

The “V” in LTV and why it matters

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The *Loan To Value* (LTV) ratio, defined by the rating agency DBRS as “. . . the ratio between the principal balance on the mortgage and the appraised value of the property serving as security for the loan itself”¹ is a key risk indicator for mortgages. It is commonly referred to in financial regulation, in rating agency methodologies, and in bank credit policy. In this article, we take advantage of European DataWarehouse’s securitisation data to take a fresh look at this key indicator, and its field of application.

We find that there are several ways to calculate a LTV, with different implications depending on the way it is calculated. For instance, the “V” in LTV is not normally updated following loan issuance. This results in conservative LTV estimates when prices rise post loan origination but it can also be misleading when house prices decrease. The LTV is both an indicator of default risk (when calculated at loan origination) and an indicator of expected loss, when the “V” is updated. Looking at European DataWarehouse (ED) loan by loan data,² we find that LTV at origination (OLTV) differs greatly from one country to another and, even within countries, OLTV change overtime, particularly in markets affected by significant property price volatility. We also find that, as expected, the LTV is a key performance indicator. In almost all countries, the lower the LTV, the better the performance of the loan.

CALCULATING THE LTV

The LTV is typically used at loan origination, and for ongoing credit risk monitoring, to assess the amount of equity a borrower has in his property. A higher LTV indicates less equity and more risk. At loan origination, the LTV is often used alongside other indicators such as the Debt To Income (DTI) ratio, which compares the debt burden to the borrower’s income. Such ratios are often considered to be more accurate measures of loan affordability and are useful indicators of how vulnerable a borrower is to changes in economic circumstances (for example, loss of job, divorce, higher interest rates). However, these ratios tend to be only a “point in time” assessments, rarely available for post underwriting performance monitoring. Because the inputs used to calculate the DTI must be requested from the borrower (his total income and total debt), updating a DTI is not feasible without borrower cooperation. In contrast, the LTV can be easily monitored using information on the outstanding amount of the mortgage and the real estate collateral that secures it.

The LTV can be calculated in different ways, depending on how the numerator and denominator are calculated. Thus, LTV calculations can be country or even bank specific. The “V” commonly refers to the acquisition/market value of the property or to its estimated foreclosure value (net of liquidation costs). In the case of German covered bonds, the property valuation is based on the long term

estimated “mortgage lending value” instead.³ The LTV provided for Belgian loans available in ED’s database is usually calculated on an “all sum” basis, i.e. the ratio of all liabilities to assets of the borrower. In order to avoid overestimating LTVs and repayment risk, conservative property valuations are often used. For example, the rating agency Standard and Poor’s mentions that their OLTV ratio typically uses the lower of the purchase price and the original valuation of the property.⁴

In cases where a loan allows for subsequent drawings, the maximum loan limit is typically used as “L” in the calculation. Rating agencies generally factor into the LTV calculation country-specific assumptions regarding a percentage of liquidation costs and a lag until the sale of the property (the period needed to liquidate the property and during which its value may decline further). Also, in countries where regulation imposes a ceiling on the LTV, the regulator often describes how the LTV should be calculated.⁵ For the sake of clarity, we will refer to the following types of LTV in this article:

- **Original Loan To Value (OLTV):** LTV calculation using L and V as of loan origination, and not updated afterwards
- **Loan To Original Value (LTOV):** LTV calculation using the current value of L but keeping V unchanged since loan origination
- **Loan To Indexed Value (LTIV):** LTV calculation using the current value of L and updating V with the relevant house price index since origination
- **Loan To Updated Value (LTUV):** LTV calculation using the current value of L and updating V with a property specific evaluation taking into account that its value may significantly depart from what the Index suggests. This calculation is rarely used for cost reasons, but is used in cases where the loan must be refinanced or when it is underperforming.

These various LTV calculations can give very different results, pointing to very different conclusions. House prices, over the long run, should generally increase with inflation. When the original valuation amount is used for the updated LTV calculation (LTOV), this generates conservative results. ED data shows that house prices are not always updated and that updated LTVs are typically based on the values at origination, only updating the L. However, when house prices decrease, this calculation can become even more misleading (Exhibit 1a). Given that a full evaluation is a costly process, revised property values, when provided, are often indexed values (LTIV). Exhibit 1a compares the evolution of the LTIV and LTOV for a Spanish loan that originated with a 100% LTV in January 2007. In Q4 2011 the LTIV is back to 100%; by Q2 2013 it stands at 115% while the LTOV indicates a value of only 76%. The LTIV is, therefore, a more appropriate measure of a loans’ Loss Given Default (LGD) in the context of sharply declining house prices.

¹ See DBRS: (DBRS Master European Residential Mortgage-Backed Securities Rating Methodology August 2010).

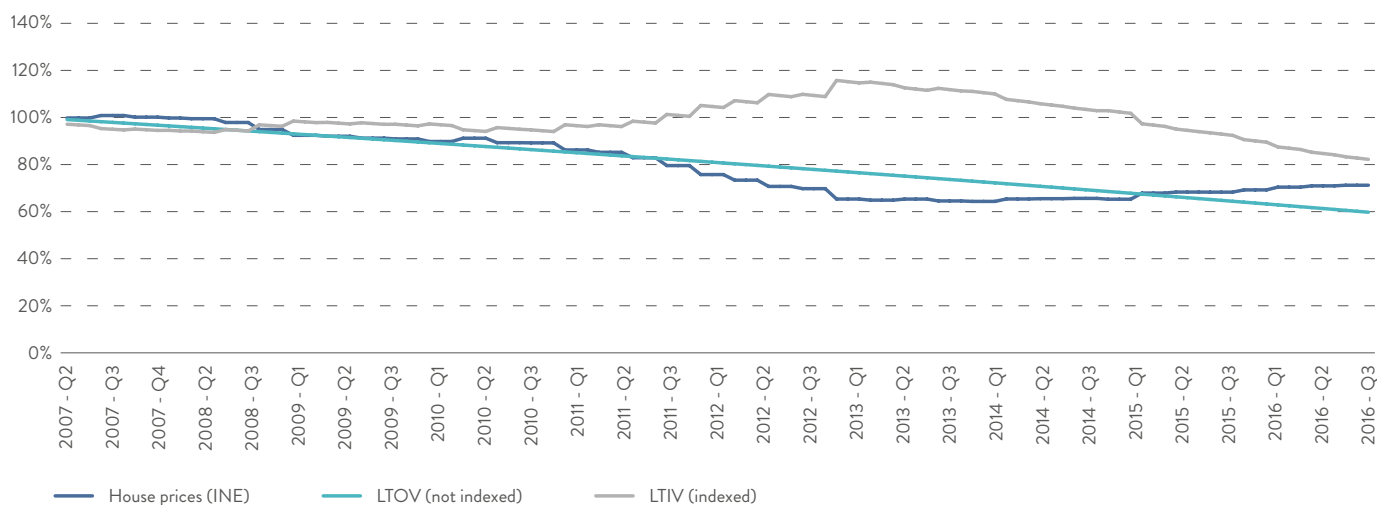
² See European DataWarehouse: The European DataWarehouse (ED) is the first central data warehouse in Europe for collecting, validating and making available for download detailed, standardised and asset class specific loan level data (LLD) for Asset-Backed Securities (ABS) transactions. Developed, owned and operated by the market, ED helps to facilitate risk assessment and to improve transparency standards for European ABS deals.

