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HOUSEHOLDS' RISKS IN THE DUTCH HOUSING MARKET: LOAN-TO-VALUE AND LOAN-TO-INCOME RATIOS

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Statistics Netherlands

Macro-economic Statistics and Dissemination

*P.O.Box 24500
2490 HA Den Haag
The Netherlands*

Households' risks in the Dutch housing market: Loan-to-Value and Loan-to-Income ratios

Arthur Denneman

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Remarks:

The views expressed in this paper are those of the author and do not necessarily reflect the policies of Statistics Netherlands.

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Summary: An overview is given of the Loan-To-Value (LTV) and Loan-To-Income (LTI) ratios for the group owner-occupiers in the Netherlands. Two populations are distinguished: (i) all owner-occupiers and (ii) the ones with a mortgage. For these two groups LTV and LTI results are shown for more than fifty subpopulations, based on specific household characteristics. The results are mainly shown at a macro level, though also some results at a micro level are given like values for median, 25% percentile and 75% percentile. The so called risk tables are new tools to interpret the data.

Keywords: housing market, households' risks, Loan-To-Value (LTV), Loan-To-Income (LTI), mortgage, house value, disposable income, and risk tables.

1. Introduction

At Statistics Netherlands interesting housing statistics has recently been compiled, which show a strong link with households' risks at the Dutch housing market. In this paper it is not tried to give a full picture of all these households' risks. Instead, only an overview is given of recently obtained results for Loan-To-Value (LTV) and Loan-To-Income (LTI) ratios. Loan refers to home mortgage, which is divided by house value and household income, respectively.

The following aspects should be taken into account when interpreting the results:

- a. The Ministry of Finance, the tax authorities, provides the data source for home mortgages and house values. The home mortgages are relevant for tax purposes due to the home mortgage interest deduction for tax payers who own their homes. Before deduction the taxable income is increased by a percentage of the house value with the reasoning that this property has a potential income-generating purpose. The municipalities are responsible for the regular measurement of house value appraisals.
- b. The home mortgages from the tax authorities refer to the debt on which interest has to be paid. Because of the tax deductibility of interest payments in the Netherlands, there is an incentive for home owners to make use of long term saving plans in parallel of the home mortgage. These saving plans are designed to pay off mortgage much later as direct mortgage payments, e.g., at the end of the home mortgage term (say 30 years). It should be emphasized that in our LTV and LTI calculations these parallel savings are not deducted from the home mortgages. Unfortunately, there is no data source for these parallel savings at household level.
- c. The income data are obtained by an annual survey amongst a panel of around 85 thousand private households. The database from this income panel survey is enriched with data from tax authorities on home mortgages and house values. The LTV and LTI results in this paper, for several subpopulations of private households, are fully consistent with this annual income panel survey (Dutch acronym = IPO, 'Inkomens Panel Onderzoek').

- d. The reference date for home mortgages and house values is 31st December of year T. The household incomes refer to the full year, i.e., the income gained within year T.
- e. In this paper only results are given for ‘disposable household income’ as denominator of LTI. However, the same set of results is also available at Statistics Netherlands for ‘gross household income’ as denominator of LTI. To keep paper length acceptable the latter set is not included in this paper.
- f. The home mortgages and house values both refer to the main residence of a private household in the Netherlands. If an owner-occupier owns two or more dwellings, only the home mortgage and house value of the main residence are taken into account in the LTV and LTI calculations.
- g. The population consists of all private households with their own home as main residency. The group ‘owner-occupiers with a home mortgage’ is relevant for risk assessment of households in portfolio of mortgage lenders. The risk of the total group of owner-occupiers is less, due to zero risk for households without a home mortgage. The LTV is associated with the risk of having a debt at the end of the home mortgage term. The LTI is linked to the risk of not being able to fulfil the monthly mortgage payments.
- h. The LTV and LTI for a (sub)population of households are calculated in a macro way. More specific, the group of households is considered as one entity. For the group under consideration, the total home mortgage of main residences is taken as nominator of both LTV and LTI. For the same group, the total house value of main residences is denominator of LTV and the total disposable household income is denominator of LTI. Similarly, instead of totals one may use averages in the calculations, i.e., the nominator of both LTV and LTI is equal to the average home mortgage of all group members and the denominators of LTV and LTI are equal to the average house value and the average disposable household income, respectively.
- i. The macro way of LTV and LTI calculations facilitates the comparison of one group of households with another group of households. The macro way does not provide information at micro level. At the end of this paper some words will be spent on the distribution of LTV’s and LTI’s within the group of households. In this paper we will not discuss the individual risks of households that are relevant for mortgage lenders (and other organisations that want to control these individual risks). The main aim of this paper is to show results at a macro level.
- j. The data in this paper are obtained for the purpose to investigate what kind of data on LTV and LTI can currently be compiled at Statistics Netherlands. At the moment, the LTV and LTI results in this paper are not disseminated as official statistics at our website. We expect that this will be done at the earliest in November 2011. For the time being, all data presented in this paper have a provisional status.

