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COMMENTARY

DBRS's Dutch Residential Mortgage Analysis and Case Studies

Contact Information

Rehanna Sameja
Vice President, EU RMBS
Global Structured Finance
+44 (20) 7855 6677
RSameja@dbrs.com

Lloyd Morrish-Thomas
Senior Financial Analyst
Global Structured Finance
+44 (20) 7855 6679
LMorrish-Thomas@dbrs.com

Vito Natale, CFA, FRM
Head of EU RMBS & CBs
Global Structured Finance
+44 (20) 7855 6649
VNatale@dbrs.com

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This commentary explores case studies of DBRS's credit analysis for Dutch mortgages. The report reviews several hypothetical Dutch portfolios using DBRS's proprietary model (the Insight Model) used for credit analysis. Further information about the Insight Model can be found in the European RMBS Insight Methodology and Dutch Addendum.

As part of the analysis, DBRS assigns a credit risk score to each borrower in a portfolio[1] based on the loan's underlying characteristics. Each loan is assigned to one of 12 risk segments based on the results of the scoring function. The risk segments were constructed by analysing the performance of approximately 1.75 million borrowers; thus, the scoring can be considered against the wider Dutch mortgage market as a benchmark. Higher risk segments will typically comprise loans with credit characteristics that have historically demonstrated a higher propensity to default, and, hence, are assigned a higher risk score.

Two key inputs that DBRS uses in its analysis are the Underwriting Score and the Deal Quality (i.e., the judgmental variables). These variables are built into the logistic regression, and are used to represent qualitative factors that are not explicitly represented in the data. The judgmental variables are assigned following DBRS's assessment of product-specific underwriting criteria, analysis of lender-specific historical performance data and a review of the lending and servicing operations. The analysis is considered in the context of the wider Dutch market practices and the historical performance of Dutch mortgages.

Figure 1 demonstrates DBRS's indicative portfolio credit assessment for hypothetical portfolios applying a ***Medium*** Underwriting Score and Moderate Deal Quality. The assessment then shows sensitivities to variance in the portfolio characteristics. For example, the characteristics of **Pool A** include multiple loan parts per borrower, a high fixed-rate concentration and a high loan-to-value (LTV) – indexed current LTV of 105%[2]. **Pool B** is the same portfolio, although the LTV is proportionally reduced to a weighted-average of 90%, resulting in a reduction in both probability of default (PD) and loss given default (LGD). For these examples, the regional distribution of the properties is assumed to be in line with Dutch RMBS concentrations[3]. A weighted-average coupon (WAC) of 4.1% is assumed for all portfolios[4].

Figure 1: Portfolio Sensitivity Comparison

	Pool A	Pool B	Pool C	Pool D	Pool E	Pool F	Pool G
Number of Borrowers	250	250	250	250	250	250	250
Number of Loans	500	500	500	500	500	500	500
NHG Guaranteed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Effective NHG Coverage Rate ('AAA')	--	--	--	--	--	--	--
WAC	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%
Effective Margin (DBRS calculated)	2.2%	2.2%	2.2%	3.1%	3.1%	3.1%	3.1%
WA Interest Reset Interval	150 Months	150 Months	150 Months	150 Months	150 Months	120 Months	120 Months
Fixed Rate	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Seasoning (Years)	7.0	7.0	7.0	3.0	3.0	3.0	3.0
Remaining Term	23.0	23.0	23.0	27.0	27.0	27.0	27.0
Arrears	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2% 1m, 1% 3m
Original LTV	95.0%	90.0%	90.0%	90.0%	95.0%	95.0%	95.0%
Indexed Current LTV	105.0%	90.0%	90.0%	90.0%	95.0%	95.0%	95.0%
Loan-to-Income	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Employed Borrowers	75.0%	75.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Savings Mortgage	20.0%	20.0%	20.0%	20.0%	0.0%	0.0%	0.0%
Repayment Vehicle	40.0%	40.0%	40.0%	40.0%	0.0%	0.0%	0.0%
Interest only (For Life)	40.0%	40.0%	40.0%	40.0%	25.0%	25.0%	25.0%
C& I Repayment	0.0%	0.0%	0.0%	0.0%	75.0%	75.0%	75.0%
Purchase	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Remortgage	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Average Risk Segment (Year 0)	8.5	7.6	7.2	7.1	8.4	9.0	9.0
Average Risk Segment (Year 10)	7.5	6.6	6.3	5.8	5.8	6.6	6.6
AAA PD	23.5%	20.9%	20.2%	19.7%	21.3%	22.9%	24.4%
AAA LGD	39.4%	33.6%	33.5%	35.0%	36.0%	36.0%	36.6%
AAA EL	9.3%	7.0%	6.8%	6.9%	7.7%	8.2%	8.9%
B PD	5.1%	3.8%	3.5%	3.3%	3.8%	4.5%	5.3%
B LGD	23.9%	17.4%	17.3%	18.6%	19.1%	19.2%	19.8%
B EL	1.2%	0.7%	0.6%	0.6%	0.7%	0.9%	1.0%

