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Price-setting and Price Dispersion in the Dutch Mortgage Market

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Abstract

We analyse empirically price-setting in the Dutch mortgage market, using information on about 124,000 Dutch households and 54 mortgage lenders over the years 1996-2001. For a narrowly defined set of mortgages (which have a fixed lending rate for ten years), the range of the lending rate between lenders varies between 0.86 and 1.24 percentage points over these years. Prices remain dispersed across lenders, even after controlling for the characteristics of the household and the municipality (1 percentage point). This may imply that there is imperfect competition among lenders, so that some of them can develop market power. Furthermore, we find that lenders with lower costs have lower lending rates, accounting for a maximum change of the lending rate by 0.076 – 0.16 percentage point. Finally, we find that the price dispersion of mortgages sold by banks is smaller than that of mortgages sold by life insurers (0.60 versus 1.28 percentage points). This difference may be due to lower agency costs for banks than for life insurers. Another likely explanation is that the market segment for banks is more transparent than that of insurance companies.

JEL classification: D40, D80, E43

1 Introduction[1]

Price-setting in the mortgage market has been studied mainly from the demand perspective. These studies have found that lending rates are dispersed across households, due to differences in risk, price discrimination and the value of the collateral (e.g. Gropp et al., 1997; Crawford and Rosenblatt, 1999; Gary-Bobo and Larribeau, 2002). Heffernan (2002) is the only study that has investigated empirically price dispersion among lenders. Using UK data, he finds that the margin between the highest and lowest lending rate is relatively small (0.45 percentage points), compared with the market for personal loans, for example, for which there is a range of 8.17 percentage points. He could not demonstrate that this dispersion is caused by differences in the underlying characteristics of the borrowers, as he used data at the lender level. No studies as yet have analysed price dispersion across different mortgage suppliers, using matched data of individual households and lenders.

It is important to gain insight into the size of price dispersion between lenders, since it informs us about the possibility of lenders to develop market power due to imperfect information on both sides of the mortgage market. This is an important issue, as market power leads to imperfect competition between the lenders, thereby diminishing the effectiveness of monetary policy. Market power of lenders affects their profitability and thus the financial stability of the financial sector. Furthermore, market imperfections on which market power is based lead to allocative inefficiencies and create welfare losses.

Another indication of the prevalence of market power may be reflected by the impact of the costs on the lending rate, which reveals whether individual lenders have the opportunity to have lower lending rates, because they may operate more efficiently. Some studies have focused on the impact of cost variables on the lending rate in the banking sector (Fase, 1995; Swank, 1995), but none of the studies has used information collected at the lender level.[2] Furthermore, there is an extensive literature on competition in the loan market, but these studies make use of aggregate data (e.g. Swank, 1995, Toolsema, 2002). Swank (1995) concludes that the mortgage market has an oligopolistic structure in the Netherlands, although competition has intensified significantly over the years. Toolsema (2002), however, finds indications for perfect competition among banks in the Dutch consumer credit market.

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[2] Another indication of the influence of lender characteristics is that the lending rate moves asymmetrically. It has been found that the nominal lending rate changes faster in upward direction than in downward direction (Haney, 1988; Toolsema and Jacobs, 2001).

This paper investigates in further detail the size and determinants of price dispersion among lenders in the mortgage market. In so doing, we will control for many observable characteristics of the borrower and municipality, including the costs of the lenders. Furthermore, we will investigate the dispersion for banks and life insurers separately.

We will make use of a unique lender-borrower matched data set that contains longitudinal, administrative information on households from about 124,000 Dutch mortgages with 54 lenders over the period January 1996 - October 2001. All of these mortgages had fixed interest rate periods of ten years. Our data are from mortgages in the lower segment of the Dutch mortgage market, as we used information of borrowers who acquired insurance against the default risk from the Dutch National Mortgage Guarantee (NMG). The advantage of this segment is that the borrowers are rather homogenous with respect to risk and the quality of the mortgage.

Our main empirical results are as follows. Compared to results by Heffernan (2002) for the UK, lending rates were found to be highly dispersed across lenders (a range of 0.86 – 1.24 percentage points over these years). Prices remain dispersed after controlling for the characteristics of the individual borrower and the region (about 1 percentage point). Higher operational costs of lenders result in higher lending rates. Both findings suggest that some of the mortgage lenders may have market power. Furthermore, we find that prices at the lender level are more dispersed for mortgages sold by life insurers (1.28 percentage points) than by banks (0.60 percentage point). This result may be due to imperfect information of borrowers (difference in transparency) and of lenders (difference in agency costs between both types of lender).

This article is organised as follows. Section 2 overviews studies on price setting that will serve as the foundation for our empirical analysis. Section 3 provides detailed information on the data set used. Section 4 examines the variation of the lending rates across borrowers and lenders over time. Section 5 introduces the empirical model and considers in further detail the explanatory variables. Section 6 discusses the estimates of the lending rate equation, and section 7 concludes.

2 Theory

We will follow Rousseas (1985), who suggests a marginal cost-pricing model in which the lending rate depends on the marginal cost price and a mark-up. The marginal cost price may be approximated by a market interest rate that has the same time horizon as the mortgage. Basically, the mortgage rate of an individual lender is based on the following simple price equation:

$$r_m = a_{0,j} + a_1 C_j + a_2\, r_b + b_1 H + b_2 H^* \tag{2.1}$$

where r_m is the lending rate on the mortgage and $a_{0,j}$ is the mark-up of the j-th lender. C_j represents the real costs of deposits of the j-th lender, and r_b is the bond rate on bonds that have the same fixed interest rate period as the mortgage. H is a vector of observable characteristics of the household, and H* is a vector of unobservable characteristics of the household that indicate risk of default or risk of (p) repayment. a_1 and a_2 are parameters, and b_1 and b_2 are vectors of parameters.

Heffernan (2002) determined that a_0 differs across lenders (he finds a range of 0.45 percentage point), but he could not control for the remaining explanatory variables of equation (2.1). There are different explanations for the dispersion of a_0. Basically, imperfect information leads to search costs of both borrowers and lenders, so that prices will be dispersed across lenders. However there are different sources of imperfect information for both sides of the mortgage market.

The impact of borrowers' search costs on the price dispersion was demonstrated theoretically by Salop and Stiglitz (1977). In their model, borrowers face unseen information costs. Some of them know the distribution of prices, while others do not. Those who know the distribution perfectly will buy bargains, whereas those lacking perfect insight will buy randomly. Due to ill-informed or inert borrowers, both lenders with a low interest rate (bargain) and those with a high interest rate (rip-off) can co-exist. Lenders offering bargains have high volumes of sales to relatively well-informed borrowers. From this model follows a bimodal price distribution with relative bargains and rip-offs existing together.

In contrast, also mortgage lenders will incur agency costs due to imperfect information on the quality of the borrowers. Higher agency costs will result in a larger dispersion of a_0. Banks may have lower agency costs than life insurers. As in other countries, in the Dutch mortgage market both banks and life insurers are active (Merriken, 1988). One of the striking differences between both types of lender is the distribution channel used to sell mortgages. Life insurers sell mortgages mainly through middlemen, whereas banks sell relatively more by direct face-to-face contacts at the desk. De Haas et al. (2000) find that large banks use middlemen as a distribution channel for only 20% of the mortgages in 1999. For small banks, this percentage is at most 70%. On the other hand, according to NERA (1999), life insurers distribute 79% of their products through intermediary channels, like affiliated agents, brokers, and even banks (10%).