2. Loan-To-Value and Loan-To-Income for several subpopulations

Taking into account all aspects given in the Introduction, the LTV and LTI for private households in the Netherlands are shown in Table 1.

Table 1: Number of private households in the Netherlands (all, with own home, and with own home and home mortgage) and the Loan-To-Value and Loan-To-Income ratios for 'all owner occupiers' and 'the ones with home mortgage'.

	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
2005	7 063	3 783	0.49	3.7	3 267	0.58	4.2
2006	7 109	3 900	0.48	3.7	3 361	0.56	4.2
2007	7 166	3 975	0.49	3.6	3 422	0.58	4.2
2008	7 242	4 126	0.50	3.6	3 455	0.60	4.3
2009	7 302	4 167	0.54	3.6	3 469	0.66	4.3

In the Netherlands the number of private households is 7 million of which 4 million households own their home. The percentage owner-occupiers gradually increases from 54 percent in 2005 to 57 percent in 2009. Not all owner-occupiers have a home mortgage. In 2005 14 percent of the owner-occupiers did not have a home mortgage. In 2009 this percentage increased to 17 percent.

The Loan-To-Income ratio is rather constant over time. This is not the case for the Loan-To-Value ratio. Especially in 2009 the LTV increased significantly due to negative house price developments starting at the end of 2008.

In the remainder of this paper we do not focus on developments over time. Instead, we show LTV and LTI results of several subpopulations for the most recent year. For instance, in Table 2 a break down to four age groups is shown.

Table 2: The results for 2009 as given in Table 1. Break down to four age groups.

2009, Age of main breadwinner	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
under 25 years	364	37	1.03	6.3	35	1.09	6.6
25-45 years	2 516	1 529	0.86	5.3	1 450	0.90	5.5
45-65 years	2 746	1 809	0.48	3.1	1 565	0.56	3.6
65 years and over	1 676	793	0.16	1.5	418	0.31	2.8
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

The results in Table 1 show that ownership of a house depends on the age of main breadwinner. As career of main breadwinner develops the percentage of owner-occupiers increases and when retirement comes near this percentage starts to decrease gradually. Of all private households the percentage owner occupiers is 10 percent (under 25 years), 61 percent (25-45 years), 66 percent (45-65 years), and 47 percent (65 years and over). Table 1 also shows that the percentage of owner-occupiers with a home mortgage decreases as age of main breadwinner increases: 95 percent (under 45 yrs), 87 percent (45-65 yrs), and 53 percent (65 yrs and over).

More interestingly, the LTV and LTI ratios show a strong dependency on the age of main breadwinner: the older, the lower LTV and LTI are. In 2009 the average home mortgage is higher as the average house value for the youngest group (under 25 years). As age increases the mortgage decreases due to the monthly mortgage payments and, moreover, many owner-occupiers gained from upward house price developments resulting in a much higher house value compared to the price paid. The decreasing LTI, as age increases, results from a decreasing home mortgage due to monthly payments and from increasing disposable income as career of main breadwinner develops.

In Table 3 results are shown for the break down to origin of main breadwinners. More or less, the longer a group with a certain origin is citizen of the Netherlands, the more they own a house and the lower the value for the LTV and LTI ratios.

Table 3: The results for 2009 as given in Table 1. Break down to origin of main breadwinner.

