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Dutch mortgages in the DNB loan level data

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Abstract

The Dutch mortgage portfolio is characterised by high LTV ratios, a large proportion of interest-only mortgages, and a huge tax subsidy in the form of mortgage interest deduction (MID). At the same time, delinquencies, defaults and risk weights are low. This study shows new empirical evidence, mostly acquired through DNB's loan level data initiative, on risk characteristics of the Dutch mortgage portfolio. Using these detailed data, we show how these characteristics are distributed across the population and how they are correlated. We also present micro simulation results on the transmission of an interest rate shock to households and on the persistence of underwater mortgages.

1. Introduction

The aim of this study is to provide quantitative background information on the main characteristics of the Dutch mortgage portfolio using a new dataset.[1] The Dutch mortgage market has a number of specific features, such as high LTV ratios, a large proportion of interest-only (IO) mortgages and a large tax subsidy in the form of mortgage interest deductibility (MID). At the same time, the Dutch mortgages are characterised by full recourse, low defaults and low risk weighting.[2] This study shows new empirical evidence acquired through DNB's loan level data (LLD) initiative, to explore some of these strengths and vulnerabilities in more detail. Moreover, we provide analyses of the persistence of underwater mortgages, which are a latent risk for the Dutch mortgage portfolio, and the pass-through of an interest rate shock to households.

We analyse three specific issues that, from a macro perspective, are often mentioned as vulnerabilities of the Dutch mortgage portfolio. The first is that most mortgages in the Netherlands do not amortise.[3] We show that 60% of the outstanding debt is indeed in IO loans. However, we also show that households often combine these loans with amortising loans or with mortgages that have a pledged savings account to be used for repayment at maturity. This is an important finding, as the credit risk of a portfolio where all individual loans are amortised up to 40% is lower than that of a portfolio where 60% of the individual loans is not amortised at all. Moreover, we show that voluntary repayments are substantial.

The second concern is that the coexistence of high LTVs, interest-only mortgages and floating interest rates on mortgages may have created a

1 See also Overview Financial Stability, Spring 2014. Chapter 3: Risks in the Dutch mortgage portfolio. DNB, 2014.
2 The low losses indicate that the main vulnerability of the large mortgage portfolio is funding risk rather than credit risk. See also Overview Financial Stability, Spring 2015.
3 As of 2013, interest deduction is limited to mortgages that are fully amortised within 30 years. Existing mortgages are grandfathered.

group of vulnerable households that combine all these features. However, we show that some of these vulnerabilities are in fact negatively correlated at the household level. High LTV mortgages tend to have a higher repayment share. Moreover, there are large differences between age cohorts. Younger households typically have higher LTV ratios, but also a higher repayment share, whereas older households have lower LTVs and more IO mortgages. We also show that at origination the mortgage interest rate is typically fixed for a period of 5 to 10 years, but almost never for the entire loan period. This implies that most borrowers will face a limited number of interest rate reset events during the term of their mortgage, the first being typically 5-10 years after origination. This immunises Dutch households to some extent from sudden increases in mortgage interest rates. This is especially important immediately after origination, when borrowers tend to be most vulnerable.

The third issue concerns the large number of underwater mortgages. We find that almost 30% of mortgages was in negative equity at year-end 2013. This is a latent risk for the Dutch mortgage portfolio, as households whose mortgage is underwater are less resilient to (income) shocks, and underwater mortgages may lead to higher credit losses in case of default. An important question is therefore how soon this problem will disappear now that house prices have started to pick up. Based on scenario analyses and a micro-simulation of voluntary repayments, we show that there is a substantial group of homeowners whose negative equity problem is unlikely to be solved in the next 5 to 8 years by price increases alone.

2. Data, definitions and descriptive statistics

2.1 The DNB loan level data

Since 2012q4, DNB has collected loan level data (LLD) using the templates that the ECB requires for accepting securitised mortgages as collateral.[4] While the ECB only requests information on the securitised mortgages, DNB also requests that mortgage lenders report the rest of their portfolio. The data is provided on a quarterly basis and, as of 2014q4, 12 institutions that securitize part of their portfolio (9 banks and 3 insurance companies) participate in the initiative, covering about 75-80% of Dutch mortgages.[5] The participating institutions report their entire portfolio. Pension funds, small banks and insurance companies that do not securitize and foreign institutions do not participate.

Box 2.1 The high mortgage debt within the Dutch institutional context

Why is it attractive in the Netherlands to have both a high nominal mortgage debt and substantial assets? Why not cancel out the debt with these assets? The answer to these questions lies in the distortion created by the tax system. Mortgage interest payments are tax-deducted with the marginal tax rate (currently up to 51%). The same is true for pension savings, insurance and, more recently, bank products pledged to the mortgage. From a tax arbitrage perspective, consumers have a strong incentive to save money in a pension fund (with EET[6] taxation) or in an insurance product pledged to the mortgage, while

4 https://www.ecb.europa.eu/paym/coll/loanlevel/transmission/html/index.en.html
5 Financial institutions participate on a voluntary basis, and report on a best effort basis.
6 EET = Exempted, Exempted, Taxed. This means that pension contributions and returns are tax-free, but retirement benefit are taxed (at a lower marginal tax rate).

keeping the outstanding nominal mortgage debt as high as possible. These pension and insurance assets are not disposable and cannot be seized by creditors. Unfortunately, these tax-favoured accounts cannot be observed directly, as public registers, such as those gathered by the tax office, do not collect this information.

By the end of the 1990's it was clear that this system, in combination with maximal LTV's above 100%, had inflated the housing market and made the mortgage portfolio more risky. Different steps have since been taken in order to reverse the flow. First the MID was limited to 30 years and to the main residence. Next, a code of conduct, agreed upon by banks, made it compulsory to amortize at least half of the new mortgage debt. Since 2013, MID for new mortgages is limited to mortgages that are fully amortised within 30 years. As a result, the provision of new I-O mortgages has ended. Together with a reduction of the maximum LTV to 100% (by 2018) for new mortgages and a reduction of the MID for all mortgages, a comprehensive reshaping of the mortgage market had taken place. Social partners have also agreed on new more stringent LTI rules that are now based on the residual purchasing capacity of a household (thus making the maximum LTI equal to about 400% of yearly gross income, excluding the MID). Finally in June 2015 the Dutch Financial Stability Committee has advised the government to further reduce maximum LTV's to 90% by 2028.

The data's very high coverage, the possibility to observe each single loan, and its many attributes make the LLD a precious source of information. For instance, unlike other administrative micro data sets, the LLD contains all of the following characteristics: mortgage provider, mortgage type, interest rate, participation into the mortgage guarantee (NHG), origination and maturity and current property evaluation. This allows us, for example, to approximate the savings deposits pledged to savings and life insurance mortgages (see Box 2.1) and to study repayments, all of which is impossible using the current Statistics Netherlands (CBS) data.[7]

The LLD also has a number of shortcomings. For privacy reasons, borrowers cannot be tracked over time when they change banks. Moreover, we cannot observe borrowers' current incomes or pre-payments into their savings accounts (see box 2.2). Furthermore, the LLD contains neither an indicator showing whether a borrower is a first-time buyer, nor the year of inception.

Box 2.2 Concepts and definitions

Origination date: in the LLD this is the date at which the contract was last (re)negotiated with the reporting bank. To approximate the inception date we subtract 30 (the typical length of a mortgage) from the maturity year (which is typically not updated upon renegotiations).[8]

Savings mortgage: a mortgage without contractual repayments of the principal during the term of the loan. Contractual periodical payments are made in a savings account that is pledged to the mortgage and that is administered by the bank (banksparen) or by an insurance

7 Other micro data sources that are often used for analysing risks of the Dutch mortgages are the IPO dataset from CBS and the Dutch Household Survey. The IPO population is representative of the Dutch population. It consists of about 100 000 households and 250 000 individuals in each wave. As of 2005 data are available also for wealth items, such as outstanding mortgage debt. The DHS data are administered by Center Data, Tilburg University. This is a representative subsample of the Dutch population with a rich set of wealth-related variables. The population interviewed partly overlaps with that used in the survey data of the ECB.

8 This is an important limitation of the data. In this study, we often limit the analysis of original values to subgroups for which we are certain to retrieve the proper origination dates. Re-negotiations overwrite original information when mortgagors change bank, or, if they stay with the same bank, when major changes to the contract are implemented.

company (spaarhypotheek). Borrowers can also make pre-payments into these accounts at origination. The return on the savings deposit equals the mortgage interest rate. Upon maturity, the mortgage is fully repaid out of the savings account.

Endowment mortgage: comparable to a savings mortgage, except that the return on the savings deposit is linked to market rates and not necessarily equal to the mortgage interest rate (levenhypotheek), and thus at maturity full repayment is uncertain.

Investment mortgages: comparable to a savings mortgage, except that the periodical payments are invested in stocks (beleggingshypotheek).

Interest-only mortgage: a non-amortising mortgage without a savings or investment account pledged to it (aflossingsvrije hypotheek).

Interest-only (IO) share: the share of the original principal financed through an interest-only mortgage, i.e. not covered by a savings or investment account or regular amortisation.

LTV: loan-to-value ratio. We distinguish between original and current LTVs and between gross and net LTVs. For the latter, we subtract the savings deposits pledged to the mortgage (see section 2.4).

NHG: National mortgage guarantee, which insures the lender against default on the mortgage in the event of the borrower's unemployment or divorce. The borrower pays a fee at origination and is granted a discount on the interest rate in exchange. NHG is ultimately guaranteed by the central government.