Differences in the process of screening may explain this price dispersion, as it is more difficult to screen borrowers for creditworthiness through middlemen than by means of face-to-face contact at the desk. Middlemen provide a limited number of observable characteristics of the borrower. When lenders meet clients at the desk, they are able to acquire more specific information about the borrower. Furthermore, in many cases a bank may have access to additional information from the lender if he has been customer of the bank (e.g. by having an account or a credit card) for a longer period. Furthermore, middlemen have their own preferences due to bonuses, provisions and discounts they may receive from specific lenders. Middlemen are thus less inclined to come up with the best information on lending rates, which will be somewhat higher.

The parameter a_1 reflects the impact of the costs on the lending rate. Lenders that have lower operational costs may have lower lending rates. No studies as yet have used data of individual lenders to estimate the impact of costs on the lending rate. A few studies used information at the level of the financial market and focused on the transmission of operational costs on the lending rate (e.g. Fase, 1995; Swank, 1995). These costs include the bond rate, the financial costs of attracting funds, the costs of personnel and the depreciation of material assets. The parameter a_2 gives the impact of the market rate r_b on the individual lending rates. When it has a value less than one, it implies that the bank rates in less competitive or oligopolistic segments of the bank market adjust incompletely and with a delay, while bank interest rates in competitive markets adjust rapidly and completely (Laudadio, 1987). Using a macroeconomic VAR model, De Bondt (2002) finds that the interest rate on consumer lending is relatively sticky compared with lending to firms for the Euro area. Caution must be used in this respect, however, as the coefficient has a different interpretation for banks than for insurers. For banks, this variable refers to differences in market power due to imperfect competition between lenders, since banks acquire more funds from the bond market than they invest in the bond market. For the life insurers, on the other hand, this variable measures mainly the opportunity costs of investing the funds in the bond market instead of in the mortgage market (Boshuizen and Pijpers, 2000). Instead of acquiring funding mainly from the bond market or from depositos (what banks do), life insurers base their activities on the premiums they receive. Fase (1995) and Swank (1995) found that the interest rate on mortgages is largely determined by the bond rate.

Equation (2.1) contains the manifest and latent household variables H and H*, since the lending rate may vary with the borrowers' characteristics (Stiglitz and Weiss, 1981). When setting the lending rate for a particular household, mortgage lenders take account of the borrower's risks, which are comprised of risk of default, repayment and prepayment risks. The repayment risk refers to a loan not repaid on time. The prepayment risk concerns the risk that a borrower will pay off the mortgage before the termination date has been reached (Martin and Smyth, 1991; Alink, 2002). If the characteristics that underlie these risks are observed, then lenders will set the lending rates accordingly. Furthermore, to limit the borrower's moral hazard, mortgage lenders may demand collateral (Nothaft and Perry, 2002; Berger and Udell, 2002).

3 Data

Our empirical analysis is based on a specific part of the Dutch mortgage market, as we make use of data provided by the National Mortgage Guarantee (NMG) ('Nationale Hypotheek Garantie'). This guarantee was set up by the Dutch government in the mid-1990s in order to stimulate homeownership for the lower segment of the Dutch home market. In the Netherlands, homebuyers may opt to insure their risk of default at the national mortgage guarantee. They pay a small insurance premium (0.15 percent of the mortgage loan) at the date of transaction of the mortgage and receive a discount on their lending rate in return (0.2 to 0.5 percentage points), since they pose no risk of default to the mortgage provider. Thus, part of the risks is covered by the NMG, but the repayment and prepayment risks remain for the lender. The criteria of eligibility for this guarantee are not stringent.[3] First, the value of the mortgage must be below 420 thousand guilders in 2000 and 2001.[4] Furthermore, the mortgage-to-value ratio must be 88% at maximum.[5] Thus, our analysis concentrates on the lower segment of the Dutch mortgage market.

The NMG provides a guarantee against the risk of default. In case of default of the homeowner, the NMG is liable for the remaining debt. The NMG will make arrangements with the homeowner to pay back this sum to the NMG over a long period. In the period 1995-2001, about 393,000 households obtained an NMG guarantee. 194 households, about 0.05% of the total number of guarantees, defaulted in this period. The guarantee of the NMG had a nearly countrywide coverage in the period 1996-2001.[6] The potential market share is based on the value of the home, taking into account the additional costs that have to be made to acquire the home and that must be financed by mortgages. The NMG has estimated that 25 percent of the total mortgage market did actually acquire an NMG guarantee in 1997. In 2001, this percentage increased to 26 percent (NHG, 2002).

We have access to data from the NMG over the period January 1996 – October 2001. Our data set contains all transactions of homeowners that got the guarantee by the NMG in the period of investigation. The NMG data have no measurement errors, as they were used to assess the eligibility of individual households. Each case contains administrative information on the mortgagor's characteristics, which includes gross annual income (distinguished by head of household and spouse), address of the home, all necessary aspects of the mortgage contract (name of mortgage lender, lending rate, type of mortgage, size of the loan, and date of the

[3] These criteria are more stringent than the criteria for mortgages usually set by lenders. The maximum size of the mortgage loan depends on the gross income of both the head of the household and the spouse. Furthermore, the maximum size depends on the value of the home (NHG, 2002).

[4] 1 Dutch guilder (gld.) is worth 0.45 euros.

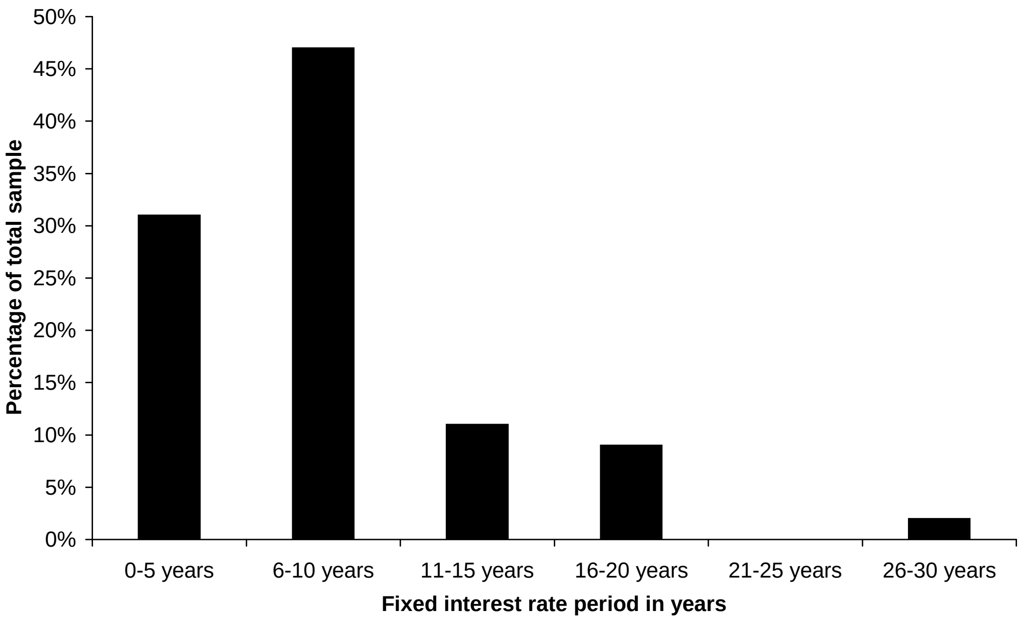
[5] In 2002, the NMG requires that a maximum of 28-37 percent of gross income (depending on household income and interest rate) may be attributed to spending on housing.

[6] A few large communities joined the NMG during our period of investigation: Groningen in January 1999, Rotterdam in January 2000 and Arnhem mid 2001. The NMG reached full countrywide coverage in 2001.

contract), and some household background characteristics (date of birth of head of household and spouse, type of home, and number of homeowners).

