▶ In this presentation we initially look at some specific building blocks for a cashflow model before turning to our spreadsheet

European RMBS model:

<https://research.dresdnerkleinwort.com/document/FILE.pdf?REF=257527>

Useful rating agency documents:

Fitch: A Guide to Cash Flow Analysis for RMBS in Europe, 20/12/2002, S&P: Cash Flow Criteria for European RMBS Transactions, 20/11/2003

Why do we prepare cash flow models?

To find out whether credit enhancement, structural features and liquidity facility are adequate to avoid losses to the note

- ▶ As in any other securitised product, credit enhancement in RMBS ensures that senior note, mezzanine note and junior note investors are adequately protected against a credit deterioration of the mortgage pool. This is achieved by prioritising investors' claims according to the rating of the notes, and is carried out through subordination, waterfalls, structural triggers and using excess spread
- **Subordination I:** one way of looking at the subordination is as the maximum amount of losses that the collateral can sustain before the RMBS note investors suffer a loss
- **Subordination II:** another way of looking at subordination, is use a probabilistic equivalence: "the probability of suffering the "first dollar" loss for the investor of an RMBS 'AAA' note with a prime mortgage pool is the same as the probability of the same loss for the investor of an RMBS 'AAA' note with sub-prime mortgage pool
- **Waterfalls:** the principal and interest payments of the mortgage pool are generally distributed sequentially to the note investors in order of their seniority, via the principal and the interest waterfall

The interest waterfall specifies the order in which interest received from the mortgage pool is paid to the notes. The fees and hedge costs, such as interest rate swap payments, are paid before the interest which is due to the note holders. Any additional income is called excess spread and is paid to the equity investors

The interest waterfall is subject to changes when those structural triggers are breached. In these instances, the interest proceeds that would normally go to pay the interest due to the mezzanine notes are used to pay down (turbo or accelerate) the senior notes

The principal waterfall establishes the distribution of the principal repayment. If the principal is paid on a sequential basis, the senior notes are at the top of the waterfall. The mezzanine notes are repaid as soon as the senior notes are fully redeemed. In this way, the performance of the mezzanine notes is fully subordinated to the good performance of senior notes

..and the role of excess spread

Excess spread is what is left in the interest waterfall after paying all expenses and interests due to the notes

- An additional objective of preparing a cash flow model is to determine the amount of credit support any excess spread is able to provide to the notes under different economic stresses
- Before the excess spread is distributed to the equity investors, it is used to cover losses (or delinquencies) in the mortgage collateral. In this way, it represents the first layer of credit protection for the note investors
- A cash flow analysis is not required for those structures which do not benefit from excess spreads (such as synthetics)
- **Front-loaded versus back-loaded defaults**
 - Estimating the benefit of excess spread is not straightforward as it is a function of not just the level of defaults but also how these defaults are allocated over the time. For example, if the structure suffers a large number of defaults in the later stages of the transaction resulting in trigger breaches, monies will then be diverted from the interest waterfall to accelerate the repayment of the senior notes using the excess spread. However, as defaults are primarily back-dated, the originator will have had plenty of time to collect excess spread and achieve a remarkable return
 - In contrast, if the structure suffers a large number of defaults in the early days of the transaction, the originator would bear the first loss and would not collect any excess spread, because it would be used to turbo-accelerate the redemption of the senior notes
- **Prepayments** - Excess spread is also dependent on the level of prepayment:
 - A higher than expected prepayment rate accelerates the amortisation of the RMBS notes and the structure de-leverages faster
 - However, its effect on excess spread often remains difficult to quantify. As a general rule, faster prepayment speeds reduce the magnitude of excess spread available in the future to cover losses and also accelerate the repayment of the senior notes, thus building an extra credit enhancement for the remaining balance of these notes
 - Additionally, there is the risk of 'adverse selection', as generally the better quality mortgage borrowers can afford to prepay, leaving mortgages with higher probabilities of default in the remaining pool

“Timely payment of interest” and “ultimate payment of principal”

RMBS are not PiK securities

- ▶ Fitch and S&P address the likelihood that note holders will receive full and timely payments of interest, as well as full and ultimate payments of principal by the final maturity date
- ▶ Unlike sub investment grade CDO notes, which usually allow for interest to be deferred and paid in kind (PiK), RMBS notes are not PiK
- ▶ With PiK notes, the rating agency will address the ultimate payment of principal and interest
- ▶ The very important distinction between PiK and non-PiK notes is that non-payment of interest for PiK notes does not constitute an event of default under the legal documentation
- ▶ Any deferred interest accrues interest at the coupon rate, is then added to the principal to be repaid at maturity