2.2 Data collection and definitions

The data collection of the LLD started in 2012q4. Each institution is requested to give a picture of the current status of its mortgage portfolio by reporting a number of mandatory and optional fields.

The matrix delivered must allow unique identification of each loan and borrower. If the loan stays within the bank for an additional period, the identifiers must enable the loan and the borrower to be tracked over time. Also, the borrower's dwelling is identified using a similar strategy. When a borrower updates the mortgage, for instance by resetting the mortgage interest rate, the information about the previous mortgage interest rate and origination date is deleted. Box 2.2 contains a glossary of the main concepts and definitions that are used in this study. Summary statistics for most key indicators are provided in Appendix 3.

2.3 Comparing the LLD to other sources

Table 2.1 shows the coverage of the LLD by comparing the total debt reported at loan level with the aggregate reported in DNB's monetary statistics. The table shows that the LLD cover 78% to 81% of the mortgage debt reported in aggregate figures. The missing items are due to DNB not gathering data from small banks, foreign banks and pension funds, as well as to banks not reporting their whole portfolios.

In the LLD, mortgages are observed in all their subcomponents (which we term 'loans'), where a mortgage is typically made up of two loans. Each wave contains more than 5.6 million loans, corresponding to about 3 million borrowers.

Table 2.1 Debt, loans and borrowers in the LLD

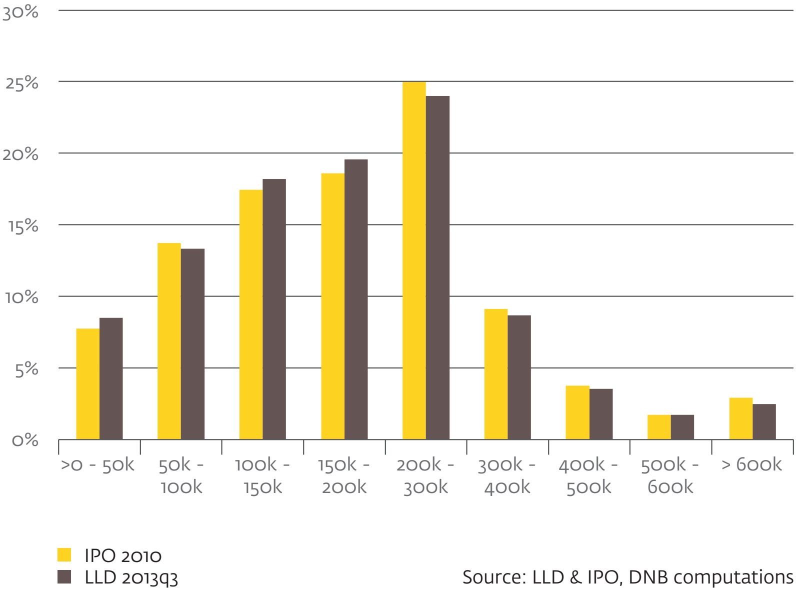
	LLD debt	Monetary Statistics DNB	LLD Debt Coverage	Loans	Borrowers
2012q4	515,412	650,993	79%	5,828,982	3,040,976
2013q1	525,728	649,517	81%	5,736,657	2,987,919
2013q2	508,323	646,708	79%	5,649,248	2,946,343
2013q3	499,002	644,853	77%	5,641,773	2,928,214
2013q4	489,775	632,944	77%	5,611,558	2,915,542
2014q1	496,096	631,077	79%	5,731,158	2,950,032
2014q2	508,389	631,395	81%	5,839,390	2,983,154
2014q3	508,014	629,445	81%	5,860,383	2,991,913
2014q4	491,890	631,879	78%	5,793,961	2,950,395

To understand whether the data are representative for the mortgage market, we compare the LLD to other sources of information on several characteristics. Graph 2.1 shows that the distribution of outstanding debt in the LLD is very similar to data from Statistics Netherlands (CBS).[9] The small differences may be the result of differences in dates and of a slightly different debt concept.[10] In both datasets, the bulk of the distribution has outstanding debt between EUR 100,000 and 300,000.

We also find that mortgages age similarly in the LLD and in the DNB Household Survey (DHS).[11] Graph 2.2 shows the cumulative distribution of the mortgage vintage, defined as the difference between the reporting

9 Data are from the IPO database, which contains micro data on income.
10 In the LLD, the balance of accounts pledged to the mortgage are subtracted from the outstanding debt.
11 In the DHS data the residual time to the next reset is self-reported.

Graph 2.1 Outstanding debt in the IPO and LLD

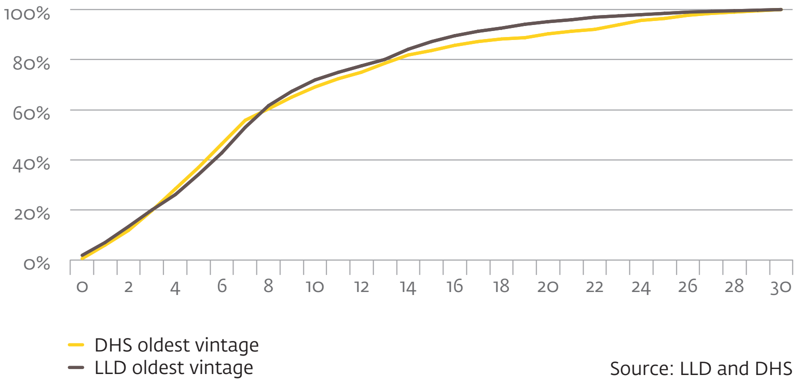


Source: LLD & IPO, DNB computations

date and the origination date. As 80% of the borrowers have multiple loans, we take the oldest loan per borrower into account.[12] The two distributions are almost identical. Graph 2.3 plots the remaining period until the next interest rate reset based on the DHS and the LLD. We use DHS data that refer to the mortgage situation in 2011. In the LLD, the data is only available from 2013q2. The two data sources show similar patterns. This confirms that relatively few mortgages have floating rates or 30-years fixed rates,

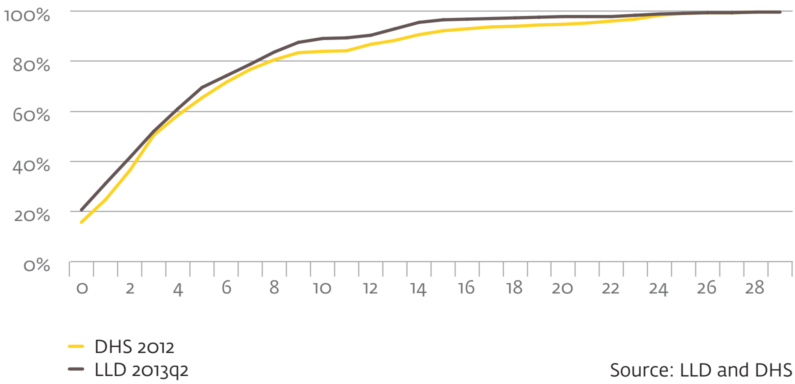
12 For 60% of the borrowers with multiple loans, the origination year is the same for all loans. For the 40% with different origination years, the median difference in reported year of origination is 5 years.

Graph 2.2 Oldest mortgage vintage of borrowers



Source: LLD and DHS

Graph 2.3 Cumulative distribution of the interest rate reset interval



Source: LLD and DHS

a fact that was already mentioned in the OFS 2012.[13] Regarding NHG (national mortgage guarantee) coverage, official data suggests that as of 2013q4 NHG mortgages amount to EUR 165 billion.[14] This is about 25% of the Dutch mortgage debt. According to the information in the LLD, about 20% of the debt has NHG coverage. This difference of 5 percentage points may be the result of incomplete data, since only 6 out of the 11 institutions provided NHG information. When we only select reporting institutions, we find that about 22% of the debt is covered by NHG.

2.4 Defining LTV and LTI ratios

The LLD provides detailed information to compute loan-to-value ratios. To start with, the LLD contains the original and current LTV as directly reported by banks and insurance companies. However, these variables have many missing values and are difficult to compare over time and across institutions, for instance because banks may use different valuation concepts. Information on the valuation of the collateral reveals that about 75% of properties are valued using an expert valuation (such as the transaction price or the forced-sale value), while about 25% is based on the tax value (WOZ). As the value concept underlying the reported LTV is typically the market value, we also construct a measure of LTV by dividing the principal by the valuation amount, which are both separately reported. As the reported and computed LTV is mostly the same, we conclude that the valuation amount being reported is a close proxy of the market value.[15] We are also able to distinguish between original and current LTV ratios.[16]

13 Overview of Financial Stability, Spring 2012. Chapter 2: The Dutch Economy. DNB, 2012.
14 https://www.nhg.nl/fileadmin/user_upload/Documenten/PDF/kwartaalberichten/Kwartaalbericht_1e_kwartaal_2014.pdf
15 Our definition of current LTV as the current outstanding balance (variable ar067) divided by the valuation amount (variable ar143) yields results that are broadly similar to the current LTV as reported by banks (variable ar141).
16 To construct our measure of original LTV, we need to manipulate the data somewhat. See box 2.2.