³ See Verband Deutscher Pfandbriefbanken: “The mortgage lending value [...] is the value of the property which based on experience may throughout the life of the loan be expected to be generated in the event of sale, irrespective of temporary, e.g. economically induced, fluctuations in value on the relevant property market and excluding speculative elements. In determining the mortgage lending value, the future saleability of the property is to be taken as a basis within the scope of a “prudent valuation”, taking into consideration the long-term, permanent features of the property, the normal regional market situation as well as the present and possible alternative uses.”

⁴ See S&P Global: “Methodology And Assumptions: Assessing Pools Of European Residential Loans”, Dec. 2016.

⁵ For instance, a 85% LTV ceiling was introduced in Sweden in 2010. The “V” in this case is defined as the value of the property if it was sold on the open market and reasonable time is given to price negotiation. The market price could be done by an individual valuation of the property. The individual valuation could be based on the general price level.

EXHIBIT 1A | INFLUENCE OF HOUSE PRICE CHANGES ON LTV CALCULATION



Source: European DataWarehouse; INE; comparing two LTV calculations assuming a Spanish loan with a 20-year maturity, 3% fixed interest rate and 100% LTV at origination in Jan. 2007

EXHIBIT 1B | INFLUENCE OF HOUSE PRICE CHANGES ON LTV CALCULATION

	PROPERTY VALUE AT ORIGINATION 2006 (A)	LOAN AMOUNT AT ORIGINATION 2006 (B)	LOAN AMOUNT NOW (C)	PROPERTY VALUE NOW - INDEXED (D)	PROPERTY VALUE NOW - FULL REVIEW (E)	OLTIV 2006 (B/A)	LTOV 2012 (C/A)	LTIV (C/D)	LTUV (C/E)
Property 1 (prime location)	100,000	80,000	70,000	80,000	90,000	80.0%	70.0%	87.5%	77.8%
Property 2 (vulnerable location)	100,000	80,000	70,000	80,000	70,000	80.0%	70.0%	87.5%	100.0%

Source: European DataWarehouse

However, an LTV recalculated using an indexed property value (LTIV) may still provide an incomplete picture of the situation. Property price indices that are used to calculate LTIV are generally only provided at a broad regional level even though there may be important differences in the evolution of property prices within this region. In countries that experienced property crises, steeper price drops were often observed in newly developed estates than in prime “city centre” locations, but a geographic index would typically not account for this. Exhibit 1b shows the various LTV calculations that can be generated when comparing a property in a prime location with a property in a more vulnerable location within the same index area (and thus updated with the same index). Assuming similar loan characteristics, including a LTV at origination of 80% and a value at origination of EUR 100,000 for both properties, the current LTOV would now be 70% for both. If the relevant property index dropped 20% since origination, the indexed property value would then be EUR 80,000 for both loans within this area and the LTIV (using the indexed value) would be 87.5% for both. If, in fact, the value of the property in the prime location only dropped by 10% while the value of the property in the newly developed location fell by 30%, a fairer LTV based on an individual revaluation of property prices would show a 77.8% LTV for property 1 and a 100% LTV for property 2. If a buffer of 10% is needed to avoid losses upon liquidation (i.e. a 90% LTV), only the second, more precise, calculation indicates a risk of loss on property 2.

Moody’s noted, in a study of Spanish repossessed properties using European DataWarehouse data, that overall, the price depreciation on foreclosed properties was substantially more severe than indicated by the index. They attributed this worse than average price depreciation for distressed properties to “...the forced sale process of distressed properties as opposed to sales between willing market participants”.⁶ Nevertheless, European DataWarehouse intends to complete its existing data with indexed property valuations, where these are not yet available, considering that LTIVs would be useful complements to the LTOVs already available.

TO WHOM THE LTV MATTERS

The LTV is used as a key input by rating agencies to determine both the default probability of a mortgage and its expected Loss LGD. The OLTIV is a predictor of default for several reasons. A high OLTIV implies higher leverage and, therefore, more risk. It implies that either the borrower was obliged to borrow more because he could not otherwise afford the property, or, if he chose to borrow more, that he was willing to take on more risk. Also, the amount of equity invested in the property can be used as an indicator of willingness to pay. This is particularly relevant in non-recourse jurisdictions where the loan

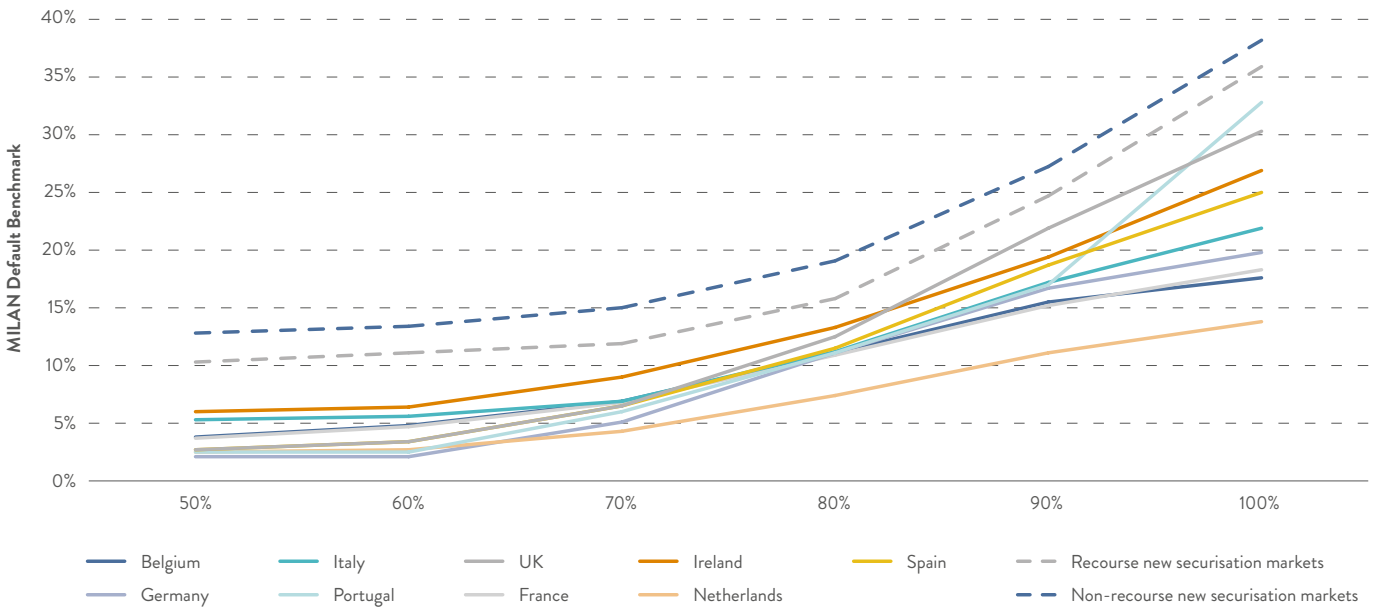
⁶ See: Moody’s sector comment, “Recovery Rates Remain Within our Assumptions, Amid Weakened Repossessed Property Prices”, Feb. 2017, report 1052711.