We matched our data set of households with three other data sets. First, we matched the data with information pertaining to the municipality, which is collected by Statistics Netherlands. These data were available for 1999 only.[7] We used municipality-level information on the population density, the number of inhabitants in the municipality, and the average value of homes in a municipality as used by the tax authorities (in Dutch: "WOZ-waarde"). The value used by the tax authorities are on average considerable lower than the market value. Second, we matched the data with monthly information on the ten-year bond rate (also collected by Statistics Netherlands). Third, we matched our data set with annual information on operational costs and costs of finance from the mortgagor. In this respect, we distinguish banks from life insurers and other suppliers (included pension funds). The data from the mortgage lenders are informative about their individual cost-structure. We used annual data, but for 2001 no cost information is available. For the banks, we used the real price of financial capital (derived from Bankscope), for which we follow the definition of Bos (2002). For the life insurers, we obtained the operational costs-to-liabilities ratio from the Dutch Pension and Insurance Chamber.

Figure 3.1 Distribution of the fixed interest rate period (in years), January 1996 – October 2001; N=386, 355



[7] Except for the average WOZ value, which is available for January 1st 1995.

Our gross sample of household data consists of 386,335 mortgages covering all maturities. Figure 3.1 gives the distribution of the mortgages' fixed interest rate period. The largest class of mortgages is that of a ten-year period with fixed lending rates (154,874 cases or 40 percent of the gross sample). We selected these ten-year mortgages. Our second selection criterion is that the mortgage may not be used to refinance the home. Our empirical analysis in Sub-section 6.1 is based on information of 123,565 mortgages.

Table 3.1 Mortgages by type of lender

Mortgagor	Number of lenders	Number of mortgages	Percentage of mortgages
Banks	17	85,614	69
Life insurers	27	17,004	14
Other lenders	10	20,947	17
Total	54	123,565	100

Table 3.2 Markets shares in the Dutch mortgage market by lender's type (in percentages)

	Banks	Insurance companies	Other lenders
1993	48.6	15.8	35.6
1994	47.8	15.6	36.6
1995	43.5	12.0	44.6
1996	46.6	12.6	40.9
1997	49.9	15.6	34.5
1998	49.9	13.4	36.6
1999	45.8	14.4	39.8
2000	46.3	13.6	40.1
2001	43.8	12.6	43.6

Source: Statistics Netherlands

This sample may be distinguished by type of lender, for which we have banks, life insurers, and other lenders. Table 3.1 gives the mortgage distribution by type of lender. Banks provide about 69 percent of the mortgages, life insurers 13 percent, and remaining lenders 17 percent. There are 54 mortgage lenders: 17 banks, 27 life insurers, and 10 other suppliers.

Our sample focuses on the lower part of the Dutch mortgage market. The distribution of mortgages by type of provider in our sample may therefore differ from that of Statistics Netherlands for the full mortgage market (See Table 3.2). Over the period 1993-2001, the market share of banks increased from 48.6% (1993) to nearly 50% (1997 and 1998), and then declined to 43.8% in 2001. For the insurance companies, the market share was 15.8% in 1993; it fluctuated in the subsequent years, dropping to 12.6% in 2001. The remaining suppliers have a market share that increased from 35.6% (1993) to 43.6% (2001).

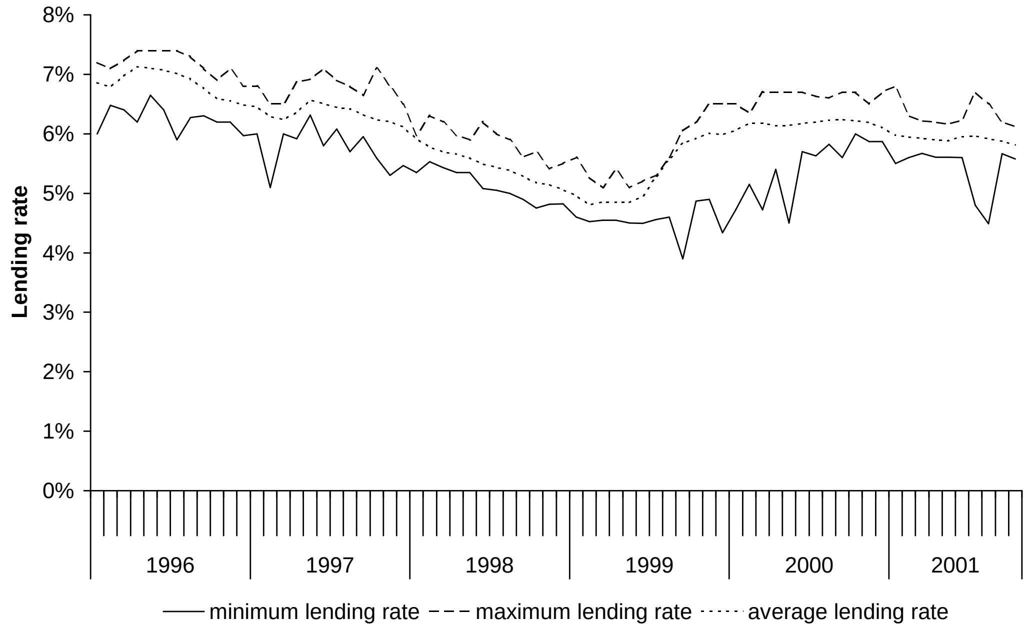
We will analyse price dispersion by type of lender separately. However, as the remaining lenders are quite heterogeneous (such as pension funds and building societies), we will use separate data sets only for banks and life insurers. For this additional analysis we add information on the lender's cost structure. Unfortunately, since we use different cost variables for banks and life insurers, we cannot pool the data across the types of lender. Our analysis in sub-section 6.2 is based on information of 66,566 mortgages sold by banks and 13,339 mortgages sold by life insurers.[8]

[8] These transactions are observed in the period 1996-2000, since no information is available on operational costs for 2001.

4 Dispersion of the nominal lending rate

This section examines the dispersion of the lending rate and its development over time. We restrict ourselves here to endowment mortgages with a ten-year fixed rate. Even though we use such a narrowly defined set of mortgages, we find that the lending rate varies substantially across lenders and borrowers.

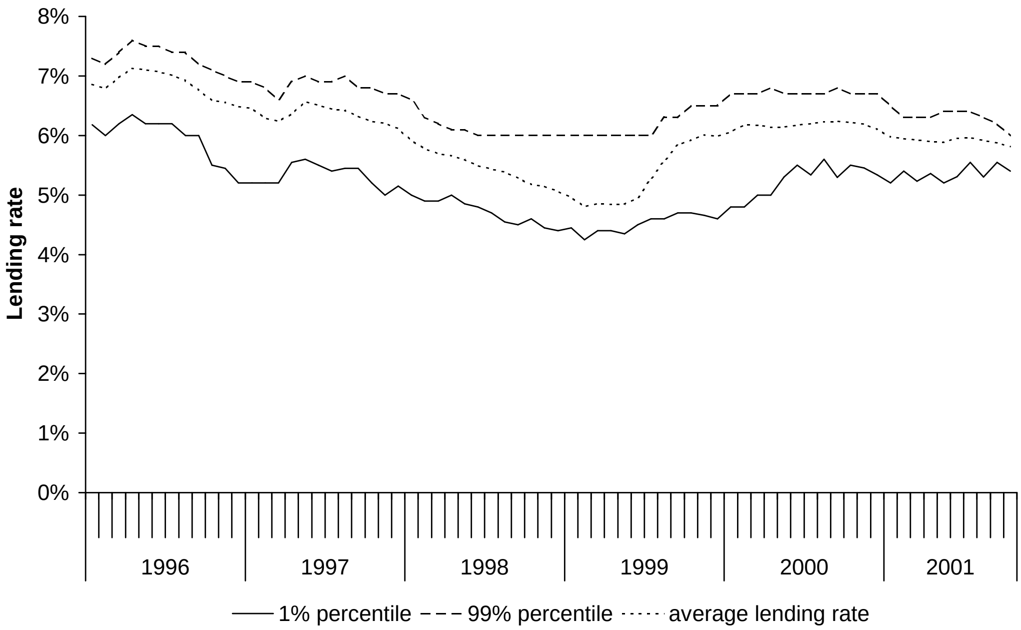
Figure 4.1 Lender level: Monthly minimum and maximum lending rate and average lending rate (in percentages); endowment mortgages; January 1996 – October 2001