The standard way of calculating the LTV ratio ignores the fact that in the Netherlands, many households have savings accounts pledged to their mortgages. To adequately reflect the home equity of Dutch borrowers, a LTV measure should ideally adjust for these balances. We use the LLD to construct such a measure. By definition, for each savings or endowment mortgage, at maturity the amount in the savings deposit will be equal to the loan principal. We use this fact to compute the development of the savings deposit over time. In doing so, we assume that no additional

Box 2.3 The difference between LTV ratio concepts of Statistics Netherlands and DNB

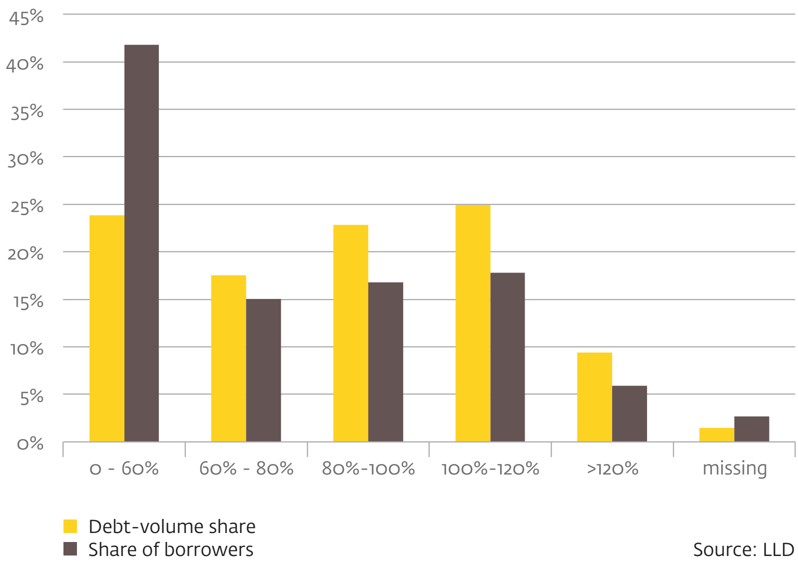
The LTV definition of DNB differs from that of the CBS. The LTV reported by the CBS is defined as the fiscal value of the mortgage divided by the tax value (WOZ) of the primary residence. The fiscal value of the mortgage is a gross measure, which ignores the balance of pledged savings accounts. Moreover, the WOZ evaluation was historically an underestimation of transactions prices, although in recent years the WOZ value has become more aligned with transaction prices in most Dutch municipalities. Both effects tend to make the LTV as reported by the CBS higher than that of DNB. For example, based on our net definition of LTV, the April 2014 OFS mentioned that 30% of the mortgages were underwater. According to the CBS definition, in the same period, 41% of the mortgages were underwater. When computing gross LTV with the LLD (by dividing the original balance by the current valuation and ignoring the savings deposits) we find that 36% of the mortgages are underwater. This is closer to the CBS figure, but evidently the current valuation is still likely to be higher than the WOZ value.

payments in the savings deposit are made, neither at origination nor at any other moment before maturity. This means that we may actually underestimate the amounts in these deposits. Moreover, due to lack of data, we ignore balances pledged to investment mortgages. Appendix 1 provides a more detailed description of the decomposition of housing wealth.

Graph 2.4 shows the distribution of mortgage debt by current (net) LTV, both in terms of debt volume and in terms of borrowers. 40% of the outstanding debt had an LTV>100%, whereas 28% of all borrowers had negative equity. This implies that borrowers with higher LTVs tend to have larger mortgages.

Graph 2.4 Debt volume and borrowers by LTV bucket

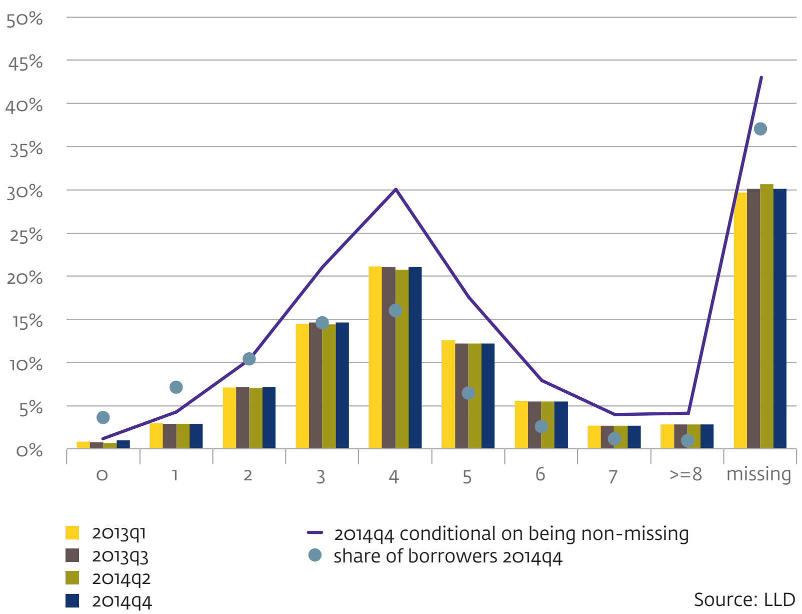
LTV is measured as net current LTV, 2014q4



Source: LLD

Graph 2.5 shows the distribution of debt by original LTI,[17] defined as the ratio of the original principal and the borrowers' income at origination. We show the development across the 4 available waves. Unfortunately, information on income is only available for almost 70% of our observations.[18] Therefore, conclusions derived from this variable should be interpreted with care. The distribution peaks at LTIs between 4 and

Graph 2.5 Debt volume by LTI buckets



Source: LLD

17 The dataset only contains gross income at origination. Because the income concept used in the LTI refers to the household income including all borrowers in the household, it may differ from the sum of primary and secondary income.
18 Information on income is missing especially for the smaller banks. Moreover, the group differs from the sample average in a number of ways (borrowers are 4.7 years younger, have lower mortgage debts, and have more recent origination dates).

5 – about 20% of the debt falls into that category. The distribution shifts to the left if we look at the share of borrowers. This indicates that those with higher LTIs have larger mortgages relative to those with lower LTIs. A possible explanation for the very high LTIs (above 7) are temporary second mortgages taken out because a household bought a new house before being able to sell the old one. The distribution of LTIs does not change significantly if we drop the observations for which information on income is missing.

2.5 Describing risks in the Dutch mortgage portfolio

By combing information on LTV and LTI ratios, we can identify a group of high-risk borrowers. Table 2.2 shows information on four different LTV-LTI buckets, based on original LTIs and LTVs.[19] In this table, high LTV is defined as an LTV above 100% and high LTI as an LTI greater than 5. The majority of the sample (59%) contains borrowers with low LTVs and low LTIs. Default risk for this group is likely to be the lowest. Borrowers with high LTI and low LTV (11% of borrowers) are more risky, because of the high LTIs, but losses in case of default are likely to be low. The third group (21% of borrowers), with low LTIs and high LTVs, probably has a higher loss given default than the second group. Finally, borrowers with both high LTVs and high LTIs, are considered the most risky group. This group accounts for 10% of the sample.

The division in groups in Table 2.2 is based on values at origination of the mortgage. Especially for the older mortgages, property values and incomes may have changed substantially since origination. Some of these mortgages were originated back in the 1990s, and property values have substantially

19 We have assumed that the mortgages were originated 30 years before their earliest maturity dates. Where necessary, income was discounted back to that moment using a 2% rate of wage inflation.

Table 2.2 Characteristics of LTV/LTI buckets

	Low LTV low LTI	Low LTV High LTI	High LTV low LTI	High LTV High LTI
Proportion of sample (%, original LTV and LTI)	59%	11%	23%	7%
Proportion of sample (%, current LTV and LTI)*	67%	3%	28%	3%
Number of loans (x 1000)	913	204	334	159
Performing loans (%)	98.5%	96.1%	96.7%	95.0%
Loans with arrears** (%)	1.1%	2.8%	2.5%	4.1%
Arrears balance, mean (EUR)	3,737	6,378	4,991	10,538
Arrears balance, median (EUR)	1,077	1,863	1,487	2,292
Total arrears (in EUR 1000)	45,282	41,469	47,467	64,764
Proportion of total arrears	23%	21%	24%	33%
Proportion of self-employed	5.8%	6.1%	5.6%	5.3%
Proportion of NHG mortgages	27.4%	16.6%	54.3%	35.4%
Average age of borrower	50	46	41	44
Current interest only share in mortgage (mean)	82.1%	88.3%	70.9%	87.3%
Mean nominal debt outstanding (in EUR 1000)	157	272	208	264

Explanatory note: Data for 2014q4. This table is computed on the subsample with information on LTI and is not representative of the whole sample. The total arrears balance in de LLD is about EUR 350 million. Due to incomplete information on LTV and LTI, we only observe EUR 200 million in the sample above. The current balance of arrears is defined as the total payments due to date less total payments received to date less any amounts capitalized. This should not include any fees applied to the account. A loan is performing when it is not redeemed, foreclosed, repurchased and has no arrear.

* Current LTI is estimated in the optimistic scenario that current income (which we do not observe) has increased with a 2% wage-inflation from origination to present for all mortgagors. No income drops or unemployment events are taken into account.

** The other account states are Default or Foreclosure, Redeemed, Repurchased by Seller.

increased since then, even if we take the recent price drop into account. Moreover, incomes at origination may not accurately reflect the current income positions of households. In order to adjust for developments in property prices, we have replaced original LTVs with current LTVs. Incomes were updated assuming 2% wage inflation per year. Using current measures on LTV and LTI, the high-risk group shrinks from 10% to 3% (see Table 2.2, second row). The main shifts in the share of high-risk households, when looking at current indicators, are caused by a substantial improvement in LTIs. The impact of using current LTVs is much smaller.