is to be repaid solely with the proceeds of the sale of the property in case of default, with no recourse against the borrower.⁷

Rating agency methodologies for residential mortgage backed securities (RMBS) generally assume that default probability increases exponentially with the LTV, that the risk carried by a specific LTV level is country specific, and that the current LTV is key to assess the expected loss on the loan. For example,

Moody’s MILAN methodology,⁸ attributes a benchmark default frequency to a loan depending on its country of origin and OLTV. This default frequency is then adjusted with several country-specific factors. The relationship linking a LTV at origination to a default probability is not linear, as shown in Exhibit 2. For a Portuguese loan, for instance, doubling the LTV from 50% to 100% increases the default benchmark more than tenfold (from 2.5% to 32.8%), but increasing the LTV from 50% to 60% leaves the default benchmark unchanged. Other rating agencies use similar approaches.⁹

EXHIBIT 2 | MOODY’S MILAN DEFAULT FREQUENCY CURVE PER COUNTRY



Source: Moody’s Investors Service

LTV values adjusted for house price variations also have some default-predicting power. This is because a borrower with a low current LTV (as measured by LTIV and LTUV), facing difficult economic circumstances (such as unemployment, divorce or long-term illness) can more easily refinance or sell his property than a borrower with a high updated LTV, at risk of becoming a “mortgage prisoner”, unable to refinance his loan. Also, in non-recourse jurisdictions, borrowers are more likely to default when they have no equity left in their property.

The updated LTV is also an essential predictor of LGD. Upon default, the property is typically repossessed by the lender and sold to repay the loan. The liquidation proceeds are first used to cover the liquidation costs and the remainder is then used to repay the loan. If the property is used as security for several loans, the senior ranking loans are paid prior to junior ranking loans, which may not be repaid in full if the proceeds are insufficient. A senior and a junior ranking loan backed by the same property can, thus, have the same probability of default (PD) but different LGDs. A given LTV ratio will, consequently,

have different implications depending on country or market-specific variables such as the ranking of the loan, the liquidation costs, the timing of recoveries etc. Overestimating the value of the property for the updated LTV results in an underestimation of the LGD.¹⁰ Also, in order to derive a possible recovery value, the indexed LTV may have to be stressed further by a Market Value Decline (MVD) assumption, that would account for further possible losses in value between the default date and the actual sale of the property. Beyond a general market decline in house prices, other factors, such as lack of maintenance, can also affect the value of a property. This is particularly relevant for borrowers who are about to default and may have neither the means nor the will to maintain their property.

The LTV plays a role in banks’ underwriting and performance management procedures. Because high LTV loans are typically expected to represent a higher risk, banks will typically extend loans with higher LTVs only to those borrowers with stronger profiles or make up for the extra risk with higher margins. For instance, it may be prudent to have lower LTVs on loans offered to

⁷ See: Fitch EMEA RMBS Rating Criteria “Empirical evidence suggests that willingness to pay is indicated by the amount of equity invested in the property. This can, for example, be determined by the OLTV. The borrowers’ perception of the magnitude of their own equity, or wealth, invested in the property at the time of purchase significantly affects the likelihood of default when the borrower is in financial distress”, Nov. 2016.
⁸ See: Moody’s “Moody’s Approach to Rating RMBS Using the MILAN Framework”, Sep. 2016.
⁹ See: See S&P Global: “Methodology And Assumptions: Assessing Pools Of European Residential Loans”, Dec. 2016.
¹⁰ See Fitch (EMEA RMBS Rating Criteria p14). “The indexation figures are calculated by only capturing 50% of property price increases (except in the UK where Fitch captures a 100% increase) while considering 100% of price decreases. In countries where there is a choice of more than one home price index, Fitch selects an index based on accuracy, frequency of calculation and coverage of the market. In countries where indexation data is limited or not sufficiently reliable, the agency may reduce indexation credit further. In most countries, Fitch distinguishes different regions and property types when indexing property values. Changes in property values from the time of analysis to the point of foreclosure are captured in the HPD component of Fitch’s MVDs.”

self-employed borrowers (who are potentially more likely to default) than non-self-employed borrowers, all else being equal. In terms of loan performance monitoring, there is a strong incentive for lenders to prioritise higher LTV loans, particularly when real estate prices decrease, because the possible liquidation value of the property declines overtime. In terms of loan management, borrowers with high LTV loans should, therefore, expect less flexibility than others. In Structured Finance, the LTV can be used as a criterion to select loans to be included in a revolving portfolio.¹¹ If banks can impose LTV ceilings to limit the risks on their loans, they can also decide to lend more by increasing their LTV limit. Higher LTVs can, therefore, be indicative of a relaxation in lending criteria, a trend often seen prior to a banking crisis. While it is generally believed that higher LTVs at origination indicates a loosening in lending standards, regulation can also provide incentives to borrow with higher LTVs. In the Netherlands, for example, tax deduction on interest explains high LTVs at origination.