For each of the mortgage lenders we calculated the average nominal lending rate on a monthly basis. We then used this information to determine the dispersion of the mean rates across the lenders (i.e. the highest and lowest lender-level rate, for each month). The between-lender variation is large. Figure 4.1 depicts the development of the minimum and maximum lender-level rates, as well as the development of the average lending rate. The average nominal lending rate decreases from seven percent to about five percent over the period January 1996 – July 1999. July 1999 is a turning point, after which the average lending rate increases by one percentage point to six percent in a few months. From January 2000 onwards, the average lending rate remains stable at the six-percent level.

With respect to the range of the lender-level rate, which is the difference between the highest and the lowest value, we notice two regimes. In the first regime of decreasing lending rates (until July 1999), the range is stable at 0.86 percentage point. The range increases to 1.24 percentage points in the second regime of an increasing rate at the market level. The widening of the dispersion is caused by an unstable minimum lender-level lending rate, which may point at higher price competition of the mortgagees to increase their market share in times of increasing lending rates. Remarkable is the shape of the maximum lending rate just after the turning point in July 1999, when the maximum lending rate is almost equal to the average lending rate. This may indicate that the maximum lending rate is sluggish in a period of unexpected price increases.

Figure 4.2 **Borrower level: monthly 1st and 99th percentile of the lending rate and the average lending rate (in percentages); endowment mortgages; January 1996 – October 2001**



For the dispersion of the lending rate at the borrower level, we determined the 1st and 99th percentiles of the sample on a monthly basis (see Figure 4.2). Our first impression is that the variation in lending rates between borrowers is huge. The 1st percentile is about 0.7 percentage point lower than the average lending rate. The difference between both percentiles is about 1.47 percentage points in the period before the turning point in July 1999. The difference increases to about 1.9 percentage points in the period of increasing lending rates. It becomes stable at about 0.96 percentage point after January 2001. The dispersion across all borrowers is between 1.5 and 2 times the dispersion of lending rate at the lender level in Figure 4.1.

5 Empirical model

In the empirical model described below we follow Fase (1995), who assumed that lenders and borrowers have no money illusion. Another motivation for using real-price variables is that the data set has a longitudinal character (as it spans a period of nearly six years). At the end of the 1990s, there was a widening between the average real and nominal lending rates that was caused by a rapid increase in the CPI from 1.66 to 4.87 percent.

Our empirical model is based on equation (2.1). Following other microeconometric studies (like Duca and Rosenthal, 1994; Chiang and Chow, 2002; and Nothaft and Perry, 2002) that emphasise the role of individual characteristics and regional characteristics, we distinguish seven classes of explanatory variables. First, the lending rate depends on the observable characteristics of borrower (H), which may point to a higher risk for the lender. Second, in line with Chiang and Chow (2002), we use characteristics of the property that affect the mortgage (P). The collateral value is captured by these characteristics. Third is the type of mortgage (M) (see also Chiang and Chow, 2002). A novelty we introduce is the use of lender characteristics. Fourth (following Nothaft and Perry, 2002), the municipality variables (Com) may pick up differences both in the population and in the location of the home (the local home market). Fifth, we include the one-month lagged real interest on ten-year bonds (r_b), which may be interpreted as funding costs for banks (Fase, 1995; Swank, 1995). For life insurers, the bond rate may be interpreted as opportunity costs of alternative investments. Sixth is the cost structure (C) of the lender: higher real costs increase the lending rate. Finally, we include year dummies. The empirical price-setting equation of the suppliers of mortgage loans is

$$r_{ijkt} = \alpha_j + \beta_1 H_i + \beta_2 P_i + \beta_3 M_j + \beta_4 Com_k + \beta_5 C_j + \beta_6 r_{bt-1} + \gamma_{year} * year + \varepsilon_{ijkt} \qquad (5.1)$$

α_j is a lender-specific dummy variable with standard deviation σ_a. β_r, r=1,…,6, are vectors of parameters. γ are coefficients on the year dummies. ε is an i.i.d. stochastic error term with standard deviation σ_e. Index j refers to the j-th lender. Index i refers to the i-th borrower. Index k refers to the k-th municipality, and index t refers to the t-th month.

Equation (5.1) contains seven categories of variables: Characteristics of the household, the property, the type of mortgage, the municipality, the costs of the lender, the bond rate, and time-varying variables. Table 5.1 gives the descriptive statistics of the variables used in the empirical analyses. The empirical analysis is based on real prices, but Table 5.1 reports the corresponding nominal price variables as well.

Table 5.1 Descriptives; Sample 1996-2001				
Variable	Mean	Std. Dev.	Min.	Max.
Characteristics of borrower				
Log(income of head household)	10.82	0.33	6.44	13.73
Log(income of spouse)	6.39	5.14	0.00	17.15
Log(real income of head household)	10.60	0.33	6.20	13.51
Log(real income of spouse)	6.26	5.04	0.00	16.86
Dummy age ≤ 20 years	0.01	0.07	0.00	1.00
Dummy 20 < age ≤ 25 years	0.19	0.39	0.00	1.00
Dummy 25 < age ≤ 30 years	0.39	0.49	0.00	1.00
Dummy 30 < age ≤ 35 years	0.21	0.41	0.00	1.00
Dummy 35 < age ≤ 40 years	0.10	0.30	0.00	1.00
Dummy 40 < age ≤ 45 years	0.05	0.23	0.00	1.00
Dummy 45 < age ≤ 50 years	0.03	0.17	0.00	1.00
Dummy age > 50 years	0.02	0.15	0.00	1.00
Dummy 1 borrower	0.28	0.45	0.00	1.00
Characteristics of home				
Dummy existing home	0.83	0.37	0.00	1.00
Dummy apartment	0.17	0.38	0.00	1.00
Dummy back repair of the home	0.04	0.19	0.00	1.00
Characteristics of mortgage and lender				
Lending rate (in percentages)	5.98	0.63	3.25	12.24
Real lending rate	3.42	1.09	– 1.11	9.22
Log(value of mortgage)	12.35	0.34	9.32	12.95
Log(real value of mortgage)	12.15	0.32	9.10	12.72
Log(real instalment payments)	6.03	5.52	– 0.15	12.42
Log(real premium deposit)	0.86	2.55	– 0.13	12.08
Dummy annuity mortgage	0.03	0.16	0.00	1.00
Dummy repayment mortgage	0.00	0.06	0.00	1.00
Dummy endowment mortgage	0.65	0.48	0.00	1.00
Dummy other mortgages (included escrow mortgages)	0.32	0.47	0.00	1.00
Dummy bank	0.69	0.46	0.00	1.00
Dummy insurance company	0.14	0.34	0.00	1.00
Dummy other lender	0.17	0.38	0.00	1.00