We have used the definition of risk groups at origination to see if and how other risk characteristics differ between the LTV/LTI buckets. Table 2.2 shows that, although arrears are very low on average, the percentage of arrears is almost four times as high in the high-risk group than in the low-risk group. The high-risk group accounts for more than a third of total arrears in the portfolio. On the other hand, the high-risk groups have lower interest-only shares, which means that a larger share of their mortgage is covered by pledged savings accounts (see also Section 3). Moreover, NHG coverage is significantly higher for high LTV mortgages.[20] This is an important risk-mitigating factor for banks.

20 The NHG indicator is only reported by 6 of the 11 banks surveyed. This may return a picture of the NHG coverage that does not necessarily correspond to that produced by the NHG fund itself.

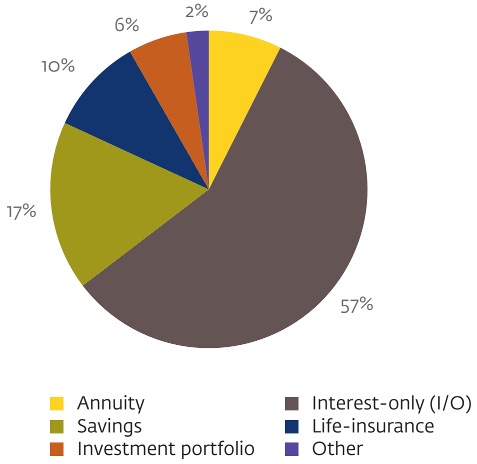
3. Interest-only mortgages and repayments

3.1 Interest-only share

The LLD confirms that 60% of the Dutch mortgage portfolio consists of interest-only (IO) loans (see Graph 3.1). To assess to what extent this poses a systemic risk, we analyse the distribution of IO loans across households. This is especially relevant for the Netherlands, where IO loans are often combined with a savings product or an amortising loan. From a risk perspective, it is relevant whether 60% of the households has a full IO mortgage or the IO loans are spread across a larger group of households, who combine them with less risky mortgage types. Moreover, other household characteristics, such as LTV ratios and voluntary repayments, also affect the riskiness of IO loans. The loan level structure of the data enables us to better understand the risks of IO loans for the households.

Graph 3.1 Debt volume by loan type

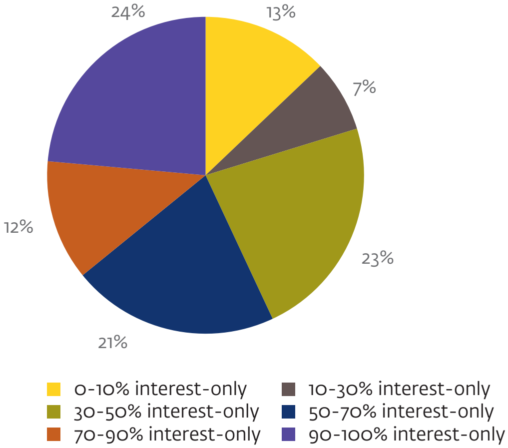
2014q4



Source: LLD

To analyse the distribution of IO loans, we define the IO share, which is the share of a borrower's mortgage that consists of an IO loan. For example, if a borrower combines an IO loan of EUR 100,000 and a savings mortgage of EUR 100,000, his IO share is 50%. Graph 3.2 shows the distribution of mortgage debt according to the IO share. The chart shows that 24% of mortgage debt consists of 100% IO mortgages in 2013q3 and that 13% are fully amortising.

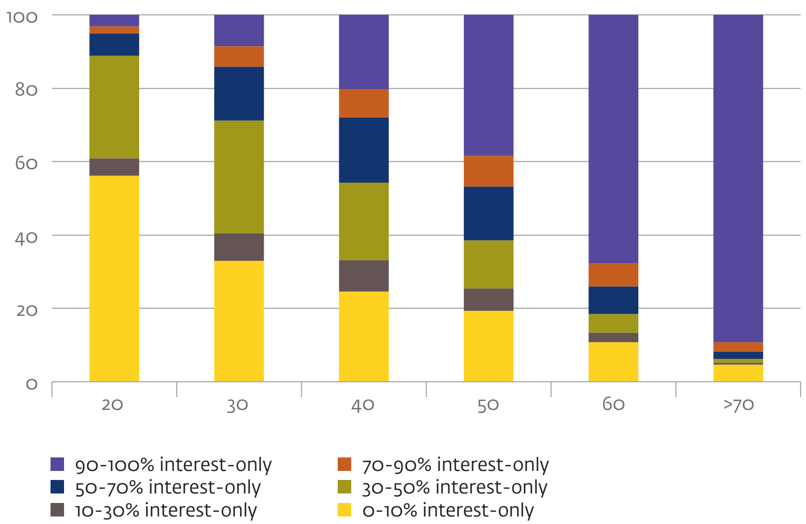
Graph 3.2 Debt-volume share by I/O share



Source: LLD

Graph 3.3 shows the distribution of the IO share across age groups, as well as the mean IO share for each category. Less than 10% of borrowers in their 20s and 30s have a 100% IO mortgage. For this group, on average less than half of their mortgage is interest-only. This is in accordance we rule of conducts and legislation that was adopted already by the end of the 1990's (see Box 2.1). The situation is different for borrowers older than 60, who have experienced a large appreciation of their home equity. This group

Graph 3.3 Repayment share by age (2014q4)

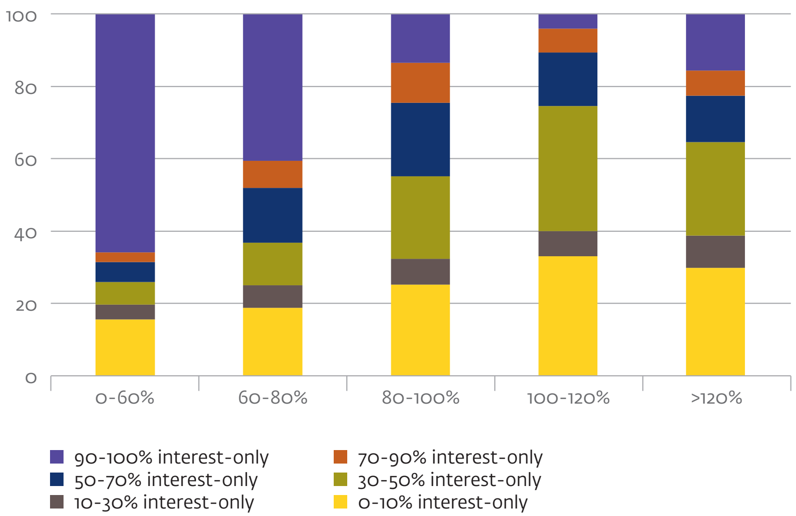


has an average IO share of more than 80%. It should be noted that this group is much smaller, both in terms of the number of households and in terms of outstanding debt. Graph 3.4 shows the distribution of the IO share across LTV buckets. The IO share correlates negatively with LTV. 100% IO mortgages are concentrated with the lower LTVs, in particular those below 60%. These figures are consistent with the anecdotal evidence that IO loans were very popular among elderly as a mean to cash out home equity (see also Van der Schoors et al. 2007[21]).

21 Schoors, A. van der, Alessie RJM, Mastrogiacomo M (2007). Home and Mortgage Ownership of the Dutch Elderly: Explaining Cohort, Time and Age Effects. De Economist. 155, 1, pp 99-121.

Graph 3.4 Debt-volume by LTV bucket and interest-only share

2014q4



3.2 Voluntary repayments

According to banks, voluntary repayments have recently increased, partly due to additional fiscal facilitation of intergenerational transfers,[22] the low deposit rate, and the partial removal of fees on voluntary repayments. Using the panel component of the data, we can defer from the balance of the outstanding principal the amount of voluntary repayments within the sample period. We have defined as voluntary repayments all

22 Intergenerational transfers (typically from parents to children) were tax-free up to the amount of about EUR 52 000 euro, provided that the recipient was under 35 years of age. In the period October 2013 - December 2014, the tax-free amount was increased to EUR 100 000, and the recipient's maximum age was dropped.

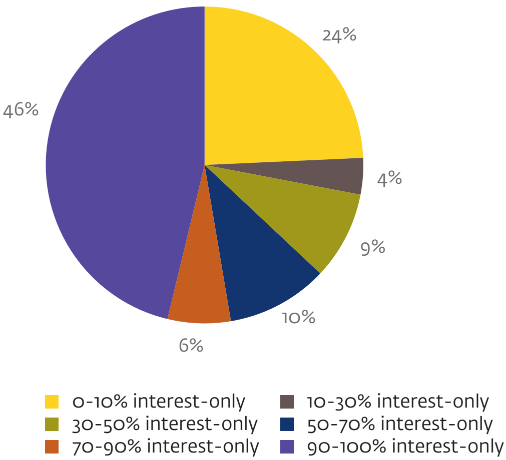
decreases of the principal that exceed contractual amortisation. Hence, the computation differs for different mortgage types. For annuities and linear mortgages, the decrease of the principal must be larger than the standard annuity repayment. For savings and endowment mortgages, households can choose between voluntary repayments of the principal and voluntary additional deposits to their pledged accounts. Banks subtract the balances of these pledged accounts from outstanding debt in the LLD. This means that contractual and voluntary repayments are observationally equivalent in the data. In order to identify the contractual component we looked at quarterly changes in the principal. When decreases are recurrent and of the same amount these are considered contractual. We then defined the decreases in principal, net of the contractual portion, as the voluntary repayments. These computations suggest that borrowers voluntarily repaid about EUR 11 billion in 2013 and EUR 18.5 billion in 2014, which corresponds to about 2-3% of the entire mortgage debt in the Netherlands in those years.[23]

Graph 3.5 shows that more than half of the volume of voluntary repayments in 2014 were made on mortgages with an IO share between 70 and 90%. This implies a considerable decrease of the mortgage debt for this type of mortgages. We have found that about 3% to 5% of the borrowers with a full IO mortgage make repayments in each quarter and that these repayments are higher on average than those on amortising mortgages. However 75% of these repayments were associated with mortgages with LTVs below 100%, and thus contributed little to reducing the number of underwater mortgages. Graph 3.6 shows that almost 65%

23 This figure corresponds to extrapolations that can be made, looking at the main banks' financial reports. However, we recommend that caution be exercised in interpreting this number, as the treatment of the various repayment accounts cannot be checked with external sources. As we have no information on repayments on investment mortgages, we have not included them in our analysis.