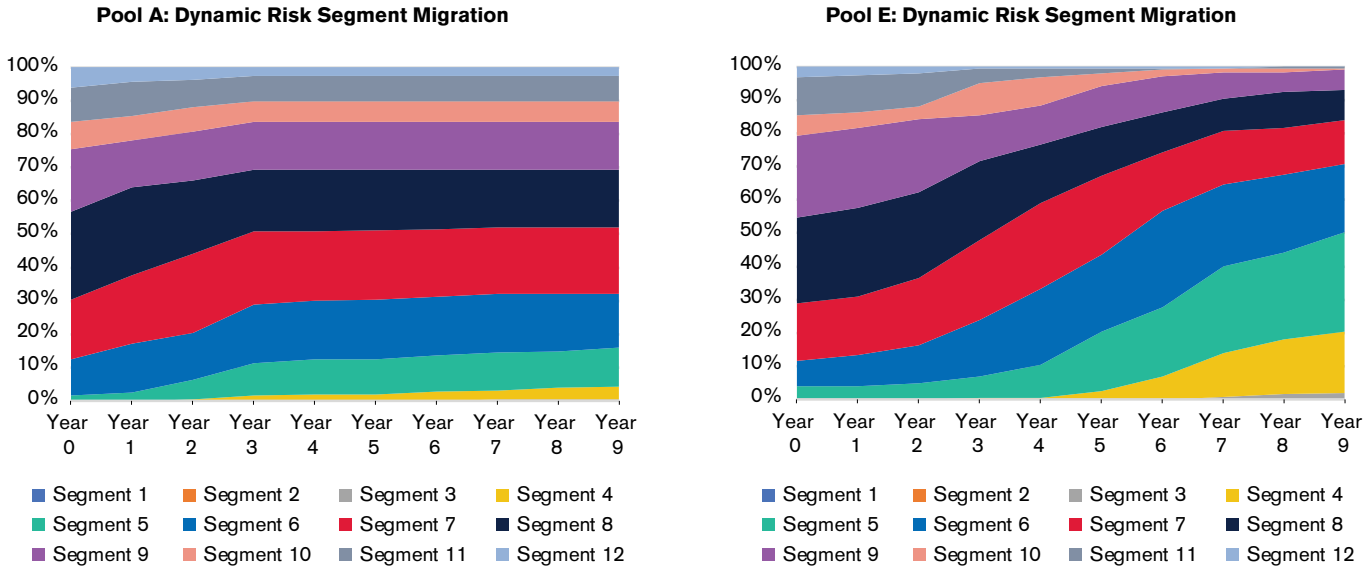
Source: DBRS.

1. In the Insight model a borrower represents all loan parts securing one property. The risk scoring is always performed on the borrower level. The aggregate of loans secured by the same collateral is defined as a property group, with loan portfolio being assessed on a property group basis.
2. DBRS applies indexation, on a regional basis, to the original property value from the valuation date to the pool cut-off date for Dutch RMBS analysis. The house price index remains below the peak values in all Dutch regions (as of Q3 – 2017), meaning that 'negative indexation' is a possibility.
3. The portfolio is assumed to be distributed with 20% concentrations in Zuid-Holland and Noord-Holland. The remainder is distributed through the country.
4. DBRS calculates a proxy margin for fixed-rate mortgages using the five-year euro swaps rate. Therefore, the estimated margin will vary based on the portfolio seasoning.