Table 5.1 (continued)

Variable	Mean	Std. Dev.	Min.	Max.
Characteristics of municipality				
Population density per square kilometre (in thousands)	0.17	0.16	0.03	0.65
Number of inhabitants (in tens of thousands)	1.04	1.38	0.01	7.27
Log(average value of homes) (in thousands of guilders)	5.10	0.22	4.47	6.12
Other characteristics that vary through time				
Real interests on ten-year government bonds	2.67	1.13	0.09	4.72
Dummy 1996	0.14	0.34	0.00	1.00
Dummy 1997	0.16	0.36	0.00	1.00
Dummy 1998	0.17	0.37	0.00	1.00
Dummy 1999	0.18	0.38	0.00	1.00
Dummy 2000	0.22	0.42	0.00	1.00
Dummy 2001	0.14	0.34	0.00	1.00
Number of observations	123,565			

Table 5.2 Descriptives by type of lender, distinguished by bank and life insurers

Variable	Banks Mean	Banks Std. Dev.	Life insurers Mean	Life insurers Std. Dev.
Characteristics of borrower				
Log(income of head household)	10.81	0.33	10.82	0.32
Log(income of spouse)	6.19	5.17	6.53	5.12
Log(real income of head household)	10.61	0.33	10.61	0.31
Log(real income of spouse)	6.07	5.07	6.40	5.01
Dummy age ≤ 20 years	0.00	0.06	0.00	0.07
Dummy 20 < age ≤ 25 years	0.18	0.39	0.20	0.40
Dummy 25 < age ≤ 30 years	0.38	0.49	0.41	0.49
Dummy 30 < age ≤ 35 years	0.20	0.40	0.21	0.41
Dummy 35 < age ≤ 40 years	0.10	0.30	0.10	0.29
Dummy 40 < age ≤ 45 years	0.06	0.23	0.04	0.21
Dummy 45 < age ≤ 50 years	0.04	0.19	0.02	0.15
Dummy age > 50 years	0.03	0.17	0.01	0.11
Dummy one borrower	0.29	0.45	0.28	0.45
Characteristics of home				
Dummy existing home	0.81	0.39	0.84	0.37
Dummy apartment	0.17	0.38	0.17	0.37
Dummy back repair of the home	0.04	0.20	0.03	0.18
Characteristics of mortgage and lender				
Lending rate (in percentages)	5.93	0.70	6.02	0.57
Real lending rate	3.71	0.74	3.70	0.67
Log(value of mortgage)	12.31	0.34	12.38	0.33
Log(real value of mortgage)	12.11	0.33	12.17	0.32
Log(real instalment payments)	6.15	5.49	4.75	5.49
Log(real premium deposit)	0.96	2.63	0.76	2.51
Dummy annuity mortgage	0.03	0.18	0.02	0.14
Dummy repayment mortgage	0.01	0.08	0.00	0.05
Dummy endowment mortgage	0.68	0.47	0.56	0.50
Dummy other mortgages (included escrow mortgages)	0.28	0.45	0.42	0.49
Characteristics of municipality				
Population density per square kilometre (in thousands)	0.16	0.16	0.18	0.17
Number of inhabitants (in tens of thousands)	0.97	1.31	1.16	1.48
Log(average value of homes) (in thousands of guilders)	5.10	0.22	5.10	0.21

Table 5.2 (continued)

Variable	Banks Mean	Banks Std. Dev.	Life insurers Mean	Life insurers Std. Dev.
Characteristics of municipality				
Population density per square kilometre (in thousands)	0.16	0.16	0.18	0.17
Number of inhabitants (in tens of thousands)	0.97	1.31	1.16	1.48
Log(average value of homes) (in thousands of guilders)	5.10	0.22	5.10	0.21
Operational costs of lender				
Real price of financial capital (banks)	0.03	0.01	-	
total cost / liabilities (life insurers)	-		0.01	0.02
Other characteristics that vary through time				
Real interests on ten-year government bonds	2.95	0.72	3.05	0.69
Dummy 1996	0.14	0.35	0.14	0.35
Dummy 1997	0.16	0.37	0.15	0.36
Dummy 1998	0.23	0.42	0.09	0.28
Dummy 1999	0.24	0.43	0.17	0.38
Dummy 2000	0.23	0.42	0.45	0.50
Number of observations	66,566		13,339	

We start with the characteristics of the borrower (H): gross income, age, and the number of borrowers in the household. The average income of the head of the household is about 50 thousand guilders (in logs: 10.82). For the spouse of the head of the household, the average income is about 596 guilders (in logs 6.39). On average, the homebuyers are young. This may be due to the segment of the housing market on which the NMG insurance focuses its activities, since young people buy relatively more homes in this segment. Twenty-eight percent of the mortgages have one borrower only. The characteristics of the home (P) are whether the property is a new home, whether it is an apartment or whether the home needs back repair. Eighty-three percent of the mortgages are used for existing homes. Seventeen percent are used for apartments. For 4 percent of the mortgages back repair of the home is needed.

Next, we discuss the characteristics of the mortgage (M). The average real lending rate is 3.4 percent. The average value of the mortgage is 231 thousand guilders (in logs: 12.35). The average value of the instalment payments is 416 guilders (in logs: 6.03). The average value of the premium deposit is 2 guilders (in logs: 0.86). Apparently, most of the borrowers have no premium deposit. Three percent of the mortgages are annuity mortgages; 65 percent of the mortgages are based on endowment; 32 percent are other mortgages, of which a part is escrow mortgages.

We use various characteristics of the municipality (Com), which refer to the situation on January 1st 1999 (see Appendix A). On average, there are about 1,700 inhabitants per square kilometre (so our households live in urbanised areas). On average, a municipality had around 10,400 inhabitants. The average value of the homes in the municipality (the WOZ value), on which local taxes are based, is 164 thousand guilders (in logs: 5.1) on January 1st 1995. On average, the real interest rate on ten-year bonds is 2.67 percent.

Table 5.2 gives the descriptives for the banks and life insurers separately. Our categorization of banks and life insurers is based on the definition of bankscope (for banks) and the definition of the ‘Pensioen en verzekeringskamer’, the supervising body of insurance companies (see Appendix A). The differences between both types of lenders seem to be rather insubstantial for most of the variables. The nominal lending rate is somewhat lower (but not substantial) for the banks than for the insurers. For the real lending rate the difference fully disappears.

We approximate the operational costs (C) by different variables for banks and life insurers. For the banks, the real price of financial capital is 2.9 percent. Total operational costs are on average 1.1 percent of the liabilities for life insurers.

6 Estimates

6.1 Overall sample

We estimated equation (5.1) using the explanatory variables discussed in the previous section. Our estimates are based on the overall sample of 123,565 cases. Table 6.1 reports IV estimates, lender-specific dummies excluded (1st column), and IV estimates including lender-specific dummy variables (2nd column).

The dispersion of the lender-specific effect is quite substantial. The standard deviation of the lender-specific dummy variable, σ_a, is 0.249, which is fairly large compared with the standard deviation of the error term (σ_e = 0.361). Thus, 95% of the total variation of the lender-specific dummy variables is 0.996, which is measured in terms of the units of the dependent variable. The maximum variation in the lending rate between the lenders is thus at least 1 percentage point (after correcting for all the explanatory variables that are included in the regression equation). This finding is in line with the rough evidence about the dispersion of the nominal lending rates at the lender level that we presented in Figure 4.1.