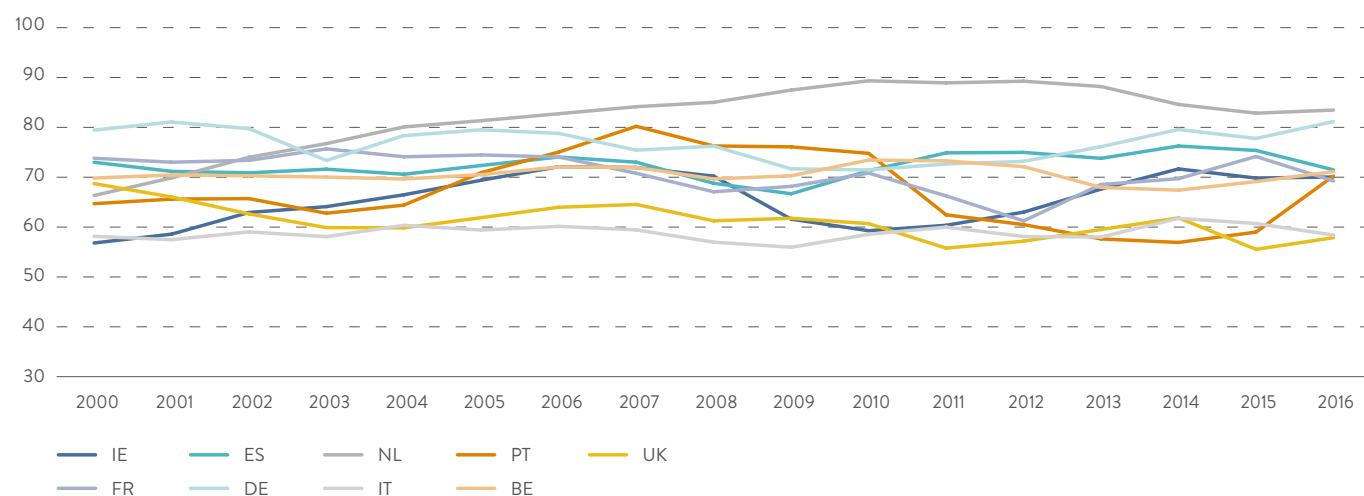
LTV limits are widely used in prudential regulation, often alongside limits on the DTI. Such policies were often implemented in advanced economies following the housing busts of the Great Recession¹² and appear to have been quite effective. The goal of these policies is to encourage higher equity stakes and lower leverage to increase borrower resilience and reduce bank losses in a real estate downturn. Some countries, thus, impose a simple hard LTV limit, others combine a LTV limit with other requirements while other countries have market-specific LTV limits (in terms of price or region),¹³ depending on the region or economic cycle. Setting the appropriate LTV limit is a balancing act. If the limit is set too high, the loans will be riskier. If the limit is set too low, first time buyers may be priced out of the market. Sudden modification of implementation of the LTV ceiling could also have a negative impact. For example, the lowering of the LTV limit in the Netherlands is being implemented gradually by increments of 1% per year to reach 100% in 2018 (from 104% in 2014). Some categories of borrowers will be better able to cope with high LTVs if, for instance, they benefit from some sort of state support.

Also, the same LTV ceiling may not be appropriate for all stages of an economic cycle. An 80% LTV at the peak of a house price bubble may not be sufficient to avoid a loss in case of default. In the wake of a house price slump, a bank may grant 100% LTV loans to clients to purchase repossessed properties in order to clean its balance sheet (effectively swapping a defaulting borrower for a solvent one).

EVIDENCE FROM EUROPEAN DATAWAREHOUSE

The role of the LTV for credit risk assessment led to the inclusion of several LTV-related fields in the ECB’s RMBS reporting template (see appendix). Some of these fields are optional while others are mandatory, and make it possible to store LTV relevant information overtime. Field AR135 (Original Loan to Value)¹⁴ is a mandatory field and is, therefore, available for all RMBS loans in ED. Exhibit 3 shows that the average OLTV per country has fluctuated substantially from 2004 to 2014. Clear cyclical fluctuations are particularly visible in Spain, Ireland and Portugal. In all three countries, OLTVs increased prior to 2007 and decreased afterwards. In the case of Spain and Ireland, where house price adjustments were very sharp, we see that LTVs increased again after 2009 and 2011 respectively. This increase in LTVs after the house price correction could have several explanations. It may be due to renegotiations aimed at helping borrowers repay their loans (with a higher LTV because the house price decreased faster than the amortisation of the loans). It may also be because banks believed that house prices had reached a floor and were then willing to lend again with higher LTVs. Or, it may be the case that banks were willing to underwrite 100% LTV loans to help clients purchase the homes they had repossessed. In other countries like UK and Italy, OLTVs remained relatively stable and in the same range (lowest in Europe), while they have stayed relatively high and stable in the Netherlands.¹⁵

EXHIBIT 3 | AVERAGE LTV AT TIME OF LOAN ORIGINATION IN EUROPEAN COUNTRIES



Source: Moody’s Investors Service

¹¹ See Fitch (EMEA RMBS Rating Criteria p39), criteria can set a limit on the OLTV for the entire portfolio or Current LTV limits for the entire portfolio or even limits on the volumes of loans in certain LTV buckets.

¹² See IMF, Cerutti, Claessens and Laeven “The Use and Effectiveness of Macroprudential Policies: New Evidence”, 2015.

¹³ See BIS, De Araujo, Barroso and Gonzalez (Loan-To-Value Policy and Housing Loans: Effects on constrained borrowers), 2016.

¹⁴ Defined in the ECB taxonomy as “Originator’s original underwritten Loan To Value ratio (LTV). For 2nd lien loans this should be the combined or total LTV. If no data available use the following input ND”.

¹⁵ In the Netherlands, there is also a specific product called “savings mortgage”. The borrower saves money for say 30 years on a separate bank account and does not repay the mortgage in the meantime. When moving, the borrower takes a new mortgage which includes the saving. So, the savings are not subtracted from the new total loan. This also results in high LTVs at origination. Thus often (as is the case here), the Dutch LTV’s are higher than they should be if the savings part was accounted for. From 2014 onwards, however, most of the new mortgages are no longer savings mortgages.

The breakdown of the various LTV buckets differs substantially by country. The average values (around 60%) for Italy and UK, are very close, and yet, the following exhibits show noticeable differences in LTV breakdown in these two markets, with fewer low and high LTVs in Italy compared to the UK. Exhibit 4 shows the evolution of the breakdown of loans originated per OLV bucket overtime, for the countries for which ED has the most data. All patterns differ either by the proportion of loans in each OLV bucket or by the evolution of the breakdown of OLV buckets overtime. In Exhibit 3 and 4, we see that:

- OLVs in Italy are overall lower than in other countries, with few LTVs above 90%. This could be because Italy did not undergo a housing boom/bust fed by private debt as seen in other countries. It could also be because legal proceedings in Italy are notoriously long, and banks may want to protect themselves by ensuring higher levels of borrower equity at loan origination.
- Ireland and Spain, which both experienced severe property price crises, show similar patterns. The proportion of loans issued with OLVs above 90% increased in the years before the crisis, probably indicating a relaxation in lending criteria in a frothy real estate market, and decreased during the crisis years, suggesting a tightening of lending criteria accompanied by lower volumes of new loans. The subsequent renewed increase in LTVs at origination in these markets could be due to renegotiations of mortgage terms and conditions, or also that banks are more willing to lend with higher LTVs in post bubble environments. In Portugal,¹⁶ LTVs increased up to 2007, and decreased afterwards during the credit crunch.
- The pattern for Dutch RMBS looks more steady, with an ever-greater proportion of loans issued with 80% OLVs or more up to 2012, and

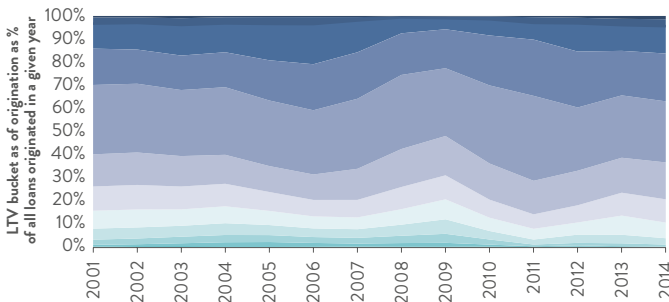
a subsequent decrease. The Netherlands is also the only country surveyed where OLVs in excess of 100% represent a significant proportion of the sample. Dutch regulation aimed at limiting tax deduction on interest and the incremental phasing in of a cap on LTVs may partly explain the reduction in OLVs in the last two years. Germany, where interest is also, but to a lesser extent tax deductible, also shows high LTVs.