Risk Scoring Segment Migration

DBRS's credit analysis can be summarised by the risk segment migration. Increased credit risk within a portfolio is shown by a higher average risk segment score. This allows for comparisons across portfolios. **Pool A** had a weighted-average risk segment of 8.5 when first scored, which is close to the 8.4 assigned to **Pool E**. Figure 2 demonstrates the dynamic risk segment migration as loans are re-scored over a ten-year period.

Figure 2:



Source: DBRS.

Every year a borrower is re-scored the Insight Model dynamically updates the outstanding balance of a loan together with its seasoning. The potential deleveraging is expected in line with the reported amortisation profile and can result in improved LTV and Loan-to-Income (LTI) metrics. This can feed into improved risk scores and consequently a potentially lower risk segment.

This is illustrated in Figure 2, where **Pool E** (75% C&I repayment) shows faster migration to lower risk segments than **Pool A** (100% IO). The limited migration for Pool A is attributed to increasing seasoning over the first three years.

When initially scored (at Year 0), 12% of **Pool E** was assigned to risk segments one to five. Following ten years of seasoning, the deleveraging led to 71% of the portfolio being assigned to risk segments one to five. **Pool A** had 12% assigned to risk segments one to five at Year 0, but the migration to lower risk segments is slower than **Pool E**, with 32% assigned to these risk segments after ten years.

Amortisation also impacts the loss severity assessment for the loans. DBRS's calculation for exposure at default gives credit to prior amortisation as well as prior portfolio prepayments (5% CPR is typically assumed).

Alongside dynamic variables such as LTV and seasoning, the interest-rate-reset-interval is a key characteristic for DBRS's analysis. Historical performance data has shown that Dutch mortgage loans with shorter reset intervals have demonstrated a higher PD compared to mortgage loans with longer fixed-rate intervals. As a result, DBRS's Insight Model applies a higher risk score to loans with shorter interest-rate-reset-intervals, although the relationship is non-linear. This is demonstrated in the sensitivity between the analysis of **Pool E** and **Pool F**, whereby the latter is assigned to higher risk segments, due to the shorter tenure of fixed-rate intervals, resulting in a higher portfolio default rate.

Dutch Underwriting Score

Additional credit considerations that may not necessarily be represented in the pool characteristics are addressed by DBRS's judgmental variables: the Underwriting Score and the Deal Quality. A lender that displays underwriting policies that are notably tighter than the market standard could be addressed in DBRS's analysis by applying an underwriting score of "High".

In the analysis of **Pool A**, this would result in the average risk segment falling from 8.5 to 5.5 at Year 0. Conversely, weaker underwriting policies could be represented by a low underwriting score, resulting in a higher risk segment distribution.

To demonstrate this sensitivity, DBRS has applied a "High" and "Low" underwriting score to **Pool A** and **Pool E**.

Figure 3: Sensitivity to Underwriting Score

	Pool A	Pool A	Pool A	Pool E	Pool E	Pool E
Underwriting Score	High	Medium	Low	High	Medium	Low
Deal Quality	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Average Risk Segment (Year 0)	5.5	8.5	9.1	6.6	8.4	9.9
Average Risk Segment (Year 10)	4.6	7.5	8.2	4.0	5.8	7.7
AAA PD	17.0%	23.5%	25.0%	18.0%	21.3%	26.2%
AAA LGD	39.1%	39.4%	39.3%	35.7%	36.0%	36.1%
AAA EL	6.7%	9.3%	9.8%	6.4%	7.7%	9.4%
B PD	2.1%	5.1%	5.8%	2.3%	3.8%	6.1%
B LGD	23.6%	23.9%	23.8%	18.9%	19.1%	19.2%
B EL	0.5%	1.2%	1.4%	0.4%	0.7%	1.2%

Source: DBRS.

Dutch Deal Quality

Similar to the Underwriting Score, Deal Quality allows qualitative factors to be accounted for in DBRS's credit risk analysis of portfolios. Two lenders with identical underwriting policies could show marked differences in historical performance data. DBRS uses Deal Quality to address for such differences.

In the analysis of **Pool A**, applying a "Good" Deal Quality results in the average risk segment falling from 8.5 to 6.7 at Year 0.

To demonstrate this sensitivity, DBRS has applied a "Good" and "Bad" deal quality to **Pool A** and **Pool E**.

Sensitivity to the Deal Quality variable is shown in Figure 4.