Ideally, in our regressions we would like to take into account all characteristics of the mortgagee as observed by the mortgagor. It could be that mortgagors have information available on the quality of the borrower (e.g. profession, which is not included in the data set we used). Although these unobserved characteristics affect price dispersion between borrowers, these characteristics will only affect the price dispersion between lenders when certain lenders would mainly serve certain groups of borrowers. For this we have no indications.

Next, we discuss the estimated coefficients on the remaining control variables. With respect to the borrower's characteristics, most of the estimated coefficients on the age dummies are significantly different from zero but only at the ten-percent level (except for the age categories below 30). The significant coefficients on the dummy categories are increasing with age. The largest difference of the lending rate with that of the reference group (older than 50 years) is for borrowers in the category 30-35 years (0.21 percentage point). For borrowers in the 45-50 years category, this difference with the reference group shrinks to 0.078 percentage point. Thus, the estimates give a very weak statistical indication that the lending rate increases with age. This finding is at odds with risk profiles from default and prepayment. Both risks are decreasing with age (NHG, 2002; Alink, 2002). We conclude that there is no strong indication for third-degree price discrimination between age groups.

The home variables may provide some indication about the impact of collateral. All of them have significant estimated coefficients. Existing homes have a 0.109 higher percentage point real lending rate. For apartments and back repair of the home, the lending rates are 0.051 percentage points and 0.023 percentage points higher, respectively. These findings imply that the value of the collateral reduces the lending rate. Apartments, as well as homes that need back repair, have a lower value. In contrast, newly built homes have a higher value. These findings are in line with the theoretical contribution of Wette (1983). Nothaft and Perry (2002) find that neighbourhoods with new homes have lower lending rates.

The estimated coefficient of the real interest on bonds is 0.592: A 1-percentage point increase in the real interest rate on bonds leads to an increase in the real lending rate by 0.592 percentage point. This is in line with an estimate of Swank (1995), who obtains the value of 0.67 for the elasticity of the government real bond rate on mortgage rates with respect to the lending rate.

Next, we examine the development of the dispersion of the lender dummies over the separate years. Table 6.2 gives the estimated coefficients. Apparently, price dispersion between the lenders is relatively low in 1997 and 1998 (σ_a = 0.155 and σ_a = 0.200), when there was a declining lending rate at the market level (see Figure 4.1). Price dispersion becomes higher in the years of increasing lending rates in 1999 and 2000 (σ_a = 0.272 and σ_a = 0.314). Apparently, price dispersion between lenders increases after the turning point, which is in line with the empirical finding of Figure 4.1.

Table 6.1 IV-estimates of equation (5.1); Sample 1996-2001

Dependent Variable: real lending rate	Lender dummies excluded Parameter	T-value	Lender dummies included Parameter	T-value
Characteristics of borrower				
Log(real income of head household)[a]	0.093	0.29	0.018	0.06
Log(real income of spouse)[a]	0.098	1.71	0.090	1.60
Dummy age ≤ 20 years[b]	– 0.298	– 0.90	– 0.309	– 0.96
Dummy 20 < age ≤ 25 years[b]	– 0.319	– 1.36	– 0.306	– 1.34
Dummy 25 < age ≤ 30 years[b]	– 0.313	– 1.63	– 0.293	– 1.57
Dummy 30 < age ≤ 35 years[b]	– 0.229	– 1.77	– 0.210	– 1.67
Dummy 35 < age ≤ 40 years[b]	– 0.139	– 1.81	– 0.124	– 1.67
Dummy 40 < age ≤ 45 years[b]	– 0.104	– 1.84	– 0.091	– 1.66
Dummy 45 < age ≤ 50 years[b]	– 0.093	– 1.99	– 0.077	– 1.69
Dummy more than one borrower[c]	– 0.807	– 1.63	– 0.750	– 1.56
Characteristics of home				
Dummy existing home[d]	0.119	10.29	0.109	9.63
Dummy apartment[e]	0.062	2.81	0.051	2.36
Dummy back repair of the home[f]	0.034	2.66	0.023	1.84
Characteristics of mortgage and lender				
Log(real instalment payments)	– 0.004	– 2.11	– 0.003	– 1.49
Log(real premium deposit)	0.004	2.64	0.003	2.15
Dummy endowment mortgage[g]	0.072	2.15	0.051	1.56
Dummy other mortgages[g]	– 0.022	– 0.54	– 0.095	– 2.39
Dummy bank[h]	0.007	0.28	-	
Dummy insurance company[h]	– 0.102	– 1.86	-	
Dummy endowment mortgage*dummy bank	– 0.050	– 2.22	– 0.021	– 0.93
Dummy other mortgages*dummy bank	0.004	0.14	0.101	3.49
Dummy endowment mortgage*dummy insurance company	–0.068	– 1.29	0.032	0.62
Dummy other mortgages*dummy insurance company	0.098	1.72	0.150	2.69
Characteristics of municipality				
Population density per square kilometre	– 0.109	– 1.91	– 0.080	– 1.43
Number of inhabitants	– 0.007	– 1.51	– 0.007	– 1.41
Log(average value of homes)	– 0.205	– 1.94	– 0.181	– 1.76

Table 6.1 (continued)

Dependent Variable: real lending rate	Lender dummies excluded		Lender dummies included	
	Parameter	T-value	Parameter	T-value
Other characteristics that vary through time				
One-month lagged real interest on ten-year government bonds	0.601	37.75	0.592	139.09
Dummy 1996[i]	1.445	33.64	1.416	33.83
Dummy 1997[i]	1.243	30.22	1.216	30.33
Dummy 1998[i]	0.983	28.77	0.967	29.02
Dummy 1999[i]	0.815	34.61	0.791	34.45
Dummy 2000[i]	0.947	18.89	0.963	123.75
Constant	1.080	0.31	1.770	0.53
σ_a	-		0.249	
σ_e	0.371		0.361	
F-test on α=0	-		131.11[j]	
Number of observations	123,565		123,565	

[a] Instrumented by month of birth (June-September=1; otherwise=0) and percentage of women in municipality.
[b] Reference group: age more than 50 years.
[c] Reference group: 1 borrower.
[d] Reference group: new homes.
[e] Reference group: remaining homes, other than apartments.
[f] Reference group: no back repair of home.
[g] Reference group: annuity and repayment mortgages.
[h] Reference group: pension fund.
[I] Reference year: 2001.
[j] Statistically different from zero at 1% level.