Graph 3.5 Voluntary repayment by amortisation type

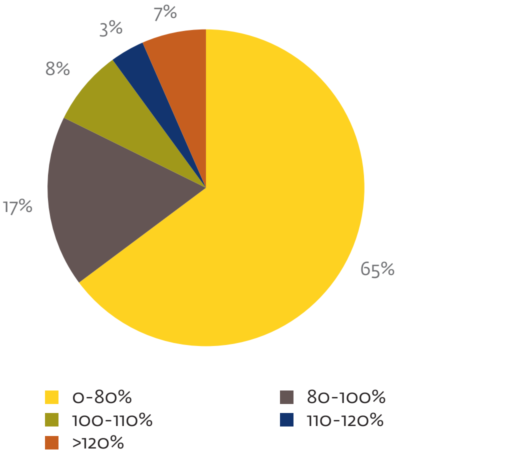
2014q4



Source: LLD, own computations

Graph 3.6 Voluntary repayments by LTV bucket

2014q4



Source: LLD, own computations

of the repayments are observed for mortgages with current LTV below 80%, while only 18% of voluntary repayments were booked on underwater mortgages.

In addition to observing repayment flows, the LLD also enables us to proxy the repayment stock on 100% IO mortgages by comparing original and current principals. This is an approximation, because the original principal refers to the origination date, which is not necessarily the date of inception. We find that more than one-third of the 100% IO mortgages experienced a repayment event sometime after origination. The reduction of the principal for these mortgages amounted to about EUR 36,000 on average.[24] This equals 16-18% of the original principal.

24 On the contrary, only 0.6% of the 100% I/O mortgage borrowers increased the principal.

4. Micro simulations on interest rates and underwater mortgages

So far, we have used the data only to produce descriptive evidence. In this section, we will turn to projecting future states of the mortgage market. More specifically, we will look at the pass-through of an interest rate shock, and the impact of house price developments and voluntary repayments on underwater mortgages.

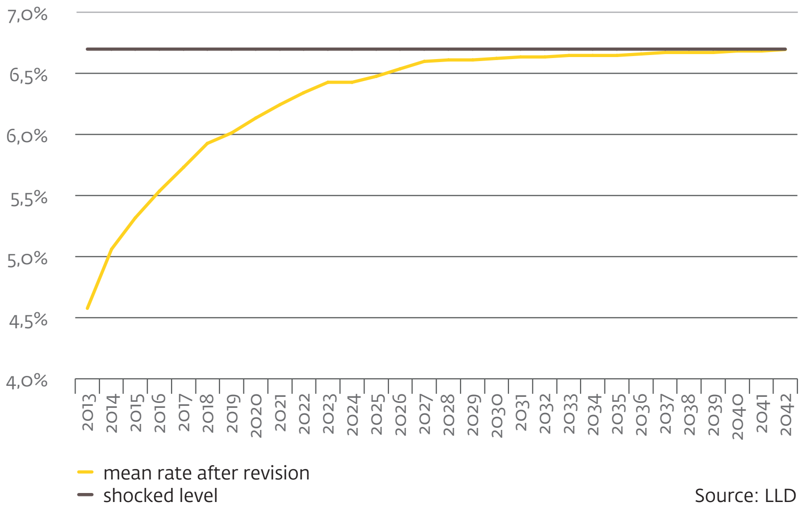
4.1 The pass-through of an interest rate shock

With high levels of household debt, an increase in interest rates may have a significant impact on debt service costs. As a result, households may experience payment difficulties and arrears could increase. The impact of a positive interest rate shock on debt service costs depends on the number of years until the next interest rate reset and on a household's current mortgage interest rate. In general, households with floating-rate mortgages and low current interest rates will be most severely affected.

To analyse how fast an increase in the quoted mortgage rate passes through to the mortgage portfolio, we perform a micro simulation using the LLD. More specifically, we simulate an upward shock of 250bps on the 10-year fixed mortgage rate in 2013 (from 4.2% to 6.7%). We assume that for each mortgage, at the next interest rate reset date the rate is set at this 10-year fixed rate, moreover we refresh the sample of borrowers, including new mortgages if the old are being redeemed.[25] We find that five years after the shock, only half of the increase in the mortgage rate has spread to the economy. The average mortgage rate increases from 4.6% in 2013 to 5.9% in 2018 (see Graph 4.1). This is consistent with the evidence in Graph 2.3 above, according to which about 20% of loans are reset within one year and 60% within 5 years.

25 In doing so, we assumed a constant population, i.e. with each home owner paying off the mortgage, a new mortgagor entered the sample (at the higher mortgage rate).

Graph 4.1 Transmission of a 250 bps mortgage rate shock



Source: LLD

The use of loan level and more recent data, especially on interest rate reset dates and the actual mortgage rates, enables us to better understand the risks related to interest rate shocks. Earlier DNB estimates suggested that the shock would have been almost fully absorbed after five years.[26] Thus, the micro simulation based on the LLD results in a slower pass-through.

The current analysis differs in a number of respects from the macro analysis that was published in the OFS in 2013. While the earlier estimates used an average interest rate reset period, in our micro simulation we updated the

26 These were based on a time series analysis and published in the OFS, Spring 2013. By way of comparison, the calibration of the mortgage rate in Delfi (the macro model of DNB which uses a long series of lags) suggests that the maximum transmission period is 8 years.

interest rate for each individual mortgage only at the observed reset date. Moreover, we were able to take into account the change in the mortgage rate at the level of individual mortgages. Due to the fact that interest rates have trended downward over the last decade, older mortgages may have actual mortgage rates that are substantially above the current rate or even above the post-shock interest rate. In our sample, we found that for 75% of loans, the observed mortgage rate was higher than the current 4.2% and that 10% of loans had a mortgage rate higher than 5.7% (for these loans the 250 bp shock translated into a 100 bp increase in the interest rate at most). For these cases, a reset to the new interest rate level was less severe, which dampened the impact of an interest rate shock. Actually, taking into account this phenomenon largely explains the difference with our earlier analysis.

4.2 The persistence of underwater mortgages

In this paragraph we will focus on the large share of underwater mortgages and how it will develop over time. We define a mortgage as being underwater if the home equity of a borrower is negative, i.e. the LTV is above 100%.[27] The proportion of underwater mortgages reached almost 30% of all mortgages in 2013, roughly three times as much as in 2008. This poses a latent threat to financial stability. First, underwater mortgages are more likely to default and, if they do, to generate larger losses (see Section 2); thus they may lead to credit losses by banks. Second, they hinder the functioning of the housing market as they lower mobility. Moreover, households with an underwater mortgage may be inclined to increase savings in order to strengthen their balance sheets, thereby negatively affecting economic recovery. For the Netherlands, this is an

27 Home equity is the difference between current value and outstanding debt plus the savings deposit linked to the mortgage (see the definition of gross and net LTV in Section 2)

unprecedented situation. In an earlier housing market bust (between 1979 and 1983), housing prices fell by 30%. At that time, however, there were fewer underwater mortgages, because households could borrow less and LTVs were much lower. In 2013q3, 5% of the borrowers had negative home equity of at least EUR 53,000 (see table 4.1). By the end of 2012, when we started the simulation presented below, this was even larger (almost EUR 70,000).

The development of underwater mortgages over time clearly depends on house price developments. Even with house prices remaining constant, the underwater problem will diminish over time as mortgages are amortised. This may happen through contractual and voluntary additional repayments.