In RMBS cash proceeds come from a number of sources

Source of principal

- ▶ Proceeds to repay the notes are going to come from a number of sources
 - Scheduled redemptions from performing mortgages
 - Unscheduled redemptions “prepayments” from performing mortgages
 - Income diverted from excess spread in the interest waterfall via principal deficiencies ledgers “PDLs”

Source of income

- ▶ To pay the interests on the notes, RMBS structures usually rely on the following sources
 - Interest received from the performing mortgages
 - Recoveries from defaulted mortgages
 - Accrued interest from cash collected between payments dates
 - Prepayment penalties

***Do not underestimate the role of important structural elements such as:
Liquidity facility, Interest rate swap and Principal deficiency ledgers***

Liquidity facilities are not credit enhancement tools

Our model provides the flexibility of using different liquidity facility arrangements

- ▶ To reduce the likelihood that the RMBS notes do not suffer from income shortfalls arising from delinquent and defaulted loans, liquidity facilities are arranged so that interest payments can be paid when they are due
- ▶ To ensure that liquidity facilities are not transformed into credit enhancement tools, all amounts drawn under the facility arrangement, are repaid back to the liquidity provider at the top of the interest waterfall, after expenses but before interest payment to senior notes
- ▶ Liquidity lines are key when managing timing mismatch, but should be analysed to ensure they are not just delaying the inevitable in stressed scenarios by prolonging the deal life at the detriment of the senior notes. Available liquidity should therefore be linked to the performance of the deal
- ▶ Different types of liquidity arrangements are used in the RMBS markets, ranging from flat liquidity amounts to amortising arrangements, in which case, the amount available reduces as senior notes are repaid. Combinations of flat and amortising liquidity amounts are also used
- ▶ The cost of a liquidity facility is made of a commitment fee until the facility remains undrawn, and of Libor rate plus a margin on the drawn amount

Interest rate swaps (IRS) and counterparty risk

Lehman's defaults highlights the need to monitor counterparty risk

- ▶ RMBS are normally floating rate notes whilst the mortgage collateral can be fixed or floating. To manage the resulting interest rate risk most RMBS typically incorporate an interest rate swap – either fixed-to-floating or floating-to-floating (for managing the basis risk between different floating indices or payment dates on the collateral vs. the notes)
- ▶ Bespoke IRS – that take specific collateral features into account – tend to be the norm and can be structured as total return swaps which can guarantee a proportion of the excess spread by reducing impact of prepayment risk. Other option features can also be added
- ▶ Lehman's defaults highlights the importance of understanding counterparty risk associated with swaps and other structural features such as liquidity providers. Rating agency generally monitor this risk by requiring the counterparty to maintain a minimum rating, with increased collateral needed to be posted if the rating is downgraded
- ▶ In addition, a downgrade also requires the counterparty to be replaced – but the more bespoke the swap the more difficult this is going to be
- ▶ No other stress is applied, and in particular it is evident from our model that when running the different-rating stresses the full benefits of the swap are taking into account during the rating process. Even for the AAA stress no scenario is modelled which specifically looks at the risk associated with counterparties, which tend to be rated below AAA in the majority of the cases
- ▶ This is an issue which rating agencies are increasingly more concerned about, and we are likely to see some penalising stresses placed on counterparties in the future, limiting the benefit that is taken into account
- ▶ The next slide shows an example of a back-to-back swap typical in many transactions, which we have used to hedge the interest rate risk in our model

Back-to-back: swapping fixed rate mortgages with floating rate notes

IRS counterparties use them to avoid prepayment risk or to make interest contributions on defaulted/delinquent loans

IRS 1	SPV	IRS counterparty
	pays fixed (WA mortgage coupon) on the mortgage performing balance	receives floating (Libor + spread) on the mortgage performing balance

Note: The IRS counterparty does not make interest contributions on defaulted and delinquent mortgages

IRS 2	Originator	IRS counterparty
	receives fixed (WA mortgage coupon) on the mortgage performing balance	pays floating (Libor + spread) on the mortgage performing balance

Note: the IRS counterparty has now zero risk as the fixed payment it provides to the originator is matched with the fixed it receives from the SPV

IRS 3	Originator	IRS counterparty
This swap is not symmetrical to IRS 2 as it uses a different notional	pays fixed (WA mortgage coupon) on the original (or any guaranteed) mortgage balance	receives floating (Libor + spread) on the original (or any guaranteed) mortgage balance

Note: the IRS counterparty has now interest rate risk (floating vs. fixed) on the original mortgage balance. Any guaranteed balance may also be used, in which case, the IRS counterparty faces prepayment risk

The originator has the interest rate risk related to prepayments, and also some interest rate risk on the non-performing mortgages

Credit support annex (CSA) are always used with IRS arrangements in RMBS. They are designed to reduce counterparty risk by requiring them to put up a collateral as a proportion of the notional of the IRS contract, depending on market conditions