Table 6.2 IV-estimates of real equation (5.1); period 1996-2001

Dependent Variable: real lending rate	1996		1997		1998	
	Parameter	T-value	Parameter	T-value	Parameter	T-value
Characteristics of borrower						
Log(real income of head household)[b]	– 1.686	– 1.00	0.842	1.17	– 0.384	– 0.80
Log(real income of spouse)[b]	– 0.152	– 1.19	0.302	2.09	– 0.025	– 0.36
Dummy age ≤ 20 years[c]	– 0.997	– 0.84	– 0.564	– 1.66	– 0.135	– 0.33
Dummy 20 < age ≤ 25 years[c]	– 0.171	– 0.33	– 0.820	– 2.34	– 0.039	– 0.14
Dummy 25 < age ≤ 30 years[c]	0.023	0.07	– 0.827	– 2.29	0.013	0.06
Dummy 30 < age ≤ 35 years[c]	0.027	0.15	– 0.540	– 2.20	0.029	0.19
Dummy 35 < age ≤ 40 years[c]	– 0.037	– 0.34	– 0.199	– 1.94	0.026	0.26
Dummy 40 < age ≤ 45 years[c]	– 0.020	– 0.32	– 0.145	– 1.68	0.039	0.57
Dummy 45 < age ≤ 50 years[c]	0.033	0.63	– 0.158	– 1.83	0.038	0.69
Dummy more than one borrower[d]	0.978	1.13	– 2.277	– 2.14	0.149	0.26
Characteristics of home						
Dummy existing home[e]	0.059	2.06	0.153	5.32	0.076	4.78
Dummy back repair of the home[f]	0.029	0.69	0.114	2.22	– 0.016	– 0.55
Dummy apartments[g]	– 0.129	– 1.13	0.202	2.07	– 0.030	– 1.18
Characteristics of mortgage						
Log(real instalment payments)	0.005	0.80	– 0.011	– 2.66	0.000	0.19
Log(real premium deposit)	0.003	0.39	0.006	2.65	0.002	1.09
Dummy endowment mortgage[h]	0.244	3.31	– 0.019	– 0.23	0.104	1.25
Dummy other mortgages[h]	– 0.117	– 1.47	0.124	1.67	0.033	0.51
Dummy endowment mortgage * dummy bank	– 0.292	– 2.50	0.168	1.16	0.0005	0.00
Dummy other mortgages * dummy bank	– 0.063	– 0.84	– 0.115	– 3.14	– 0.005	– 0.08
Dummy endowment mortgage * dummy insurance company	0.164	2.66	– 0.229	– 1.80	0.041	0.48
Dummy other mortgages * dummy insurance company	– 0.411	– 2.46	0.042	0.32	– 0.003	– 0.02
Characteristics of the municipality						
Population density per square kilometre	0.386	1.12	– 0.474	– 2.05	0.088	1.19
Number of inhabitants	0.031	1.19	– 0.050	– 1.89	0.006	0.54
Log(average value of homes)	0.506	1.19	– 0.726	– 2.06	0.117	0.69

Table 6.2 (continued)

Dependent Variable: real lending rate	1996		1997		1998	
	Parameter	T-value	Parameter	T-value	Parameter	T-value
Other characteristics that vary through time						
One-month lagged real interest on ten-year government bonds	0.651	18.60	0.710	50.02	0.462	30.92
Constant	17.348	1.08	– 2.912	– 0.50	5.561	1.17
σ_a	0.251		0.155		0.200	
σ_e	0.392		0.324		0.347	
F-test on α=0	25.37[i]		48.30[i]		49.29	
Number of observations	17,058		19,212		20,744	

[a] Lender dummies included.

[b] Instrumented by month of birth (June-September=1; otherwise=0) and percentage of women in municipality.

[c] Reference group: age > 50 years

[d] Reference group: 1 borrower.

[e] Reference group: new homes.

[f] Reference group: no back repair of home.

[g] Reference group: non apartments

[h] Reference group: annuity and repayment mortgages.

[I] Statistically different from zero at 1% level.

Table 6.2 (continued) **IV-estimates of ; period 1996-2001**

Dependent Variable: real lending rate	1999 Parameter	T-value	2000 Parameter	T-value	2001 Parameter	T-value
Characteristics of borrower						
Log(real income of head household)[b]	– 1.127	– 0.64	0.752	1.90	– 0.271	– 0.75
Log(real income of spouse)[b]	– 0.005	– 0.10	– 0.065	– 0.65	– 0.267	– 0.84
Dummy age ≤ 20 years[c]	– 0.723	– 0.64	0.668	1.33	0.584	0.70
Dummy 20 < age ≤ 25 years[c]	– 0.325	– 0.61	0.405	1.03	0.624	0.78
Dummy 25 < age ≤ 30 years[c]	– 0.161	– 0.59	0.246	0.76	0.601	0.80
Dummy 30 < age ≤ 35 years[c]	– 0.064	– 0.48	0.144	0.59	0.456	0.80
Dummy 35 < age ≤ 40 years[c]	– 0.038	– 0.48	0.087	0.54	0.325	0.77
Dummy 40 < age ≤ 45 years[c]	– 0.005	– 0.07	0.071	0.54	0.234	0.76
Dummy 45 < age ≤ 50 years[c]	0.053	0.43	0.023	0.22	0.229	0.78
Dummy more than one borrower[d]	–0.119	– 0.24	0.679	0.74	2.355	0.83
Characteristics of home						
Dummy existing home[e]	0.054	1.81	0.077	4.77	0.055	1.72
Dummy back repair of the home[f]	– 0.034	– 0.83	– 0.007	– 0.38	0.006	0.33
Dummy apartments[g]	– 0.037	– 0.64	0.026	1.01	– 0.092	– 0.88
Characteristics of mortgage						
Log(real instalment payments)	0.003	1.90	0.001	0.46	0.006	0.75
Log(real premium deposit)	0.007	0.89	0.000	0.29	– 0.002	– 0.67
Dummy endowment mortgage[h]	0.010	0.07	0.088	0.60	0.388	1.19
Dummy other mortgages[h]	0.053	0.35	– 0.079	– 0.58	– 0.285	– 1.09
Dummy endowment mortgage * dummy bank	0.165	1.10	– 0.145	– 0.64	– 0.327	– 1.13
Dummy other mortgages * dummy bank	0.081	0.59	– 0.049	– 0.43	– 0.260	– 1.23
Dummy endowment mortgage * dummy insurance company	– 0.008	– 0.06	0.083	0.50	0.378	1.09
Dummy other mortgages * dummy insurance company	0.080	0.45	– 0.049	– 0.24	– 0.262	– 0.98
Characteristics of the municipality						
Population density per square kilometre	0.161	1.21	– 0.027	– 0.42	0.233	0.93
Number of inhabitants	0.009	0.65	– 0.001	– 0.14	0.017	1.18
Log(average value of homes)	0.169	0.57	– 0.058	– 0.47	0.422	0.88

Table 6.2 (continued)						
	1999		2000		2001	
Dependent Variable: real lending rate	Parameter	T-value	Parameter	T-value	Parameter	T-value
Other characteristics that vary through time						
One-month lagged real interest on ten-year government bonds	0.757	60.82	0.651	93.94	0.339	28.99
Constant	12.491	0.71	– 6.377	– 1.38	1.114	0.33
σ_a	0.272		0.314		0.259	
σ_e	0.346		0.349		0.219	
F-test on α=0	25.64[i]		60.64[i]		84.23[i]	
Number of observations	22,218		27,584		16,749	

[a] Lender dummies included.
[b] Instrumented by month of birth (June-September=1; otherwise=0) and percentage of women in municipality.
[c] Reference group: age > 50 years
[d] Reference group: 1 borrower.
[e] Reference group: new homes.
[f] Reference group: no back repair of home.
[g] Reference group: non apartments
[h] Reference group: annuity and repayment mortgages.
[I] Statistically different from zero at 1% level.

6.2 Banks and life insurers

We focus on differences in price dispersion between banks and life insurers. Table 6.3 gives the estimated coefficients. The dispersion of the lender dummy variable is much larger for life insurers (σ_a = 0.320) than for banks (σ_a = 0.150). Thus a 95% confidence interval for the lender dummies is 1.28 percentage points for the life insurers and 0.60 percentage point for the banks. There may be two explanations for the higher price dispersion of life insurers. On the one hand, borrowers may incur higher search costs when they buy a mortgage from an insurer, as customers of banks may be better informed. On the other hand, life insurers may have higher agency costs. Life insurers have more difficulty in screening clients, as they mainly make use of middlemen.