Figure 4: Sensitivity to Deal Quality

	Pool A	Pool A	Pool A	Pool E	Pool E	Pool E
Underwriting Score	Medium	Medium	Medium	Medium	Medium	Medium
Deal Quality	Good	Moderate	Bad	Good	Moderate	Bad
Average Risk Segment (Year 0)	7.6	8.5	9.7	g 4	8.4	9.7
Average Risk Segment (Year 10)	6.7	7.5	8.9	4.9	5.8	7.4
AAA PD	21.2%	23.5%	28.4%	19.6%	21.3%	25.1%
AAA LGD	39.1%	39.4%	39.3%	35.9%	36.0%	36.1%
AAA EL	8.3%	9.3%	11.2%	7.0%	7.7%	9.1%
B PD	4.0%	5.1%	7.4%	2.9%	3.8%	5.6%
B LGD	23.6%	23.9%	23.7%	19.1%	19.1%	19.2%
B EL	0.9%	1.2%	1.8%	0.6%	0.7%	1.1%

Source: DBRS.

Dutch Dynamic Delinquency Migration Matrices

Following assignment of initial risk segments, DBRS applies the Dutch Dynamic Delinquency Migration Matrices (DMMs). The DMMs are constructed from historical performance of Dutch mortgages and are different for each risk segment. The DMMs measure the quarterly transition rate between different arrears statuses. Defaulted and redeemed are absorbing states, as loans do not return from these states. A loan could, however, recover from arrears.

A key input for the DMM analysis is the actual arrears status of the mortgages. If a loan is in arrears, it will not be adjusted for in the scoring function; instead, the loan will be assigned to a higher DMM. For example, the probability a current loan will become three months in arrears (using risk segment eight as an example) is 0.1% in one quarter. Whereas if a loan is already two months in arrears, the probability rises to 25.5%.

Figure 5 illustrates the DMMs per risk segment for loans that are current and Figure 6 show the risk segment for a loan one month in arrears. The DMMs for a loan one month in arrears show a significantly higher probability of defaulting, remaining one month in arrears or deteriorating to a higher arrears status, than the DMMs for a current loan.

Figure 5: DMMs for Current Loans

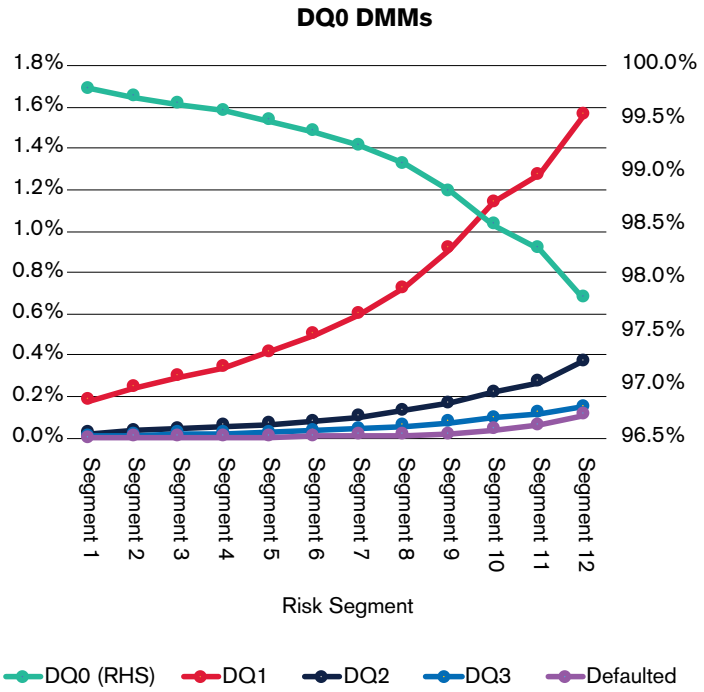
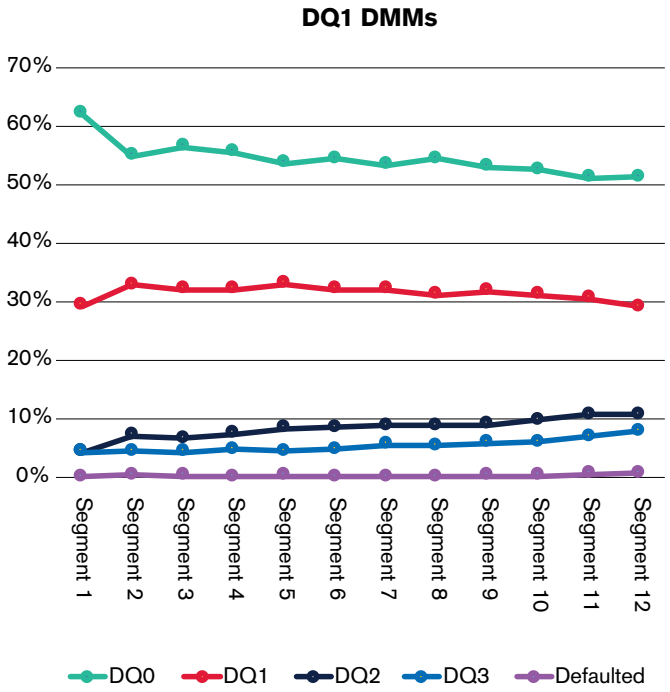