Principal deficiency ledgers

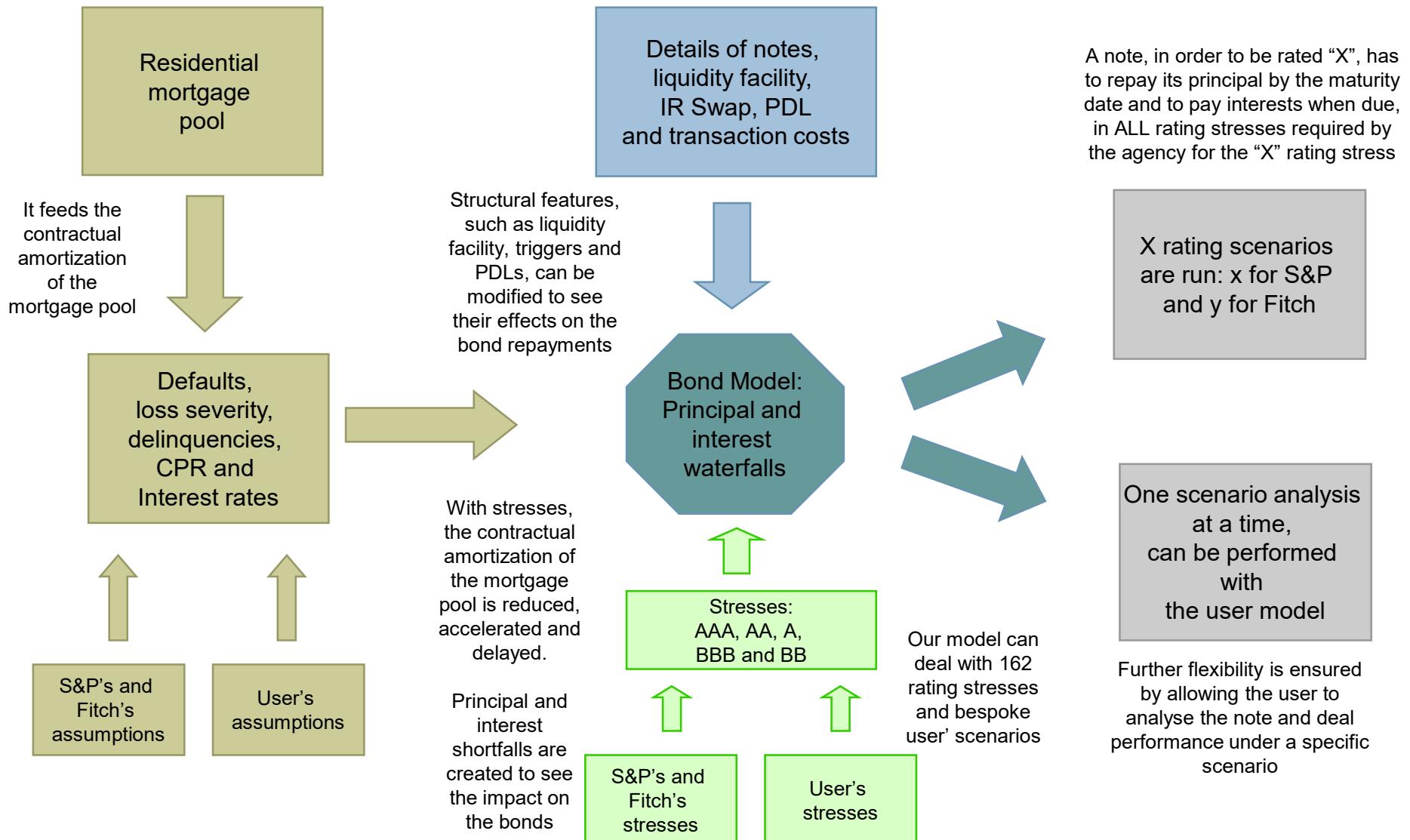
It is important to clarify the role that Principal Deficiency Ledger (PDL) has in RMBS

- ▶ The PDL records any shortfall that would occur in repayment of the outstanding notes, should the mortgage pool be immediately liquidated
- ▶ The ledger is essentially debited to the extent of any delinquent or defaulted loans and credited with available funds diverted from the interest waterfall
- ▶ The net debit on the PDL is then equal to the principal shortfall (performing mortgages less liabilities), and is obviously limited to the outstanding balance of the notes
- ▶ In reality there is a separate PDL for each class of notes. As delinquent and defaulted mortgage loans are recognised, they are recorded on each PDL, beginning with the lowest rated notes and only moving to hit higher tranches when these lower PDLs are 'exhausted'
- ▶ PDL deficits and triggers can lead to interest proceeds being diverted into the principal waterfall. If there is a deficit on any PDL on a payment date, then interest proceeds are diverted into the principal waterfall until the deficiency is eliminated

So let's look at our model now!!