For both types of lender we find a statistically significant impact of the cost variable on the real lending rate, which implies that individual lenders have some market power due to differences in costs. We calculated the maximum change in the lending rate that corresponds to the range of the cost variable. For banks, the costs of finance lead to a change in the lending rate of 0.076 percentage point at maximum. For life insurers, the maximum change that could be achieved by a change of the cost variables is 0.16 percentage point.

We next consider the impact of the bond rate on the lending rate. Our estimates imply that for banks, an increase in the bond rate by 1 percentage point leads to an increase in the real lending rate of 0.726 percentage point (for life insurers 0.681 percentage point). Differences between banks and life insurers are significant, and banks seem to be for various reasons more sensitive to changes in the mortgage rate than are life insurance companies. Since banks attract funds mainly from the bond market, the bond rate represents the marginal costs of attracting funding to finance mortgages for banks. Since this estimated coefficient is significantly smaller than one, it indicates that banks have some market power due to imperfect competition. We cannot draw such a conclusion for life insurance companies, since they mainly invest in the bond market in contrast to banks that mainly attract funds from the bond market. The bond rate has therefore a different interpretation, and reflects their opportunity costs of alternative investments in bonds (Boshuizen and Pijpers, 2000).

Finally, with respect to the development of the year dummies, we observe that maximum variation is 0.37 percentage point for the banks, which is substantially smaller than that of the life insurers (0.48 percentage point).

Table 6.3 IV-estimates of equation (5.1); distinguished by banks and life insurers (lender dummies included)

	Banks		Life insurers	
Dependent Variable: real lending rate	Parameter	T-value	Parameter	T-value
Characteristics of borrower				
Log(real income of head household)[a]	– 0.419	– 0.44	0.401	0.81
Log(real income of spouse)[a]	0.077	1.10	0.036	0.70
Dummy age ≤ 20 years[b]	– 0.585	– 0.71	0.112	0.27
Dummy 20 < age ≤ 25 years[b]	– 0.410	– 0.88	0.025	0.10
Dummy 25 < age ≤ 30 years[b]	– 0.331	– 1.06	– 0.039	– 0.21
Dummy 30 < age ≤ 35 years[b]	– 0.209	– 1.15	– 0.048	– 0.39
Dummy 35 < age ≤ 40 years[b]	– 0.114	– 1.16	– 0.031	– 0.40
Dummy 40 < age ≤ 45 years[b]	– 0.063	– 1.05	– 0.036	– 0.45
Dummy 45 < age ≤ 50 years[b]	– 0.030	– 0.69	– 0.039	– 0.55
Dummy more than one borrower[c]	– 0.700	– 1.09	– 0.253	– 0.56
Characteristics of home				
Dummy existing home[d]	0.092	7.41	0.101	5.49
Dummy apartment[e]	0.012	0.40	0.050	2.12
Dummy back repair of the home[f]	0.003	0.10	0.032	1.08
Characteristics of mortgage				
Log(real instalment payments)	– 0.003	– 1.51	0.002	0.85
Log(real premium deposit)	0.002	0.70	0.002	0.99
Dummy endowment mortgage[g]	0.046	2.25	0.052	1.55
Dummy other mortgages[g]	0.004	0.19	0.085	2.57
Characteristics of municipality				
Population density per square kilometre	– 0.020	– 0.24	– 0.014	– 0.21
Number of inhabitants	– 0.004	– 0.63	– 0.009	– 1.65
Log(average value of homes)	– 0.113	– 0.82	– 0.135	– 1.18
Operational costs				
Real price of financial capital (banks)	2.633	6.93	-	
Total cost / liabilities (life insurers)	-		0.841	2.64

Table 6.3 (continued)

	Banks		Life insurers	
Dependent Variable: real lending rate	Parameter	T-value	Parameter	T-value
Other characteristics that vary through time				
One-month lagged real interest on ten-year government bonds	0.726	54.97	0.681	89.53
Dummy 1996[h]	0.228	4.93	0.410	9.88
Dummy 1997[h]	0.150	3.24	0.310	7.36
Dummy 1998[h]	– 0.050	– 1.24	0.082	2.14
Dummy 1999[h]	– 0.142	– 5.83	– 0.071	– 2.67
Constant	6.701	0.67	– 2.260	– 0.45
σ_a	0.150		0.320	
σ_e	0.375		0.333	
F-test on α=0	228.27[i]		28.97[i]	
Number of observations	66,566		13,339	

[a] Instrumented by month of birth (June-September=1; otherwise=0) and percentage of women in municipality.
[b] Reference group: age more than 50 years.
[c] Reference group: 1 borrower.
[d] Reference group: new homes.
[e] Reference group: remaining homes, other than apartments.
[f] Reference group: no back repair of home.
[g] Reference group: annuity and repayment mortgages.
[h] Reference group: pension fund.
[I] Reference year: 2001.
[j] Statistically different from zero at 1% level.

7 Conclusion

With regard to price setting by lenders in the mortgage market, we may conclude the following. For a narrowly defined set of mortgages (fixed rate for ten years), we found that the range between the highest and lowest lending rate between lenders fluctuates over time between 0.86 and 1.24 percentage points. Price dispersion among the lenders remains about 1 percentage point on average, even after correcting for the underlying borrowers' characteristics as well as for the features of the mortgage and the municipality.

The range of the lending rates is large compared with the range of 0.45 percentage point found for the UK mortgage market (Heffernan, 2002). This may indicate that the Dutch mortgage market is less competitive than the UK mortgage market. In 1999, the lending rate increased after a period of steady decline. We observe that the dispersion among lenders widens after the turning point in 1999.

Price dispersion may hint at the presence of imperfect competition, caused by search costs of borrowers (Salop and Stiglitz, 1977) or by agency costs of lenders. Imperfect competition leads to market power for some of the lenders, for which we have the following additional empirical indications. Our estimates have shown that lenders with higher marginal costs transfer these costs to the borrowers. The cost variable accounts for a change of 0.08 - 0.16 percentage point of the lending rate at maximum.

We observe substantial differences in price dispersion between the mortgages of banks and the mortgages of life insurers. After correcting for the household and municipality characteristics, we find that the dispersion of the lending rates is 1.28 percentage points for the life insurers and 0.60 percentage point for the banks. This difference may be caused by a difference in agency costs between banks and life insurers due to unobserved characteristics of the lenders. Banks may screen borrowers better, as they have relatively more transactions at the desk. Life insurers make use of middlemen, who may screen the borrowers less effectively. Life insurers may therefore use the interest rate as a screening device. Another explanation may be that the number of uninformed borrowers is relatively high due to the high search costs involved in tracking down the best bargain. The mortgage market is not very transparent, due to the use of middlemen (which are mainly used by life insurers). Middlemen may have their own preferences, since they may get bonuses from specific lenders. Thus, they may be less inclined to come up with the best lending rate.

We consider these empirical results on the difference in price dispersion between banks and life insurers as a first step toward a better understanding of the differences in the way banks and life insurers operate in the mortgage market.

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Appendix A: Definition of the lender-specific and regional variables

Lender cost variables

Banks:

- Real price of financial capital = [interest expense/ [customer & short-term funding + other funding]] - consumer price inflation.
  Source: Bankscope

Life insurance companies

- Net operational expenses/total liabilities = (costs from acquisition + change in costs from past acquisitions + operational and personnel costs + depreciation + received provisions and profit sharing from reinsurance)/total liabilities.
  Source: Dutch Pension and Insurance Chamber

Municipality variables

- Number of inhabitants on January 1st 1999.
- Population density: number of inhabitants per square kilometre (January 1st 1999).
- Average value of homes: the WOZ-value of the home on January 1st 1995.
  Source: Statistics Netherlands, Kerncijfers Wijken en Buurten 1999.