Table 4.1 Distribution of net home equity

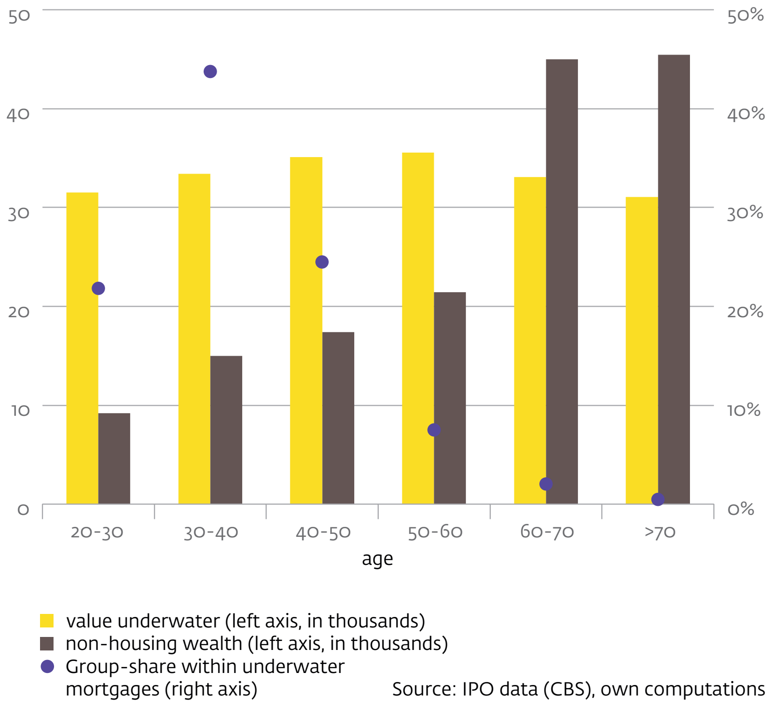
Quantile	Net home equity whole sample		Net home equity sample of underwater mortgages	
	2013q3	2014q4	2013q3	2014q4
1%	-133,361	-126,226	-291,518	-287,258
5%	-53,447	-44,471	-107,707	-108,656
10%	-35,069	-27,086	-72,639	-67,873
25%	-6,456	-21	-44,206	-38,592
50%	59,916	67,389	-26,402	-21,544
75%	151,792	158,674	-13,988	-10,570
90%	251,626	260,009	-6,045	-4,691
95%	331,497	341,135	-3,056	-2,460
99%	574,284	585,502	-521	-500

Explanatory note: Home equity is defined as the difference between the value on December 2014 minus outstanding debt plus the estimated value of the accounts pledged to the mortgage.

Given the large share of interest-only mortgages, the latter is especially relevant for the Netherlands.

As we showed in Section 3, voluntary repayments in 2013 did little to reduce the underwater problem, as households with higher LTVs showed lower voluntary repayments. A possible explanation is that households that are underwater in general do not have substantial buffers in the form of non-housing wealth (see Graph 4.2).

Graph 4.2 Median underwater value and median non-housing wealth



Source: IPO data (CBS), own computations

Using the LLD, we extrapolated how the mortgages that are currently underwater will develop between 2013 and 2023, based on different scenarios for house prices. The regular amortisation is a deterministic projection of housing debt when the contractual amortisation scheme for each mortgage is followed to maturity. The voluntary repayment scenarios are generated by a two-step micro simulation model.[28]

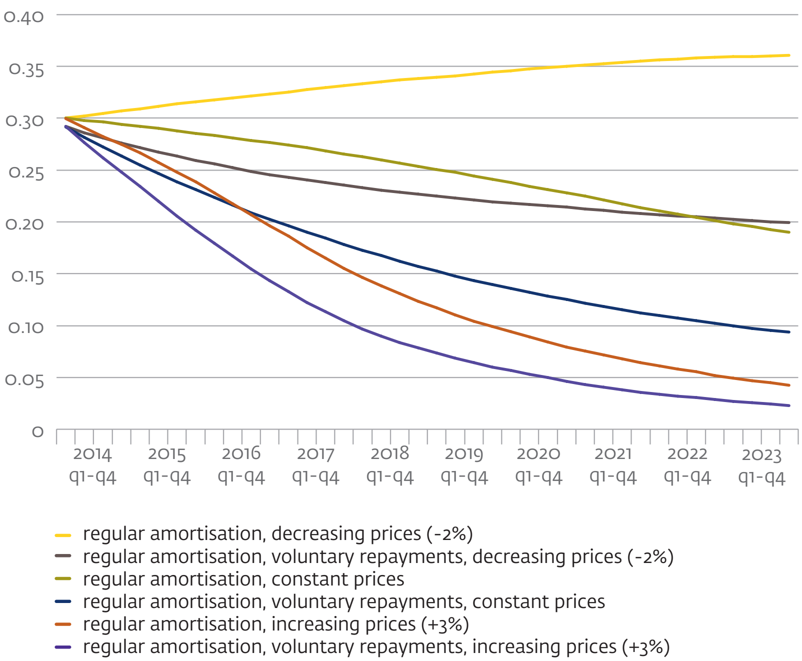
Graph 4.3 shows the results of this model.[29] If house prices fall by 2% a year over the next decade, the share of underwater mortgages will increase to 36% in 2023 due to the large number of interest-only mortgages. If we take into account voluntary repayments, underwater mortgages in 2023 will decrease to 20%. If house prices increase by 3% a year, the scenario with regular amortisation shows that almost 5% of the existing mortgages will still be underwater in ten years' time. With voluntary repayments, this will be about 3% (100,000 borrowers).

An important assumption of the model is that the share of borrowers who make voluntary repayments will fall from 5% per quarter in 2013 to 2% in 2023. This assumption captures a scenario in which arbitrage opportunities will gradually reduce over time. The main features of the model that produces these results are explained in Appendix 2.

28 The results of our models are reported below. We have observed that about 5% borrowers voluntarily repaid their mortgages between 2012q4 and 2013q1. We have also observed the size of voluntary repayments. The repayment event was identified separately from its value, also depending on the margin between the mortgage and deposit interest rates (instrument). The possibility to arbitrage on low interest rates on savings is assumed to motivate the repayment event only. In turn, the level of the voluntary repayment depends on observable mortgage and borrower's characteristics and the 'interest-only share' (see Graph 3.5).

29 Regular amortisation includes payments into savings and endowment mortgages. Due to lack of data, we have disregarded payments in investment portfolios (beleggingshypotheken) that amount to about 5% of total debt.

Graph 4.3 Share of underwater mortgages, 2014-2023

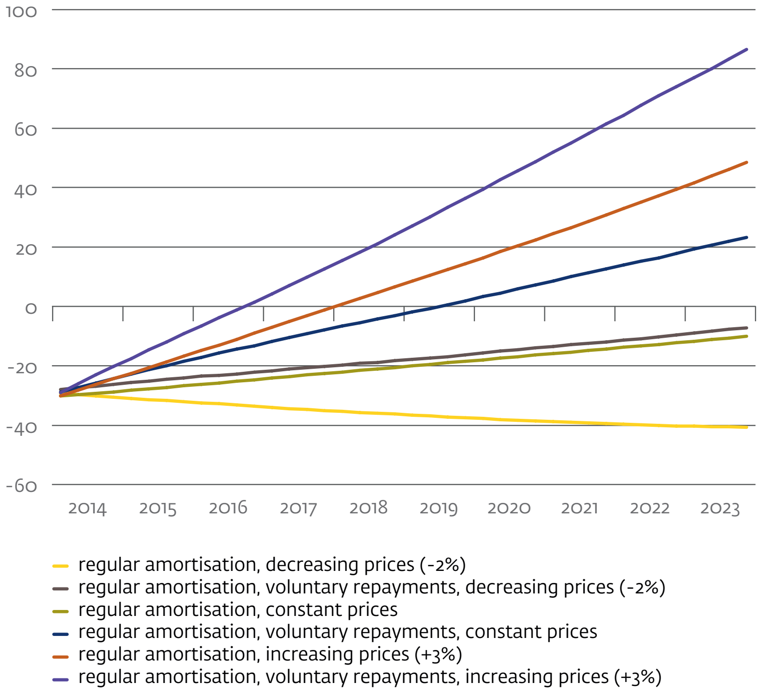


Source: DNB, LLD, own computations

When we look at the value that is actually underwater, we notice that, in a pessimistic scenario when prices decrease and there is no voluntary amortisation, the median underwater value will be below the 2012 level. In all other scenarios the median underwater value is reduced relative to 2012. Graph 4.4 shows that, depending on assumptions about prices and voluntary repayments, the median value of the current underwater mortgages will become positive between 2015q3 and 2018q2 in the three most optimistic scenarios. In the three more pessimistic scenarios,

Graph 4.4 Value of underwater mortgages, 2014-2023

net median value of mortgages that were underwater in 2012q4, in thousands



Source: LLD, own computations

the median value of the current underwater mortgages still remains negative, but less so than in 2012.

This shows that the underwater problem is persistent, even though voluntary repayments may alleviate it substantially. In our model, voluntary repayments depend on arbitrage opportunities. In the future, such opportunities may not be present, e.g. if deposit rates pick up. As a consequence, our model shows that a reduction in arbitrage opportunities slows down the decrease of the share of underwater mortgages (see appendix 2).[30] The currently high level of voluntary repayments is partly due to the tax incentives for intergenerational transfers, as discussed above. However, this temporary measure plays no role in our simulation, which is based on the first two waves of the LLD.

30 Note that this does not imply that households are more vulnerable. With higher deposit rates, households will earn a higher return of their savings, which increases their net wealth.

Appendix 1
Housing wealth

In Graph A.1.1 and A.1.2 we show the decomposition of housing wealth in different subcomponents for two different samples. Graph A.1.1 shows value shares that are relative to the current valuation, only looks at non-re-contractors (first-time buyers) and focuses on different cohorts. In fact, there is no proper definition of a first-time buyer in the LLD. We have selected borrowers aged below 32 with little down payments (max. 5% of the current value of the house). For this selected group we separate the cohorts by origination year. Due to re-contracting and survival, there are few observations dating 30 years back.