- In the UK, we observe very few OLVs above 100%, and average LTVs are as low as in Italy, with somewhat more extreme values (more loans in high or low LTV buckets). In the context of chronically high demand and a relatively low supply of properties (and consequently high property prices), one can suppose that borrowers must either buy with a high LTV to step on the “property ladder”, or sell or mortgage a property they already own. This may explain the relatively high percentage of loans with low OLVs in the UK.
- In France, a substantial proportion (more than 20%) of loans report OLVs of 100% or more. This is partly because LTVs in excess of 100% are reported as conservative estimates for some of the properties for which the detailed property value analysis was not conducted at loan origination. It is also partially because the LTV in France is only one of the factors considered by banks, which otherwise typically require a 10% deposit at least. Borrowers would have to be particularly safe to obtain a 100% LTV loan.
- In Belgium, where there were no boom/bust cycles, the proportions of LTVs look relatively evenly distributed and stable. It is noticeable that Belgian LTVs are calculated with an “all sums” calculations.¹⁷

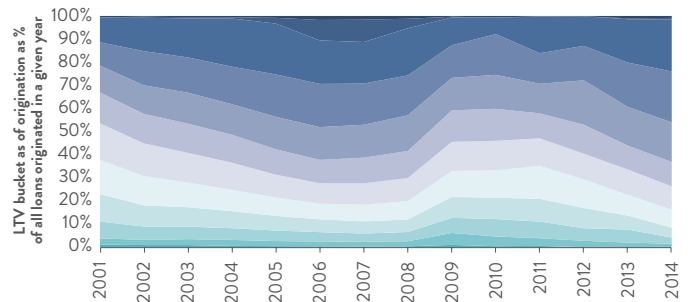
EXHIBIT 4 | EVOLUTION OF LTV AT ORIGATION IN 6 EUROPEAN COUNTRIES



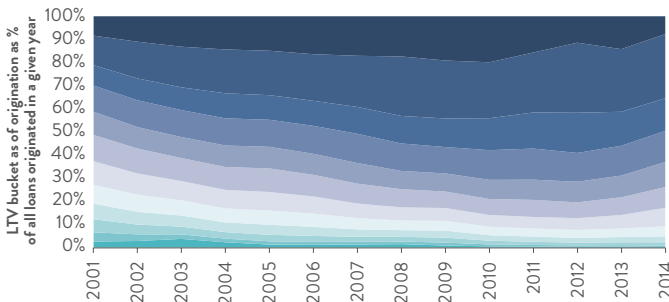
LTVs ON SPANISH MORTGAGES AT TIME OF LOAN ORIGATION



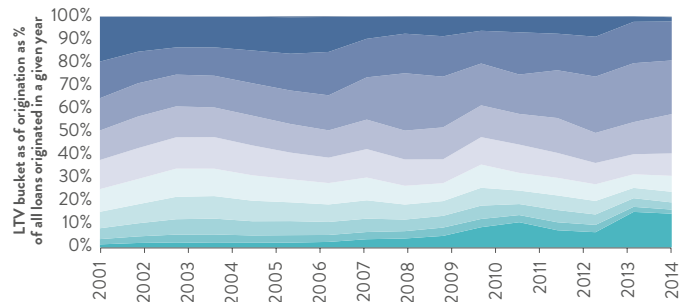
LTVs ON IRISH MORTGAGES AT TIME OF LOAN ORIGATION



LTVs ON DUTCH MORTGAGES AT TIME OF LOAN ORIGATION



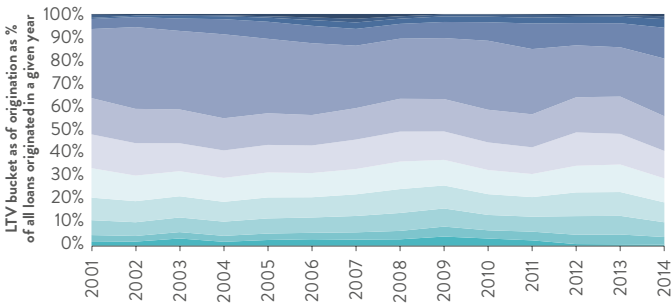
LTVs ON UK MORTGAGES AT TIME OF LOAN ORIGATION



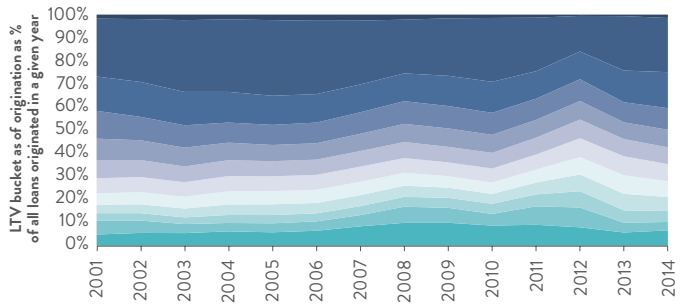
¹⁶ In Exhibit 4, we truncated the chart for Portugal in 2010. This is because there are not enough new deals and therefore not a sufficient number of observations to give a representative picture after this point.

¹⁷ See EDWIN commentary for Belgian RMBS deals “is computed at borrower level as the sum of current nominals of all loans to a borrower (including pari passu and loans ranking prior to securitised loans) divided by the total current values of his properties”.