2009, Origin of main breadwinner	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
The Netherlands	5 920	3 665	0.52	3.6	3 036	0.64	4.2
Germany or Belgium (neighbours of NL)	243	133	0.44	3.1	101	0.59	4.0
Indonesia	214	111	0.64	4.2	99	0.72	4.7
Other western countries	247	92	0.63	4.4	80	0.76	5.0
Suriname	152	50	0.83	4.7	46	0.89	5.0
Turkey	134	43	0.92	5.1	40	0.98	5.4
Other non-western countries	392	73	0.79	4.9	67	0.88	5.3
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

Indonesia and Suriname are former colonies of the Netherlands. Around 1950, at the independency of Indonesia, many Indonesians went to the Netherlands to find a residence. Twenty-five years later, at independency of Suriname (1975), a similar flow of people from Suriname came to the Netherlands. Around 1970 a steady flow of Turkish immigrants came to the Netherlands.

In Table 4 results are shown for the break down to size of household. Only 34 percent of the singles own their house. For the other households this percentage is 64 percent (households of two persons, like couples without children) and 76 percent (households of three or more persons, like families). Thus, small households found in majority their dwelling at the rental market, whereas larger households found their dwelling, of larger size, in majority at the buyers market.

Table 4: The results for 2009 as given in Table 1. Break down to size of household.

2009, Size of household	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
One person	2 598	891	0.44	4.2	654	0.64	5.8
Two persons	2 412	1 534	0.44	3.1	1 212	0.58	3.9
Three or more persons	2 292	1 743	0.66	3.9	1 603	0.72	4.3
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

Table 4 shows that the LTV and LTI ratios are dependent on size of household, but there exist also a dependency on the specific household composition. See Table 5.

Table 5: The results for 2009 as given in Table 1. Break down to household composition.

2009, Household composition	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
Single man, under 65 yrs	994	372	0.67	5.6	325	0.78	6.4
Single man, 65 yrs and over	209	82	0.15	1.5	36	0.33	3.6
Single woman, under 65 yrs	786	242	0.57	5.2	210	0.68	6.2
Single woman, 65 yrs and over	609	195	0.10	1.3	83	0.25	3.2
Couple, without children	2 083	1 404	0.44	3.0	1 108	0.57	3.8
Couple, only children < 18 yrs	1 321	1 095	0.76	4.7	1 041	0.80	4.9
Couple, at least 1 child >= 18 yrs	598	469	0.47	2.5	408	0.54	2.9
One parent family, only children < 18 yrs	267	92	0.68	6.3	82	0.77	7.1
One parent family, at least 1 child >= 18 yrs	208	91	0.40	2.8	71	0.55	3.8
Other multi-person households	227	126	0.54	3.4	105	0.67	4.1
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

Table 5 shows that results for one person households in Table 4 are dependent on gender and age. According to Table 5 the percentage of single men that own their house is 38 percent and it is 31 percent for single women, whereas its average is 34 percent (Table 4). The LTV and LTI ratios in Table 5 are slightly lower for single

women compared to single men, whereas these ratios are significant higher for singles under 65 years compared to singles of 65 years and over.

The results for couples without children in Table 5 are similar to the results for two person households in Table 4. Note that the group ‘two person households’ not only consists of ‘couples without children’, but also includes ‘one parent families with one child’ and ‘two person households that are not a couple or parent-child’.

The group ‘households of three persons and more’ in Table 4 mainly consists of the subpopulation ‘couples with children’, but it also includes ‘one parent families with two children or more’ and all kinds of other households compositions consisting of three or more persons. Table 5 shows that for couples with children it does matter if there are only children under 18 years, or that at least one of the children is 18 years or over: the LTV and LTI are significant higher for the young families. The same is valid for one parent families. The main difference between ‘one parent families’ and ‘couples with children’ is represented by a significant higher LTI for one parent families, due to a lower household income for these families.

Table 6 shows a break down to the number of persons with income in a household. The subpopulation ‘households with one person with income’ consists mainly of singles and one parent families.

Table 6: The results for 2009 as given in Table 1. Break down to number of persons with income in a household.