For them, we have defined the following five concepts:

1. Appreciation/depreciation: value change due to price changes
2. Take-up of home equity: positive difference between original and current principal
3. Down payment: positive difference between original value and original mortgage
4. Standard savings deposit (SSD):[31] value of repayment scheme excluding pre-payments
5. Repayment: negative difference between original and current principal

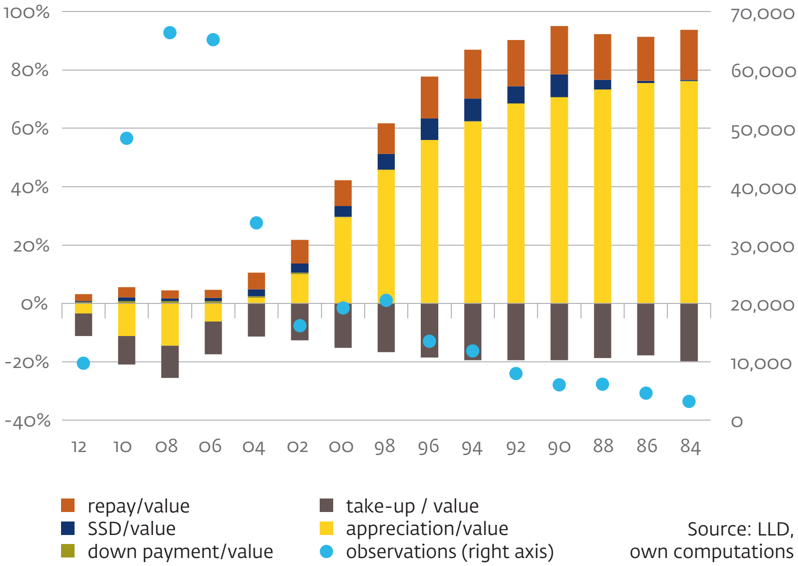
The Graph shows that about 70% of the housing wealth is due to a price effect in mortgages originated in the 80s. Down payments are modest by definition and most cohorts have taken up 20% of home equity on average.

31 The starting point for the computation of the SD is a standard savings mortgage scheme. Since we know principal (P), interest rate (i) and duration (d), we can compute the monthly interest rate payments (p), the savings premium (s), the discount (r) and the accumulated amount in the SD, where:

$$p = P^{*} i / 12, \qquad r = \frac{1}{1+i}, \qquad s = \frac{\dfrac{P}{(1+1)^{d}}}{\dfrac{1-r^{d}}{1-r}}, \qquad SD_{\tau} = \sum_{t=1}^{\tau} s_t$$

Graph A.1.1 Composition of housing wealth

by year of first house purchase



Source: LLD, own computations

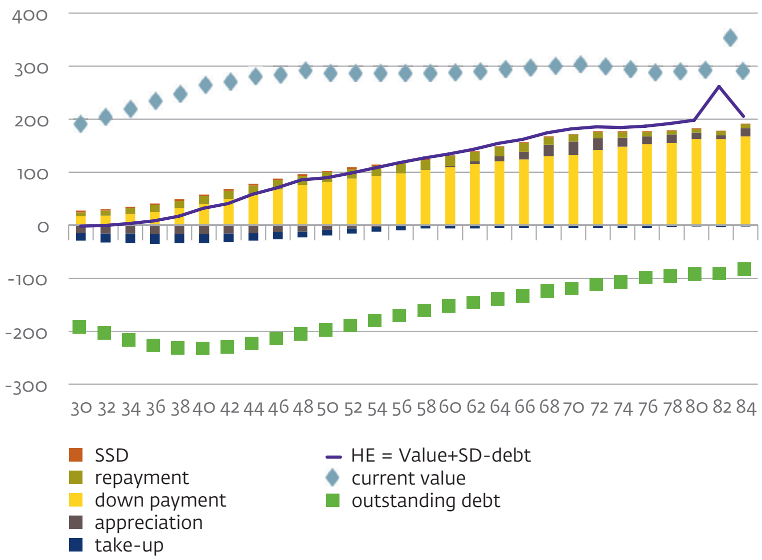
Savings deposits are not large for younger cohorts and somewhat more substantial for older ones.

Graph A.1.2 concerns the sample of wage-employed, and looks at the age of a borrower. Wage-employment is defined at origination. The Graph shows substantial down payments, as the sample is no longer confined to first-time buyers. In fact, the down payments are of a specific nature due to tax incentives. When borrowers re-contract their mortgage, they have a strong incentive to invest their home equity in a new house.[32] In this

32 Tax deductibility of mortgage interest is limited to the interest paid on an amount equal to the value of the new house minus the home equity.

Graph A.1.2 Housing wealth of wage-employed

by age, in thousands

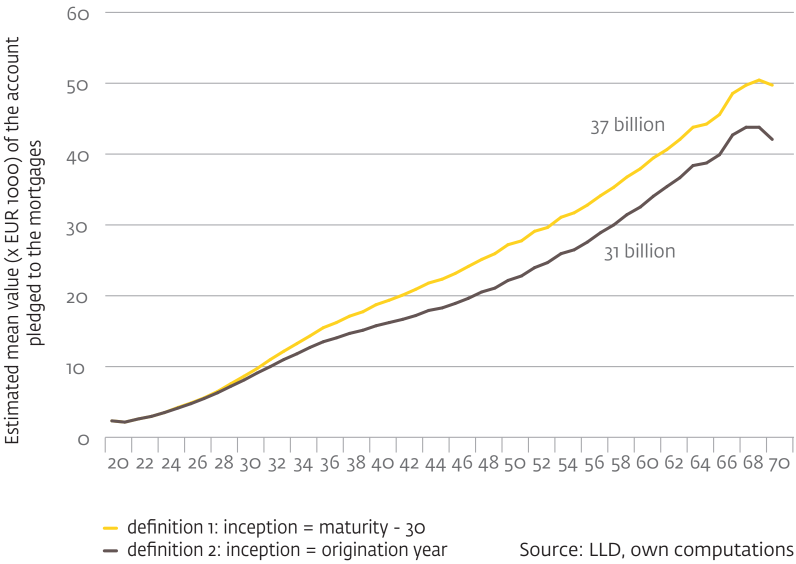


sense, previous house price appreciation translates into a down payment, and when there are many re-contractors, these two concept become observationally equivalent. As the interest rate is typically reset each 5-10 years, older borrowers appear to have large down payments, which is actually the effect of appreciation.

Macro figures suggest that savings deposits account for just over EUR 30 billion (OFS 2012), when we sum up those linked to banksparen, savings and life insurance mortgages, and investment mortgages. We can confirm these data indirectly by aggregating the SSD computed above. In this way, we compute that about EUR 31-37 billion (see also Graph A.1.3) is represented by deposits linked to either savings or life insurance mortgages. These figures are extrapolations that take into account both the fact that some variables are missing, and that the data only capture about 80% of the market. These can thus be interpreted as an aggregation at a national level and suggest that just under 5% of the Dutch mortgage debt, as reported in the macro statistics, cancels out thanks to these savings deposits. These figures depend very much on the assumptions made, however. Graph A.1.3 shows the aggregation and the pattern over age of the mean value of these accounts, when prepayments are disregarded. As explained above, the balances of savings are imputed using the origination date as the start of the accumulation period. For re-contractors this implicitly underestimates the balance in the first years and overestimates annual accruals. This may bias the results depending on the timing of the

Graph A.1.3 Balance of accounts pledged to the mortgage

2014q4



Source: LLD, own computations

NB: the prepayments in these accounts are not considered

42 imputation. One way to check the robustness of this result is to approximate the inception date using both the origination date and the maturity date (which typically does not change upon re-negotiation) less 30 (as most borrowers choose a 30-year contract) and then take the minimum of this variable for each borrower (in the case of multiple loans, some may have originated at different points in time). When we use this procedure, to define the inception date of the mortgage, the aggregate figure of EUR 31 billion increases to about EUR 37 billion. Anecdotal evidence from several banks' reports suggests that the second figure may be the most realistic one. Graph A.1.3 also suggests that at an individual level, the two ways to impute the pledged accounts generate a maximum difference of EUR 5,000 for the middle-aged.

Appendix 2 The underwater simulation model

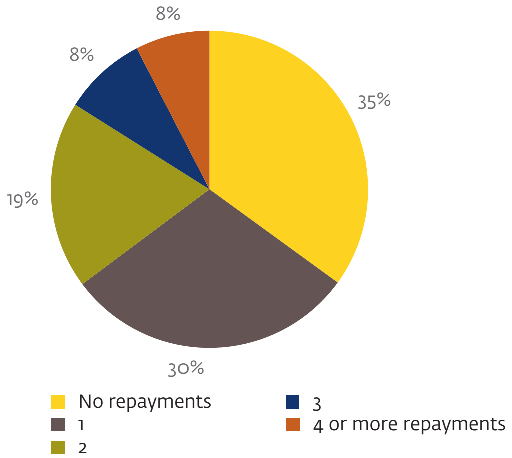
The projections for the underwater mortgages presented above were generated by a model based on the following assumptions:

1. Voluntary repayments follow a two-step process. The decision to repay and the repayment amount were jointly estimated.
2. The two steps were jointly estimated using the Heckman procedure. The instrument used for the identification is the difference between the mortgage interest rate and the interest rate on savings (referred to as the interest rate margin below).
3. The occurrence of a repayment event is not deterministic, as it is disturbed by random draws from the empirical distribution of the error term (40 draws) of the model.
4. In conducting the extrapolation to 2023, we assume that a variable share of borrowers would voluntary repay over time. This share decreases gradually from the observed 5% in 2013 to 2% in 2023.[33]
5. Each quarter, a borrower is allowed to voluntarily repay, which is why the 10-year simulation period was split into 40 quarters.
6. Scenarios were applied for the development in nominal house prices and repayment shares (see assumption 4).
7. Voluntary repayments are also allowed for those not underwater, which means that early repayment of the entire mortgage is also allowed. No additional repayment is allowed once the mortgage has been fully repaid.
8. Current interest rates on mortgages are assumed constant over the simulation period.