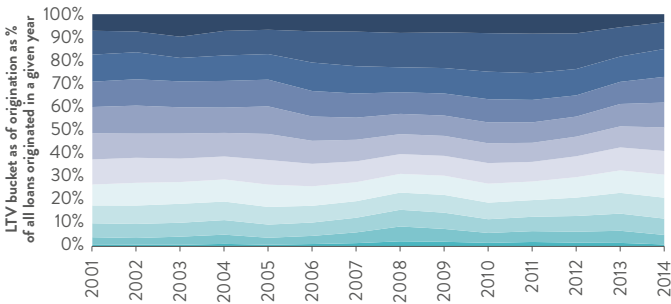
LTVs ON ITALIAN MORTGAGES AT TIME OF LOAN ORIGINATION



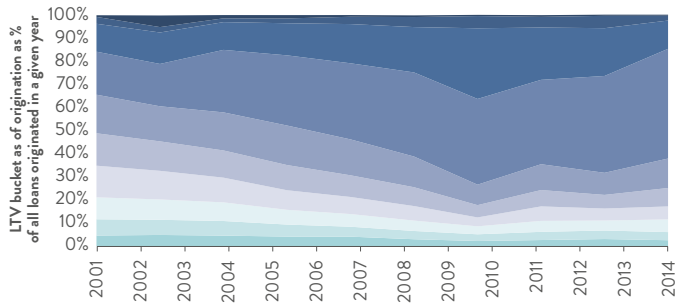
LTVs ON FRENCH MORTGAGES AT TIME OF LOAN ORIGINATION



LTVs ON BELGIAN MORTGAGES AT TIME OF LOAN ORIGINATION



LTVs ON PORTUGUESE MORTGAGES AT TIME OF LOAN ORIGINATION

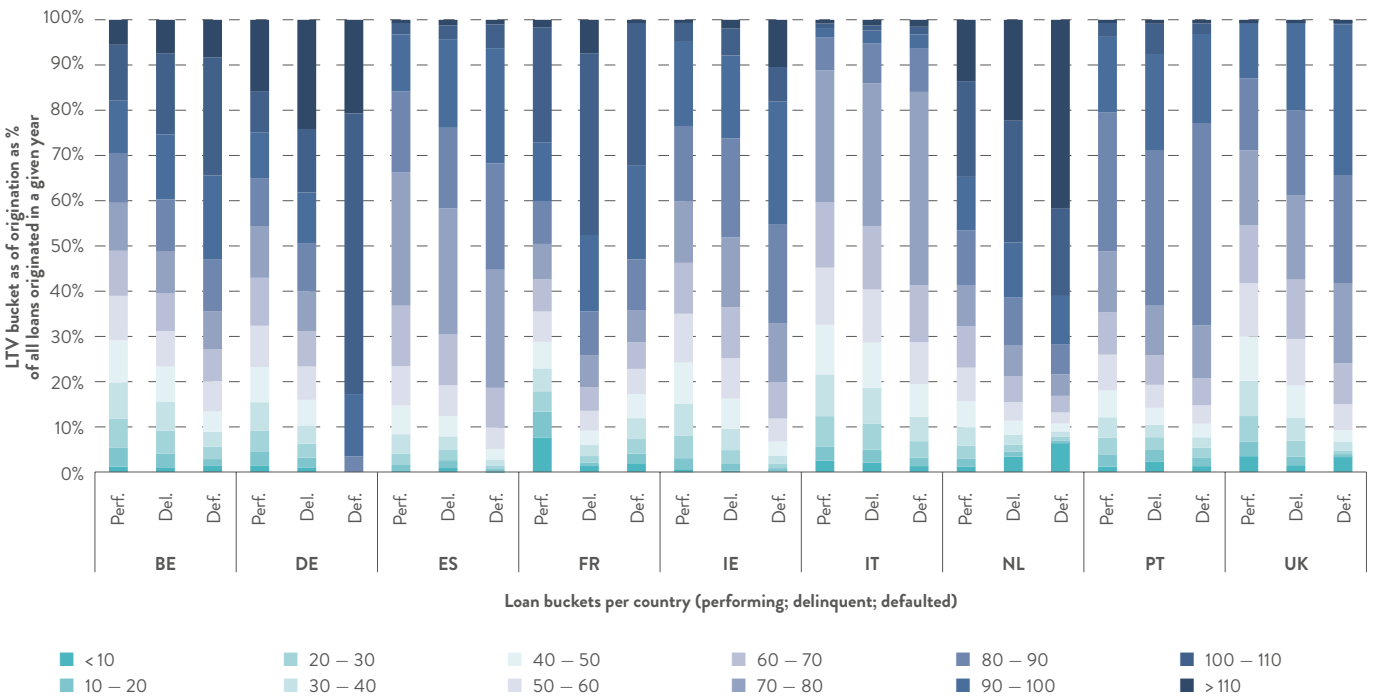


Source: European DataWarehouse

As expected, loans with higher LTVs are more common among delinquent and defaulted loans. Exhibit 5 shows the breakdown of the OLTV for the loans that were active in ED's database as of Q1 2017 by country and loan status:

performing; delinquent; or defaulted). It shows that in all countries, except France,¹⁸ loans with higher LTVs are more common among delinquent and defaulted loans as compared with performing loans.