Components at a glance... (colours correspond to tab colours on spreadsheet)

Defaults, recoveries, prepayments and delinquencies can be modelled/stressed as requested – Reports are also available



Rating agency vs. your own assumptions

You can also discover S&P's and Fitch's quantitative approaches which are used to calculate credit enhancements

- ▶ **WAFF, WALS and WARR**: In this model, we make no attempt to calculate the expected default and recovery rate of the mortgage pool. To do so, we would need loan level detail information of the mortgage pool, which we and generally the investor or potential buyer do not have!
 - Rating agencies, for example, have access to this data, and as a result are able to calculate the weighted average foreclosure frequency (WAFF for S&P and Fitch), weighted average loss severity (WALS for S&P) and weighted average recovery rate (WARR for Fitch) for each mortgage pool securitised
 - However, we assume that you have access to the WAFF, WALS and WARR. i.e. you have the magnitude of the cumulative default and recovery rate until the mortgage pool matures. You have just to input these values in the correct part of the spreadsheet
 - Up to this point, you know the cumulative default rate. How defaults are distributed through time is yet to be defined. You can use rating agency assumptions regarding how default and recovery will occur, or you can use your own default and recovery lag curves
- ▶ **Prepayments**: Mortgages also prepay, and as a result, their ability to generate excess spread reduces
 - Rating agencies test the mortgage pool cash flow under several prepayment scenarios. You can find them in this model
 - You can also test the RMBS structure under your own prepayment assumptions. But remember that excess spread and credit quality drop as prepayments rise. Experience tells us that better quality mortgage loans are more reactive to alternative refinancing opportunities than "not-so good" loans, as riskier borrowers cannot easily refinance their debt
 - You can also analysis the "extension risk" by assuming prepayment speeds slower than the base case
- ▶ **Interest rate**: Nearly all RMBS have interest rate swaps to cover to interest rate mismatches. Rating agencies incorporate interest rate shocks in their cash flow models. You can also use your own interest rate up and down scenarios, to analyse their impact on the structure
- ▶ **Stresses**: You can stress (using rating agencies' or your own scenarios) all the variables above and see what happens to your notes

Finally....doing it in excel

You can change the structural features of the RMBS deal in the “Deal Structure” sheet

RMBS structural features

Liquidity facility	
Liquidity Cost	
Drawn Margin	40 bps
Commitment	20 bps
Max Liquidity Line	35,000,000

Liquidity Type:	Amortising	▼
Flat	2	
Amortising		
Combination		

1 - Flat	2 - Amortizing (never > Flat Liq.)	3 - Combination (never > Flat Liq.)
Fixed for duration at 35,000,000	% of outsta mortg. balance provided that A2 > Otherwise	2.30% 10% 0.0% Flat during the first 16 Qrts then max of: % of initial mortg. balance 1.50% % of outstan mortg. balance 3.00%

Triggers

A1 / A2 amortization: Pro-rata unless trigger fails	Allow Trigger?
1. Unpaid PDL > 0.50%	
2. A1 Current / Initial Balance <= 45.00%	TRUE
Class B	
1. Unpaid PDL > 9.00%	
Class C	
1. Unpaid PDL > 7.50%	
Class D	
1. Defaults level > 3.50%	
2. Delinquency level > 8.00%	
3. Unpaid PDL > 2.00%	

Reserve fund (first loss)

Stepped Fund: Criteria	
if [Current Rated Notes/Initial Rated Note	50.00%
>=50%	<50%
% of initial rated notes	0.5%
Amount (€)	6,290,000
	3,145,000

Other features

Senior Expenses		Allow Feature?
Servicer Fees	0.50%	
Other Fees	0.017%	
Clean-up call (% of original coll. balance)		
Current coll. balance <= 10.000%		TRUE
Further Advances		
Max amount available	1,000,000	TRUE
Length	3.0 years	
Lock out Period for Initial Principal Receipts?		
Length of Period	18 months	TRUE
This is for Italian RMBS where notes do not amortise for 1st 18 months		

Current rates

Liber rate	3.8160%
GIC rate	-50 bps
Swap rate	1.800%

Options available (do not delete)
TRUE
FALSE

Afterwards go to the other sheets!

Disclosure appendix

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	All covered companies	Companies where a Dresdner Kleinwort company has provided investment banking services		
		16	33%	9
Overweight	16	33%	9	56%
Marketweight	20	42%	7	35%
Underweight	12	25%	6	50%
Total	48		22	

Source: Dresdner Kleinwort Research

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