2009, Number of persons with income in a household	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
One person with income	3 287	1 265	0.46	4.2	961	0.63	5.5
Two persons with income	3 177	2 262	0.59	3.8	1 943	0.69	4.4
Three persons with income	557	411	0.51	3.0	363	0.59	3.4
Four or more persons with income	280	228	0.49	2.4	202	0.55	2.7
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

The more persons with income, the higher the percentage of private household that own their house: 38 percent (one person with income), 71 percent (two persons), 74 percent (three persons), and 81 percent (four or more). Ratio LTI decreases as more persons in household have income. On the other hand, LTV is relatively low for households with one person with income, but it is relatively high if there are two persons with income, i.e., LTV goes up and down again if number of persons with income increases.

Table 7 shows a break down to main source of household income. It shows that 3.3 million households earn a wage as non-government employee and that 0.5 million households are employee at the government. Note that the group households with old-age pension/ survivors benefits is significant (1.8 million households).

Table 7: The results for 2009 as given in Table 1. Break down to main source of household income.

2009, Main source of household income	All private households	All owner-occupiers		Owner-occupiers with mortgage			
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
Wage; non-government employee	3 341	2 077	0.68	4.1	1 933	0.74	4.4
Wage; government employee	455	345	0.66	3.9	321	0.71	4.2
Other income from labour	145	126	0.70	5.5	111	0.78	6.3
Income from own enterprise	832	653	0.52	3.3	515	0.67	4.2
Old-age pension/survivors benefits	1 780	853	0.19	1.8	499	0.32	3.1
Other, e.g., social provisions and sickness/disability/unemployment benefits	749	113	0.41	4.0	89	0.50	4.7
Total	7 302	4 167	0.54	3.6	3 469	0.66	4.3

The percentage owner-occupiers is highest, 87 percent, for households with main income source ‘other income from labour’ (mostly major share holders). For ‘income from own enterprise’ this percentage is 78 percent, for ‘wages: government employees’ 76 percent, for ‘wages: non-government employees’ 62 percent, and for ‘old-age pension/survivors benefits’ 48 percent. The lowest percentage owner-occupiers, only 15 percent, is for main income source ‘other, like social provisions and sickness/disability/unemployment benefits’. The highest LTV and LTI are for major share holders, the lowest for ‘old-age pension/survivors benefits’.

The population owner-occupiers is subdivided in four groups according to income level, house value level, and equity level: see Tables 8, 9, and 10, respectively. The four groups are of equal size for the population ‘all owner-occupiers’, while the size of the four groups differ for the subpopulation ‘owner-occupiers with mortgage’. The income groups are composed using disposable income levels. The equity groups are composed of ‘equity, excluding house value minus mortgage of own home’. Second homes are included. Only main residences are excluded.

Table 8: Number of owner occupiers in the Netherlands (all and the ones with mortgage) and their Loan-To-Value and Loan-To-Income ratios. A break down to four groups, according to income level.

2009 Disposable income categories	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
Income level: 1 st 25% group (low)	1 042	0.45	5.7	788	0.62	7.5
Income level: 2 nd 25% group	1 042	0.54	4.1	879	0.65	4.8
Income level: 3 rd 25% group	1 042	0.57	3.7	907	0.67	4.2
Income level: 4 th 25% group (high)	1 042	0.56	2.9	895	0.67	3.4
Total	4 167	0.54	3.6	3 469	0.66	4.3

The break down to income categories, in Table 8, shows that the higher the income the smaller LTI will be. The LTV for all owner-occupiers is for the lowest income group significant smaller compared to the other three income groups. This is mainly caused by the relatively high share of ‘no mortgage’ for this lowest income group.

Table 9: Number of owner occupiers in the Netherlands (all and the ones with mortgage) and their Loan-To-Value and Loan-To-Income ratios. A break down to four groups, according to house value level.

2009 House value categories	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
House value level: 1 st 25% group (low)	1 042	0.74	3.6	884	0.87	4.2
House value level: 2 nd 25% group	1 042	0.62	3.5	892	0.72	4.1
House value level: 3 rd 25% group	1 042	0.52	3.4	863	0.63	4.0
House value level: 4 th 25% group (high)	1 042	0.45	3.9	829	0.57	4.8
Total	4 167	0.54	3.6	3 469	0.66	4.3

The break down to house level categories, in Table 9, shows that LTV decreases as house value increases. The LTI for the highest house value group is significant higher compared to the other three house value groups.

Table 10: Number of owner occupiers in the Netherlands (all and the ones with mortgage) and their Loan-To-Value and Loan-To-Income ratios. A break down to four groups, according to equity level.