The model predicts that 35% of mortgages will experience no voluntary repayment event (see Table A.2.1) in the coming 10 years. This translates into 20% of borrowers never voluntarily repaying on their mortgage.

33 We made the implied conservative assumption that arbitrage opportunities become less frequent. So, even if we had not varied interest rates to the individual borrower, we implicitly reduced interest rates arbitrage.

Graph A.2.1 Repayment events, 2013-2023



Source: LLD

A considerable proportion of these borrowers (about 40%) has an interest-only mortgage.

Assumptions 1 to 3

We present a scoring model below, this is used to assign a repayment event to those with the highest probability to make a repayment. Estimating the probability to repay should not be seen as disjoint from the decision on the repayment amount. Joint estimation of such a process is typically approached using a Heckman two-step procedure. The instrument needed for identification should explain the repayment event whithout affecting the repayment amount. The instrument is further untestable. We have assumed that the interest rate margin (the difference between the mortgage interest rate and the deposit rate) qualifies as instrument, as it captures arbitrage opportunities.

Table A.2.1 shows the different models, both for the selection equation (dependent variable is a dummy for the repayment event) and for the main equation (dependent variable is the repayment amount).

Table A.2.1 Estimation results

Main equation	Model 1 OLS	Model 2 OLS	Model 3 Heckman
Interest-only share	7,570***	6,529***	7,810***
Net home equity	53.55***	55.26***	47.67***
Borrower's age	-165.4***	-153.7***	-177.9***
Self-employed	2,213***	2,040***	2,424***
NHG participant	-3,124***	-3,514***	-3,016***
Interest rate margin		-1,933***	
Constant	18,951***	28,142***	28,589***
N		129,625	
Log Likelihood	-1,461,000	-1,461,000	-1,972,000
Selection equation	**Model 4 OLS**	**Model 5 Probit**	**Model 6 Heckman**
Borrower's age	-0.0000555***	-0.000527***	-0.000553***
Never re-contracted	0.0194***	0.189***	0.203***
Interest rate margin	0.00678***	0.0670***	0.0617***
Underwater	-0.0525***	-0.615***	-0.628***
Constant	0.0271***	-1.885***	-1.861***
N		2,763,917	
Log Likelihood	382,772	-511,163	-1,972,000

*** implies significance at the 1%-level

46 Table A.2.1 shows that the qualitative performance of the different models does not differ much when the model is estimated by OLS, probit or using the Heckman procedure. Interestingly, if we look at Model 2, the interest rate margin has a significantly negative effect on the repayment amount. For every additional percentage point of interest rate margin, borrowers repay about EUR 2,000 less. We wish to highlight this result, because the interest rate margin is the instrument used in the Heckman model. The coefficients in Model 2 suggest that the assumptions needed to defend the instrument may therefore not be valid. However two things are worth noting. The first is that the direction of the effect is unintuitive. One would expect that borrowers with a mortgage rate that is higher than the deposit rate, thus with higher interest margin, have stronger arbitrage incentives, and would repay more, rather than less. The fact that the coefficient is negative suggests that the interest rate margin picks up something different than simply the (opportunity) costs of the mortgage when included in the main equation. Possibly, periods of lower interest rates (and thus lower deposit rates) are related to unobserved characteristics, such as the time at which respondents entered the housing market, i.e. their cohort, or some type of business-cycle effect that we cannot adjust for given the short time period elapsed by the data. Also, it should be noted that Model 3, without the interest rate margin, performs very simarly to Model 2, more so than Model 1. This suggests that the selection equation, with multiple instruments, picks up the same unobservables for Model 3 that the interest rate picks up in Model 2. Remember that Models 3 and 6 are estimated jointly.

Using these results, we estimate the probability of a repayment event and draw residuals from their empirical distribution. The draws allow to score the repayment events less deterministically. One draw was taken for each of the 40 periods of the simulation. The exercise was subsequently repeated 100 times, for which a total of 4,000 draws were taken.

The scoring repeated over the 40 quarters allows to assign the desired number of repayment events to the borrowers over the whole simulation period. The model predicts that about 35% of the loans will never experience a repayment event, which is about 20% of the total number of borrowers. Furthermore, the model shows that 30% of the loans will be repaid once in 10 years, 20% twice and the remainder (15%) more than twice (mostly 3 or 4 times), see Graph A.2.1.

Assumption 4

We have described above how the model scores borrowers depending on the likelihood of a repayment event, based on the assumption that repayment events are motivated by arbitrage opportunities. The latter are captured by the difference between the mortgage interest rate and the deposit rate. However, as arbitrage opportunities change, not only the probability of a repayment will be affected, but also the proportion of borrowers that repay. We observed between 2012q4 and 2013q1 that almost 5% of borrowers experienced such an event. But if the mortgage interest rate were to decrease or if the interest rate on savings were to increase the margin would reduce and we would expect this proportion to drop. Conversely, when the mortgage interest tax deduction were to become less generous, the share of repayment events could increase.

It is not clear a priori how the proportion of borrowers that repay must be dealt with within such a reduced form model. In the computation, we have assumed that this proportion will gradually decrease from the current 5% to 2% in 2023. Although banks reported a further increase in voluntary repayments in 2014, we think a gradual decrease is still a reasonable assumption. First of all, as mortgage rates continue to follow a downward trend, the arbitrage incentives will gradually become weaker. Second, the amount of liquid financial assets that is available for voluntary repayments will be gradually be exhausted, leading to lower repayments.

Sample simulation with the two-step model above shows that, if the arbitrage opportunities were equal to zero, the repayments would drop substantially, from 5% to 3%, but would not equal zero. Therefore, in our parametrisation we picked a number below but close to 3% in order to determine the proportion of voluntary repayments.[34] A more comprehensive analysis of this assumption requires the estimation of a behavioural model, which is beyond the scope of the present study.

Remaining assumptions

All remaining assumptions are mechanic implementations of the model results and of deterministic mortgage rules. These assumptions imply that we cannot produce a single result, and that results will depend on the assumed parameters. We have shown three scenarios in which house prices are constant, increase by 3% and decrease by 2%, nominally on a yearly basis, respectively.

34 When we assume that the proportion of mortgages on which a voluntary repayment takes place will instead drop to 1% or 3% in 2023, the results do not change much. Computations are available from the authors upon request.

Appendix 3
Key indicators

Table A.3.1 Key indicators of Dutch mortgage portfolio

Based on the LLD*

	2013q1	2013q2	2013q3	2013q4	2014q1	2014q2	2014q3	2014q4	2015q1	2015q2
Mean current value of a property	265.398	267.248	266.083	270.035	269.877	271.432	281.068	282.797	288.790	288.605
Median current value of a property	214.084	216.265	216.164	218.762	218.900	220.254	225.279	226.352	230.000	231.627
Mean outstanding mortgage debt (per borrower)	200.700	199.600	195.500	193.900	193.800	195.600	194.900	191.600	192.500	190.100
Mean savings deposit (SD) pledged to mortgage	19.430	19.103	19.243	18.530	19.557	21.025	19.090	20.609	23.148	23.873
Mean original LTV ratio whole sample	84%	81%	87%	79%	79%	80%	78%	78%	78%	80%
Mean original LTV ratio under 35, recent production	108%	97%	98%	98%	98%	96%	96%	95%	97%	96%
Mean current LTV ratio whole sample	67%	68%	68%	67%	66%	67%	67%	66%	67%	68%
Mean original LTI ratio, whole sample	3,9	3,9	3,9	3,8	3,9	3,9	3,9	3,9	3,8	3,8
Mean original LTI ratio under 35, recent production	4,4	4,3	4,3	4,3	4,4	4,3	4,3	4,4	4,5	4,5
Mean mortgage interest rate, whole sample	4,62%	4,54%	4,50%	4,45%	4,42%	4,30%	4,24%	4,15%	4,11%	4,01%
Mean mortgage interest rate under 35	4,75%	4,71%	4,68%	4,63%	4,59%	4,55%	4,50%	4,45%	4,40%	4,35%
Mean interest rate reset interval (years) for the first loan to be adjusted	8,1	8,0	8,0	7,8	7,7	7,7	7,7	7,7	7,7	7,9
Mean interest rate reset interval (years) for the last loan to be adjusted	10,0	9,9	9,9	9,7	9,6	9,6	9,6	9,6	9,6	9,8
Share of underwater mortgages **	36,1%	34,2%	35,5%	32,0%	31,9%	32,1%	30,1%	29,2%	28,2%	26,9%
Mean home equity of an underwater mortgage (including SD)	-49.078	-49.268	-61.000	-43.162	-41.153	-41.919	-41.030	-39.236	-40.362	-38.832
Median home equity of an underwater mortgage (including SD)	-36.786	-34.979	-37.413	-32.824	-30.973	-30.325	-29.179	-28.595	-27.628	-25.487
Mean original LTI of underwater mortgages	4,7	4,7	4,6	4,7	4,6	4,7	4,7	4,6	4,7	4,6
Mean share of interest only mortgage at origination	57,8%	57,9%	57,7%	59,1%	58,6%	58,2%	57,9%	57,6%	57,5%	56,9%
Mean share of interest only mortgage at origination, under 35, recent production	25,8%	17,2%	13,5%	18,0%	14,4%	11,4%	11,9%	12,4%	12,1%	12,2%

* These statistics are based on the LLD, and do not necessarily correspond to DNB official statistics. This table is based on the most recent version of the LLD, and some figures may differ slightly from those based on earlier versions.

** Net of pledged saving accounts (proxied using inception date rather than origination date).

EUROSYSTEEM

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