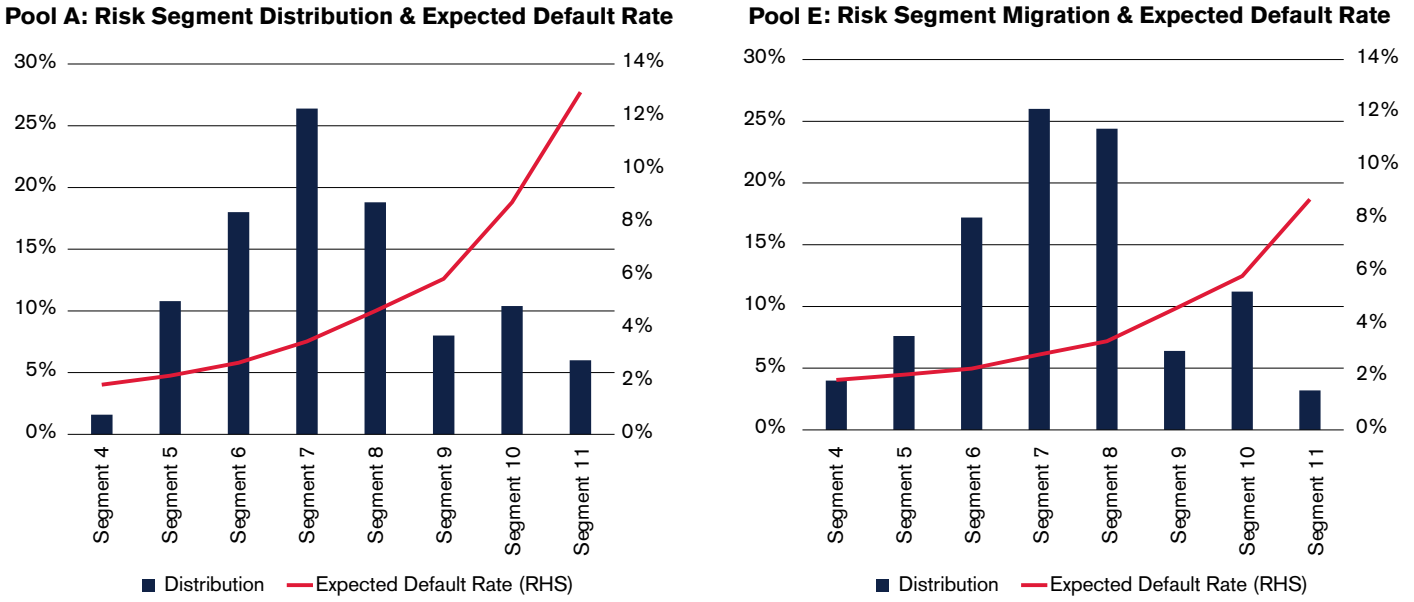
Figure 6: DMMs for Loans One Month in Arrears



Source: DBRS.

Figure 7 shows the distribution of risk segments, when initially scored in Year 0, and the expected default rate per risk segment. As anticipated, the expected default rate is higher for loans assigned to higher risk segments.

Figure 7: Expected Default Rate per Risk segment (Year 0).



Source: DBRS.