EXHIBIT 5 | LTV AT ORIGINATION AND LOAN PERFORMANCE



Source: European DataWarehouse, data providers; Active loans as of Q1 2017

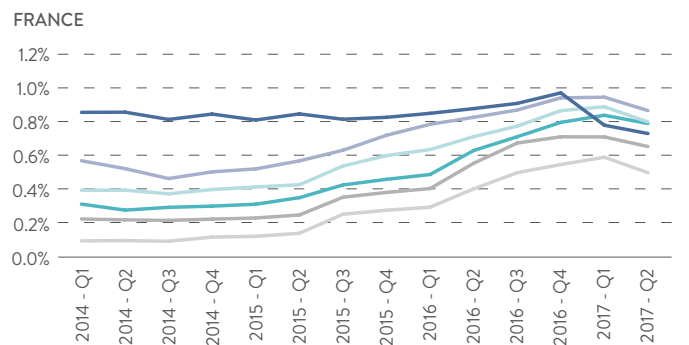
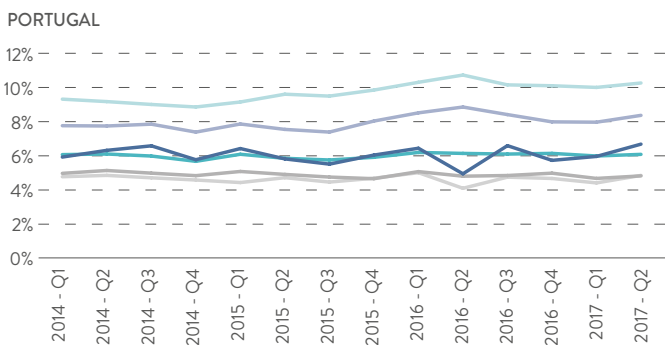
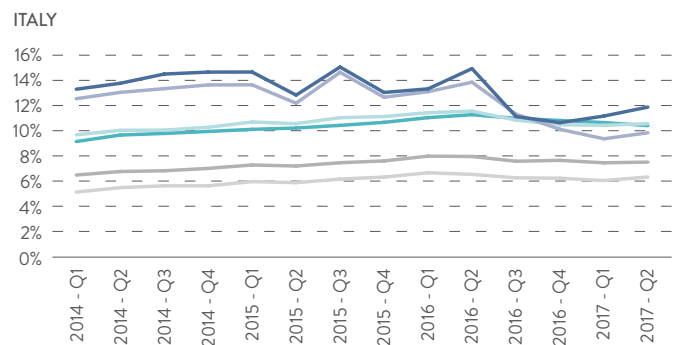
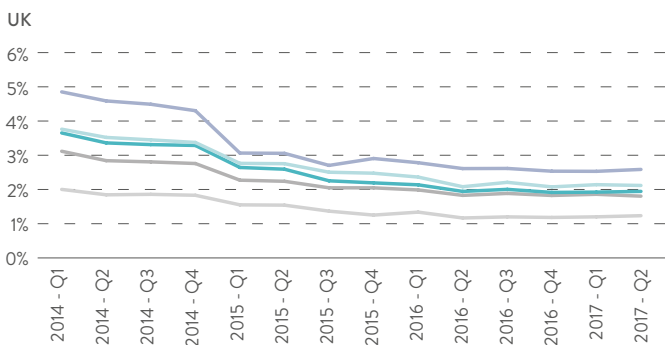
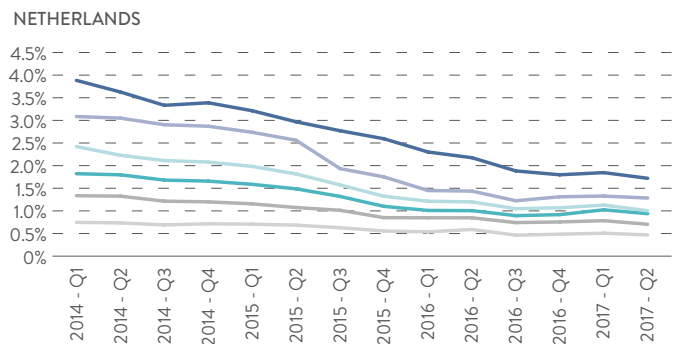
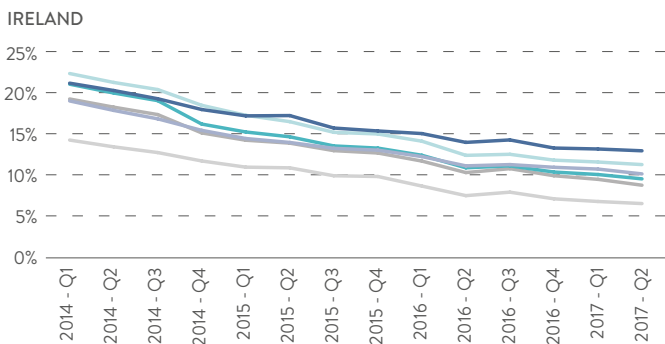
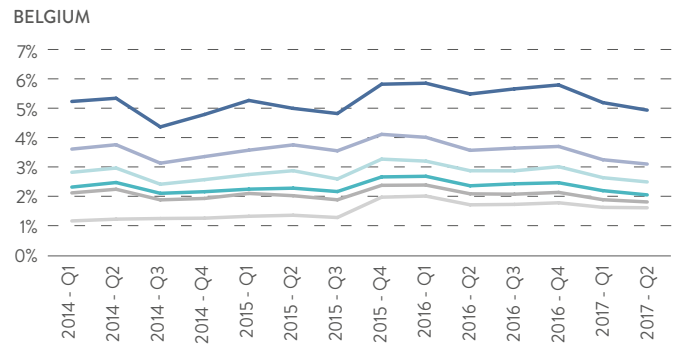
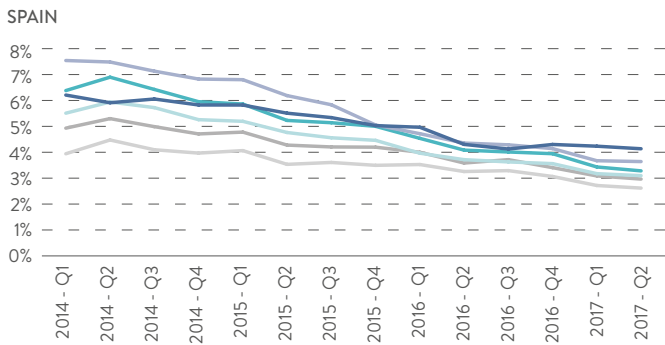
¹⁸ For which 100%+ LTV assumptions are used when detailed house price evaluations are not available. Thus, some of the French loans for which an LTV in excess of 100% is recorded have "true" LTVs below this value.

For the countries of the sample, loans with a lower LTV almost always perform substantially better than loans with a higher LTV. Exhibit 6 shows the evolution of the percentage of active delinquent and defaulted loans since Q1 2014. Overall, delinquency levels have decreased in all countries (except France) over this period, although the actual delinquency levels may not be comparable for all countries because arrears and default definitions can vary depending on the market. In some countries, for example, the Netherlands, the number of months in

arrears is typically rounded up (i.e. a loan one days in arrears will be considered as one month in arrears), whereas in other markets, the number of days in arrears is rounded down, and loans may not be flagged as “in arrears” until they are already several months overdue. Also, in countries where property crises were particularly sharp or, where recovery processes can be lengthy, the number of underperforming loans is higher as the recovery processes for defaulted loans is still ongoing. The same observation also applies to countries with high levels of technical arrears.

EXHIBIT 6 | SHARE OF ACTIVE LOANS THAT ARE DELINQUENT OR DEFAULTED PER COUNTRY AND LTV BUCKET

Legend for LTV Buckets:
 < 60 (light grey), 60 – 70 (dark grey), 70 – 80 (teal), 80 – 90 (light blue), 90 – 100 (medium blue), > 100 (dark blue)



Source: European DataWarehouse, data providers; Active loans from Q1 2014 to Q2 2017; The aim of these charts is to illustrate the performance rank ordering of loans. These charts only show loans reported to have a delinquent or defaulted status (AR166 = 2 or 3). A loan that is one day in arrears and is reported as delinquent is, therefore, included. The actual levels shown may depend on local reporting practices.