2009, Equity categories (equity, exclusive of home equity)	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
Equity level: 1 st 25% group (low)	1 042	0.70	4.9	957	0.77	5.3
Equity level: 2 nd 25% group	1 042	0.61	4.1	946	0.67	4.4
Equity level: 3 rd 25% group	1 042	0.50	3.3	865	0.59	3.8
Equity level: 4 th 25% group (high)	1 042	0.42	2.8	701	0.60	3.9
Total	4 167	0.54	3.6	3 469	0.66	4.3

The break down to equity level categories, in Table 10, shows for the group ‘all owner-occupiers’ that both LTV and LTI decrease as equity increases. For the ones with mortgage, the third and fourth equity groups have similar LTV and LTI ratios.

Until now, only break downs to specific household characteristics were examined. It is also possible to have break downs to dwelling locations. Table 11 shows that households in the western part of the Netherlands have higher LTV and LTI ratios compared to the other parts of NL. The four biggest cities of the Netherlands

(Amsterdam, Rotterdam, The Hague, and Utrecht) belong to this western part. This suggests that the degree of urbanisation plays a role here.

Table 11: The results for 2009 as given in Table 1. Break down to dwelling location: group of Provinces, COROP 1.

2009, Group of Provinces (COROP 1)	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
North NL	759	464	0.52	3.2	375	0.66	3.9
East NL	1 476	900	0.53	3.6	764	0.64	4.2
West NL	3 514	1 839	0.56	3.8	1 547	0.68	4.5
South NL	1 552	964	0.50	3.5	782	0.62	4.3
The Netherlands	7 302	4 167	0.54	3.6	3 469	0.66	4.3

In Table 12 a break down to the degree of urbanisation is given. The number of addresses defines the urbanisation category of a municipal district or municipality. Five degrees of urbanisation are distinguished:

1. extremely urbanised: 2 500 or more addresses per kilometre squared;
2. strongly urbanised: 1 500 – 2 500 addresses per kilometre squared;
3. moderately urbanised: 1 000 – 1 500 addresses per kilometre squared;
4. hardly urbanised: 500 – 1 000 addresses per kilometre squared;
5. not urbanised: up to 500 addresses per kilometre squared.

Table 12: The results for 2009 as given in Table 1. Break down to dwelling location: degree of urbanisation.

2009, degree of urbanisation	All private households	All owner-occupiers			Owner-occupiers with mortgage		
	Number of households (x 1 000)	Number of households (x 1 000)	LTV	LTI	Number of households (x 1 000)	LTV	LTI
Extremely urbanised	1 627	619	0.64	4.2	533	0.76	4.8
Strongly urbanised	2 084	1 125	0.61	3.9	977	0.71	4.4
Moderately urbanised	1 351	851	0.54	3.7	717	0.65	4.3
Hardly urbanised	1 467	1 011	0.46	3.3	813	0.58	4.1
Not urbanised	773	561	0.43	3.0	428	0.57	3.8
The Netherlands	7 302	4 167	0.54	3.6	3 469	0.66	4.3

Urbanisation plays a role. The more urbanised the dwelling location is, the lower the percentage of owner occupiers will be and the higher the LTV and LTI ratios.

3. Concluding remarks

The LTV and LTI ratios presented in this paper make clear that the households' risks at the Dutch housing market show a significant dependency on the specific household characteristics. To be able to interpret these results it would help to disseminate these results together with averages per household for home mortgage, house value, and disposable income. For example, if a ratio increases, it could be caused by an increase of the nominator or by a decrease of the denominator, or by both. That is why Statistics Netherlands will not only disseminate LTV and LTI ratios at our website in the near future, but also their nominators and denominators.

The so far calculated LTV and LTI ratios do not provide information at micro level, i.e., the individual risks of households. Only groups of households were compared with each other, without presenting results of the distribution of LTV's and LTI's within the group of households. We end this paper by showing two different ways to provide information at micro level.

Distribution variables: median, 25%-percentile and 75%-percentile

Instead of calculating LTV and LTI ratios for some specific group of households at a macro level, these ratios can also be calculated for every individual group member. The distribution of LTV's and LTI's can be represented by histograms, as many researchers would do. Instead of doing that in this paper, we will focus on the 'median', which is the numerical value of the ratio that separates the lower half of the distribution from the higher half. In the same sense, the value of 25% percentile separates the first 25% of the distribution from the other 75%.

