Online Appendix for

"Inattention and Inertia in Household Finance: Evidence from the Danish Mortgage Market,"

by

Steffen Andersen, John Y. Campbell, Kasper Meisner Nielsen, and Tarun Ramadorai.[1]

This appendix contains six parts:

1. Details about refinancing in Denmark.
    a. This appendix provides answers to FAQs about access to refinancing in Denmark, obtained from the Association of Danish Mortgage Banks. These details confirm that refinancing is widely available, and largely unrestricted.
    b. Brief history of the Danish Mortgage Market

2. Appendix B: Additional Tables
    a. Table B1: Our estimated mortgage termination probabilities. We model mortgage terminations that are driven by household-specific events, such as moves, death, or divorce, by predicting the probability of mortgage termination.
    b. Table B2: The underlying distribution of our ranked variables
    c. Table B3: The underlying distribution of our estimated monetary incentives
    d. Table B4: Household Characteristics and Refinancing Errors.
    e. Table B5: Costs of Errors of Omission
    f. Figure B1: Histogram of estimated mortgage termination.
    g. Figure B2: 30-year Danish Mortgage Rates, 2003-2016
    h. Figure B3: Refinancing Activity by New Mortgage Coupon Rates

3. Appendix C: Replication of Table 5 and corresponding figures, assuming a constant mortgage termination probability of 10% across households.

4. Appendix D: Replication of Table 5 and corresponding figures, excluding all cash-out and maturity extension refinancing from the sample.

[1]We are grateful to the Association of Danish Mortgage Banks for providing data, and for facilitating dialogue with the Mortgage Banks. We are particularly grateful to the senior economists Bettina Sand and Kaare Christensen at the Association of Danish Mortgage Banks for providing us with valuable institutional details.

Appendix A:

The following is a list of questions and answers resulting from our discussions with the Association of Danish Mortgage Banks regarding constraints on Danish households' ability to refinance mortgages.

The answers to several of these queries provide perspective on the controversy surrounding a recent article in The Economist newspaper, which has engendered some debate in Denmark.[2] This article suggests that the ability to refinance mortgages in Denmark is limited due to legal restrictions: "*Refinancing is an option for many, but not for the most precarious borrowers, due to legal restrictions on loans of more than 80% of a property's value.*" However, in Denmark, the article has been rebuffed by economists and market participants. For instance, the largest commercial bank Danske Bank wrote in April 2014: "*The Economist has renewed the focus on Danish households' debt in a recent article entitled 'Something rotten, Denmark's property market is built on rickety foundations'. We have looked into the arguments in the article and we conclude that it is based more on myths than realities with regard to the financial stability in Denmark.*" [3]

The original correspondence with the Association of Danish Mortgage Banks is in Danish, and has been translated into English by the authors. The original correspondence will be included in a later version of this appendix.

	Question (by the authors)	**Answer (from the Association of Danish Mortgage Banks)**
A.1	*Can households always refinance their mortgages?*	Households can always refinance if they do not increase their principal.
A.2	*Can households add the refinancing costs to their principal?*	Households have the right to refinance their mortgage, adding costs and capital loss to the new principal, as long as they stay within the same house associated with the mortgage.
A.3	*Does refinancing trigger a credit evaluation?*	No credit evaluation is done in the event of refinancing.
A.4	*Can households refinance in a situation in which the LTV has risen above 80% of the property's value, on account of declining house prices?*	Yes, households are allowed to refinance in such a situation because the value of the property is not re-assessed when households refinance. As long as the household does not increase the principal (beyond adding costs and capital loss to the new principal as described in Question A.2), the LTV will not be re-assessed and households therefore have the option to refinance.
A.5	*Do the terms of the mortgage change in case of delinquencies or default? Do households owe the market value or the face value of the mortgage to the mortgage bank?*	The terms of the loan does not change for delinquent borrowers. Mortgages can be bought back on the same terms. Thus, in case of a forced sale due to foreclosure, the borrower owes the mortgage bank the Min[Face value, Market value] plus transaction costs – foreclosure proceeds.

[2] "Danish Mortgages: Something rotten, Denmark's property market is built on rickety foundations'", The Economist. April 19, 2014.
[3] "Research Denmark: Myths and realities about large household debt", Danske Bank, April 24, 2014.

History of the Danish mortgage system

The Danish mortgage system originated in 1795 when a huge fire burned one in four houses in Copenhagen to the ground. To finance the reconstruction, lenders formed a mortgage association in 1797 and the first Danish mortgages were issued on real property on the basis of joint and several liability to enhance credit quality. Over the past 200-plus years the market has experienced no mortgage bond defaults, and only in a very few cases have payments to investors been delayed. The last example of delayed payments to mortgage bond investors occurred in the 1930s.

This track record is partly attributable to the legal framework, which was first introduced in 1850, with successive changes resulting in the current framework, which dates from 2007. The legal framework is designed to protect mortgage bond investors and confines the activities of mortgage banks to mortgage lending funded only through the issuance of mortgage bonds. Mortgage loans serving as collateral must meet restrictive eligibility criteria including LTV limits and valuation of property requirements laid down in the legislation. For instance, for private residential properties the LTV limit is 80% and mortgage banks are obliged to assess the market value of pledged properties at the time of granting the loans. The maximum loan maturity is 30 years, with an option for interest-only periods of a maximum of 10 years for private residential properties. Mortgage banks may not grant loans exceeding these limits, even to borrowers who are extremely creditworthy. However, refinancing is relatively unconstrained even for loans exceeding the LTV limit, as we discuss in the paper.