Treatment of NHG Loans

The NHG is a national mortgage insurance scheme, administered by Stichting Waarborgfonds Eigen Woningen (WEW) under strict eligibility criteria. DBRS's analysis of **Pool A – NHG** shows a portfolio (identical to **Pool A**) where 30% of the loans are granted NHG insurance. DBRS's 'AAA' expected loss is approximately 10% lower for **Pool A – NHG**, relative to **Pool A**.

Figure 8: NHG Portfolio Sensitivity Comparison

	Pool A	A – NHG	Pool E	E – NHG
Number of Borrowers	250	250	250	250
Number of Loans	500	500	500	500
NHG Guaranteed	0.0%	30.0%	0.0%	30.0%
Effective NHG Coverage Rate ('AAA')	--	3.7%	--	8.4%
WAC	4.1%	4.1%	4.1%	4.1%
Effective Margin (DBRS calculated)	2.2%	2.2%	3.1%	3.1%
WA Interest Reset Interval	150 Months	150 Months	150 Months	150 Months
Fixed Rate	95.0%	95.0%	95.0%	95.0%
Seasoning (Years)	7.0	7.0	3.0	3.0
Remaining Term	23.0	23.0	27.0	27.0
Arrears	0.0%	0.0%	0.0%	0.0%
Original LTV	95.0%	95.0%	95.0%	95.0%
Indexed Current LTV	105.0%	105.0%	95.0%	95.0%
Loan-to-Income	4.5	4.5	4.0	4.0
Employed Borrowers	75.0%	75.0%	95.0%	95.0%
Savings Mortgage	20.0%	20.0%	0.0%	0.0%
Repayment Vehicle	40.0%	40.0%	0.0%	0.0%
Interest only (For Life)	40.0%	40.0%	25.0%	25.0%
C& I Repayment	0.0%	0.0%	75.0%	75.0%
Purchase	85.0%	85.0%	85.0%	85.0%
Remortgage	15.0%	15.0%	15.0%	15.0%

Figure 8: NHG Portfolio Sensitivity Comparison

	Pool A	A – NHG	Pool E	E – NHG
Average Risk Segment (Year 0)	8.5	8.2	8.4	8.1
Average Risk Segment (Year 10)	7.5	7.3	5.8	5.5
AAA PD	23.5%	22.4%	21.3%	20.6%
AAA LGD	39.4%	36.8%	36.0%	31.5%
AAA EL	9.3%	8.3%	7.7%	6.5%
B PD	5.1%	4.6%	3.8%	3.4%
B LGD	23.9%	22.7%	19.1%	16.6%
B EL	1.2%	1.0%	0.7%	0.6%

Source: DBRS.

Given that 30% of the portfolio is effectively insured by WEW, it could be expected that the reduction in loss rates would be more notable. However, there are two significant circumstances where the NHG either does not pay out at all or does not pay out the full amount claimed:

1. **Amortisation:** The NHG assumes that a loan amortises over a 30-year period, regardless of the actual loan amortisation. As of January 2013, all loans backed by an NHG should be repaid on a 30-year annuity basis. A mismatch between the mortgage balance and NHG amount may exist depending on the type of loan guaranteed, original term of the loan and seasoning of the loan. **Pool E – NHG** demonstrates the additional benefit that an amortising portfolio yields from NHG guarantees. In this example, the effective NHG coverage rate in a 'AAA' scenario is 8.4% and the 'AAA' EL is reduced by 15%, versus the same portfolio without the guarantees.
2. **Non-compliance with the NHG:** The NHG has prescriptive eligibility rules that the lender is responsible for, ensuring each application meets the NHG conditions. If the loan was underwritten in breach of eligibility rules, all or part of the claim amount may not be paid by the NHG. Additionally, in the case of proven fraud the NHG will not pay out any of the claim amount. To account for these rejections, a rescission rate is applied. In the absence of lender-specific NHG rescission data, DBRS assumes a base rescission rate of 25%, which is increased in higher rating scenarios. The rescission rate (excluding amortisation mismatch) in a 'AAA' scenario is assumed to be 40%.

Further information about the Insight Model can be found in the European RMBS Insight Methodology and Dutch Addendum.

DBRS Ratings Limited | 20 Fenchurch Street, 31st Floor, London, EC3M 3BY United Kingdom | TEL +44 (0)20 7855 6600 | www.dbrs.com