As an example, the LTV and LTI ratios for 'owner-occupiers with mortgage' as given in Table 1 are shown again in Table 13, in which also median, 25% percentile, and 75% percentile are given.

Table 13: The LTV and LTI ratios as given in Table 1 (macro), including micro-information: median, 25 percentile and 75 percentile.

The Netherlands: owner-occupiers with mortgage	LTV ratio				LTI ratio			
	macro: Table 1	25% perc.	median	75% perc.	macro: Table 1	25% perc.	median	75% perc.
2005	0.58	0.28	0.55	0.89	4.2	2.0	3.8	6.1
2006	0.56	0.29	0.56	0.89	4.2	2.1	3.9	6.2
2007	0.58	0.30	0.58	0.90	4.3	2.1	4.0	6.2
2008	0.60	0.33	0.62	0.94	4.3	2.2	4.1	6.3
2009	0.66	0.36	0.69	1.02	4.3	2.3	4.2	6.3

The results show that the increase of LTV in time is mainly caused by the increase of LTV's at the higher half of the distribution. In 2005 the median of LTV was lower than the 'macro LTV' and in 2009 the median is higher. The 75% percentile

shows a similar increase as the median, while the increase of 25% percentile is less prominent. For LTI the median was significant smaller in 2005, but this difference is reduced in 2009.

There exist limitations on using distribution information of LTI ratios, like median and average. The denominator of the LTI, the disposable household income, might have a negative value. For instance, owners of enterprises might suffer a year with bad business resulting in negative incomes. The disposable income might even be zero. If there is only one household with zero income, the LTI of this household will go to infinity. If this specific household belongs to a group of millions households, the average of all individual LTI's will still go to infinity too.

In our opinion using such average is not very useful, even if one decides to delete all 'zero income records' in the database. Low incomes blow up such a LTI average too. Should low income records be deleted too? We don't think so, since it would be a subjective decision on what threshold value to use. We therefore simply advise not to use an average of individual LTI's as risk indicator.

In case of a LTI distribution it seems more appropriate to use its median instead. For median calculations the zero income records do not cause methodological problems. One simply assigns an extremely high value to their LTI's. For median calculations it does not really matter what value to assign to the LTI of zero income records, provided it is an extremely high positive value.

On the other hand, there is some peculiarity with negative household incomes if one calculates a median of the LTI distribution. Normally, if we assume that negative incomes do not exist, the higher LTI, the higher the associated risk. Or in different words, the smaller the income, the higher the LTI (and risk). This is valid until income becomes negative. We therefore assign an extremely high positive value to the LTI's of households with negative disposable income. By treating non-positive household incomes in this way the median makes sense as risk indicator.¹

Risk tables

Another way of providing information at micro level is compilation of the so called risk tables. A risk table is a frequency table in which individual LTV's are grouped in four categories: (i) $LTV = 0$ (no mortgage), (ii) $0 < LTV \leq 0.5$ (low mortgage), (iii) $0.5 < LTV \leq 1.0$ (high mortgage), and (iv) $LTV > 1.0$ (mortgage > house value).

In the same sense the individual LTI's are grouped in four categories, where the thresholds are 3.5 and 7.0 instead of 0.5 and 1.0, i.e., a factor of 7 higher, since LTI based on disposable income is roughly 7 times higher as LTV (see Table 13). Would

¹ Of course, it does not make sense to calculate a median for the individual LTI's of a group of households of which a majority have a non-positive household income. According to our treatment of records with non-positive incomes, such median would be exactly equal to the extremely high value assigned to LTI's for records with non-positive household incomes. Such medians are easily identified, so it is simple to prevent dissemination of these medians.

gross income be used in our LTI calculation, the factor would be 4 instead of 7. The LTI's of households with non-positive disposable incomes are in category LTI > 7.0.

Table 14 shows risk tables for 2008 and 2009 in which the number of households are given, where the individual LTV's and LTI's are classified according to four categories. Table 15 shows the same risk tables with percentages instead of the number of households. Table 16 shows a similar risk table: with percentages and where the categories LTV = 0 and LTI = 0 are left out. Tables 14 and 15 refer to all owner-occupiers. Table 16 only refers to the owner-occupiers with mortgage.