APPENDIX: ED’S LOAN BY LOAN DATA SAMPLE

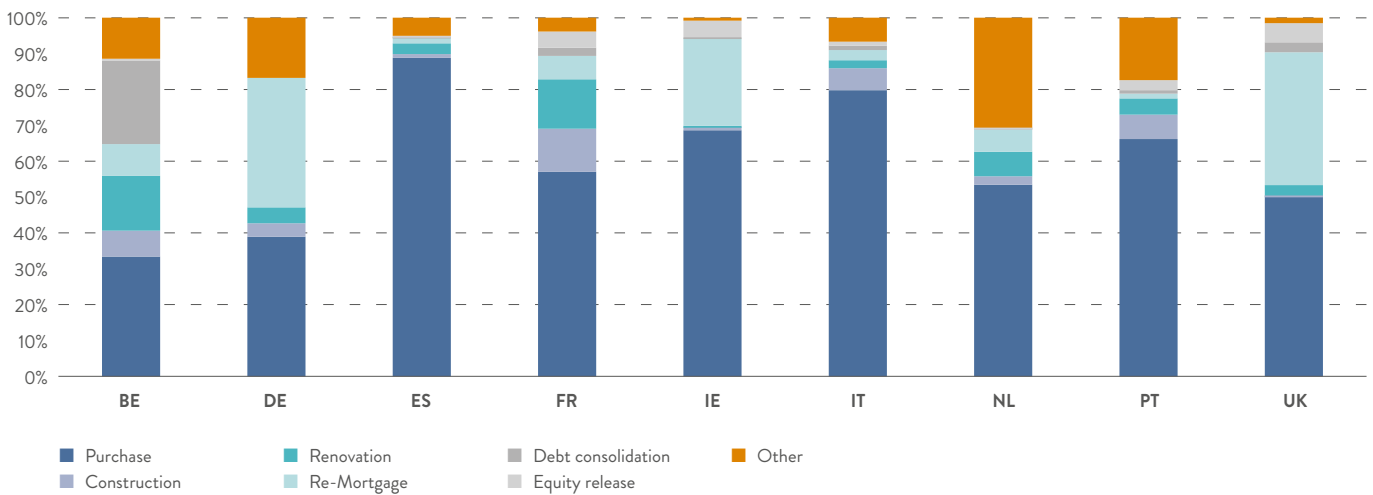
Our RMBS database gathers loan by loan data for securitised portfolios representing 14 million loans from 627 RMBS transactions as of June 2017. Thus, the representativeness of the sample is subject to the issuance of new deals, and will mirror some selection bias (cherry picking) for the respective deals (loans included in securitisations are typically performing on closing date). Our data sample is also subject to survivor bias as the loans in our sample are the ones that were still active by the time the data was first reported to European DataWarehouse. Loans that would have been liquidated, repaid or refinanced prior to this time may, therefore, be excluded. To limit the risk of drawing the wrong conclusions, we decided to focus on the markets for which ED has the greatest number and volumes of loans, and limit in time the starting date for the study (delinquency charts thus start in Q1 2014). In previous studies, our samples were found to be

geographically representative (the proportion of loans in a region tends to match the importance of that region in each country). For some countries, the influence of very large portfolios must also be taken into account.

We based our queries on all the loans reported in RMBS pools, regardless of loan purpose. Loan purpose is provided by mandatory field AR59. A variety of loan purposes is available in this field including equity release or debt consolidation. As appears in Exhibit 7, purpose varies considerably from one country to the next.

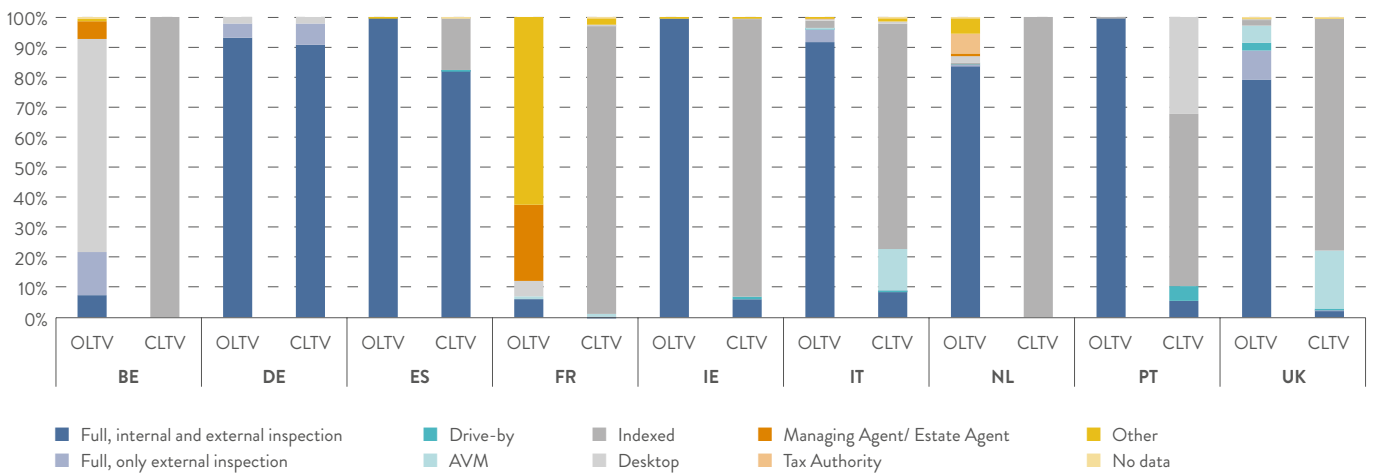
The type of evaluation conducted depends from country to country, but generally, “full internal and external inspection” seems to be the mean most used for the calculation of the Original LTV reported in ED, while the current LTV (CLTV – regardless of the way the evaluation is conducted) is often based on an indexed value, in case the property value was revalued (Exhibit 8).

EXHIBIT 7 | BREAKDOWN OF THE SAMPLE BY MORTGAGE PURPOSE



Source: European DataWarehouse

EXHIBIT 8 | ORIGINAL VS REVISED VALUATION TYPE (FOR LOANS FOR WHICH AN UPDATED VALUATION IS GIVEN)



Source: European DataWarehouse

¹⁹ See for instance ED’s explanatory report on the standardisation of geographic information <https://eurodw.eu/wp-content/uploads/ED-Explanatory-Report-on-standardised-geographic-information-for-European-Loan-Level-Data-23.03.pdf>

The LTV is recognised as a key credit risk indicator and the ECB template mentions a list of fields directly related to the LTV calculation (Exhibit 9).

It should be noted that the valuation amount may relate to the sum of several property values used as collateral for the loan. Also, although mandatory data must be reported, optional data is not always reported.

EXHIBIT 9 | ORIGINAL VS REVISED VALUATION TYPE
(FOR LOANS FOR WHICH AN UPDATED VALUATION IS GIVEN)

FIELD NUMBER	PRIORITY	TAG	FIELD NAME
AR135	Mandatory	Static	Original Loan to Value
AR136	Mandatory	Static	Valuation Amount
AR137	Mandatory	Static	Original Valuation Type
AR138	Mandatory	Static	Valuation Date
AR139	Optional	Static	Confidence Interval for Original Automated Valuation Model Valuation
AR140	Optional	Static	Provider of Original Automated Valuation Model Valuation
AR141	Mandatory	Dynamic	Current Loan to Value
AR142	Optional	Static	Purchase Price Lower Limit
AR143	Mandatory	Dynamic	Current Valuation Amount
AR144	Mandatory	Dynamic	Current Valuation Type
AR145	Mandatory	Dynamic	Current Valuation Date
AR146	Optional	Dynamic	Confidence Interval for Current Automated Valuation Model Valuation
AR147	Optional	Dynamic	Provider of Current Automated Valuation Model Valuation
AR148	Optional	Dynamic	Property Value at Time of Latest Loan Advance
AR149	Optional	Static	Indexed Foreclosure Value
AR179	Mandatory	Dynamic	Sale Price lower limit

Source: ECB Data templates (RMBS)