Table 15: The number of owner-occupiers. Break down to four LTV categories and four LTI categories.

2008, Number of owner-occupiers (x 1 million)		LTV categories				Total
		0	0 – 0.5	0.5 – 1	>1	
LTI categories	0	0.7				0.7
	0 – 3.5		1.1	0.3	0.0	1.5
	3.5 – 7		0.2	0.8	0.3	1.3
	> 7		0.0	0.3	0.3	0.7
Total		0.7	1.4	1.4	0.7	4.1

2009, Number of owner-occupiers (x 1 million)		LTV categories				Total
		0	0 – 0.5	0.5 – 1	>1	
LTI categories	0	0.7				0.7
	0 – 3.5		1.1	0.3	0.1	1.4
	3.5 – 7		0.2	0.7	0.5	1.4
	> 7		0.0	0.2	0.4	0.7
Total		0.7	1.3	1.3	0.9	4.2

Table 16: The same information as in Table 15, but expressed as percentages.

2008, Percentages, 4.1 mln owner-occupiers		LTV categories				Total
		0	0 – 0.5	0.5 – 1	>1	
LTI categories	0	16%				16%
	0 – 3.5		28%	7%	1%	35%
	3.5 – 7		5%	19%	8%	32%
	> 7		1%	8%	7%	16%
Total		16%	34%	34%	16%	100%

2009, Percentages, 4.2 mln owner-occupiers		LTV categories				Total
		0	0 – 0.5	0.5 – 1	>1	
LTI categories	0	17%				17%
	0 – 3.5		25%	8%	1%	34%
	3.5 – 7		4%	17%	12%	33%
	> 7		1%	6%	9%	16%
Total		17%	30%	31%	22%	100%

Table 17: The same information as in Table 16, in which percentage refer to group owner-occupiers with mortgage instead of all owner-occupiers.

2008, Percentages, 3.5 mln with mortgage		LTV categories			Total
		0 – 0.5	0.5 – 1	>1	
LTI categories	0 – 3.5	33%	8%	1%	42%
	3.5 – 7	6%	23%	10%	39%
	> 7	1%	9%	9%	19%
Total		40%	41%	19%	100%

2009, Percentages, 3.5 mln with mortgage		LTV categories			Total
		0 – 0.5	0.5 – 1	>1	
LTI categories	0 – 3.5	30%	10%	1%	41%
	3.5 – 7	5%	21%	14%	40%
	> 7	1%	7%	11%	19%
Total		36%	37%	27%	100%

To compare risk tables with each other, the ones with percentages are most appropriate (Tables 16 and 17). Some users prefer risk tables based on ‘all owner-occupiers’ (Table 16), since these tables also show information on owner-occupiers without a home mortgage. Other users, like mortgage lenders, might prefer risk tables based on ‘owner-occupiers with mortgage’ (Table 17). For convenience, we only discuss the risk tables in Table 17.

The most right column shows LTI frequencies, the bottom row shows LTV frequencies, and the ‘3 x 3 box’ shows a cross of LTI and LTV frequencies. The bottom row clearly shows that the LTV distribution is moved upwards if one compares 2008 with 2009. In 2009 27 percent of the group ‘owner occupiers with mortgage’ have a mortgage higher as the house value, whereas in 2008 this percentage was much lower: 19 percent.

The most right column for 2009 does not differ much from the one in 2008, which means that the distribution of LTI’s remained roughly the same. The ‘3 x 3 box’ shows results for both risks. The upper left corner represents low risk (33 percent in 2008 and a decrease to 30 percent in 2009). The lower right corner represents high risk (9 percent in 2008 and an increase to 11 percent in 2009).

We emphasize that information at micro level is especially relevant for specific subpopulations. For every household group with specific characteristics a risk table can be compiled, including values for median, 25% percentile, and 75% percentile. The results in Table 2 up to Table 12 show how many subpopulation are possible.

At Statistics Netherlands there are serious plans to disseminate the contents of Table 13 for all these subpopulations at our website for 2005 and later years. After having done this, the next thing should be the compilation of risk tables for all these subpopulations, which could be used as handy new tools to interpret our LTV and LTI data disseminated at our website.