Appendix B:

Table B1: Determinants of Mortgage Termination (UPDATE)

This table shows results from simple probit specifications which seek to uncover the determinants of mortgage termination caused by moving, or other circumstances which result in full prepayment of the mortgage. The dependent variable takes the value of 1 if a household terminates its mortgage in a given month, and 0 otherwise. Each column estimates a model with a non-linear transformation ($f(x) = \sqrt{2x^2}$) of several of the rank control variables in addition to their levels x. As before, we estimate these specifications using all households in Denmark with an unchanging number of members, with a fixed rate mortgage in 2010 through 2015. The independent variables are indicated in the rows. The first set of variables is a set of dummy variables indicating the demographic status indicated in the row headers. The next set constitutes rank variables, which are normalized to take values between 0 and 1, and range between -0.5 and 0.5 once demeaned. All variables are described in greater detail in the header to Table 2 in the paper. ***, **, and * indicate coefficients that are significant at the one, five, and ten percent level, respectively, using standard errors clustered at the level of households. We use predicted mortgage terminations by household characteristics for all of our estimations of refinancing choices.

	2010	*2011*	*2012*	*2013*	*2014*
Single male household	0.168***	0.156***	0.137***	0.095***	0.095***
Single female household	0.083***	0.067***	0.054***	0.025***	0.045***
Married household	-0.198***	-0.212***	-0.213***	-0.248***	-0.196***
Children in family	-0.162***	-0.172***	-0.153***	-0.190***	-0.174***
Immigrant	0.149***	0.148***	0.123***	0.139***	0.091***
Financially literate	-0.032***	-0.003	0.010	-0.016**	0.010
Family financially literate	0.000	0.000	0.009*	0.014***	0.018***
No education data	0.145***	0.142***	0.161***	0.161***	0.110***
Getting married	0.081***	0.136***	0.134***	0.165***	0.154***
Having children	0.072***	0.104***	0.112***	0.138***	0.123***
Region of Northern Jutland	-0.107***	-0.116***	-0.069***	-0.119***	-0.030***
Region of Middle Jutland	-0.069***	-0.092***	-0.042***	-0.084***	-0.015***
Region of Southern Denmark	-0.080***	-0.087***	-0.050***	-0.094***	-0.064***
Region of Zealand	-0.060***	-0.079***	-0.036***	-0.070***	-0.075***
Demeaned rank of:					
Age	-0.774***	-0.816***	-0.785***	-0.909***	-0.905***
Length of education	0.726***	0.756***	0.801***	0.890***	0.856***
Income	0.041***	0.076***	0.058***	0.065***	0.107***
Financial wealth	0.062***	0.101***	0.085***	0.034***	-0.017
Housing wealth	-0.454***	-0.453***	-0.563***	-0.485***	-0.366***
Non-linear transformation f(x),where x is the demeaned					
Age	-0.067***	-0.083***	0.099***	0.095***	0.129***
Length of education	0.021***	-0.030***	-0.049***	-0.068***	-0.030***
Income	0.852***	0.795***	0.698***	0.683***	0.584***
Financial wealth	-1.866***	-1.917***	-1.621***	-1.701***	-1.600***
Housing wealth	2.236***	2.322***	1.985***	1.992***	1.720***
Constant	-1.105***	-1.080***	-1.076***	-0.908***	-1.037***
Issuing Quarter Dummies	Yes	Yes	Yes	Yes	Yes
Current Quarter Dummies	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.106	0.108	0.121	0.104	0.111
Log Likelihood	-385,877	-381,275	-377,616	-388,586	-443,373
# of observations	1,267,937	1,267,335	1,267,834	1,265,924	1,281,436

Table B2: Underlying Distribution of Incentives

In each block of numbers, we compute the percentiles of the distribution reported in the top row of column headings, across the entire sample of Danish households pooling data over all periods from 2010 to 2014, as well as separately by year. The blocks of numbers are for the interest rate spread in percentage points (defined as the coupon rate on the old mortgage less the yield on a newly available mortgage of roughly the same maturity); the threshold level above which refinancing is sensible, taking into account the option value of waiting, reported in percentage points, and calculated using the closed form solution in the Agarwal et al. (2013) formula; and the total incentive in percentage points, measured as the interest rate spread less the computed threshold level. To preserve confidentiality, percentiles are calculated using 5 nearest observations to the percentile point.

	1%	5%	25%	Median	75%	95%	99%
				Interest Rate Spread in Percentage Points			
All	-1.01	-0.41	0.04	0.35	1.08	2.52	3.69
2010	-1.06	-1.01	-0.08	0.65	0.82	1.94	2.94
2011	-0.96	-0.55	-0.16	0.45	0.84	1.85	2.94
2012	-0.20	-0.10	0.30	0.85	1.39	2.45	3.85
2013	-0.68	-0.37	0.13	0.56	1.45	2.56	3.64
2014	-0.32	-0.10	0.51	0.90	1.61	3.09	4.10
				Threshold Level in Percentage Points			
All	0.49	0.55	0.64	0.76	0.94	1.51	3.08
2010	0.49	0.55	0.64	0.75	0.94	1.50	2.75
2011	0.51	0.57	0.66	0.77	0.95	1.53	3.09
2012	0.49	0.55	0.65	0.76	0.96	1.58	3.66
2013	0.48	0.54	0.64	0.75	0.92	1.48	3.02
2014	0.48	0.54	0.64	0.76	0.94	1.49	3.04
				Incentives in Percentage Points			
All	-2.37	-1.38	-0.71	-0.15	0.31	1.33	2.31
2010	-2.44	-1.71	-0.89	-0.26	0.14	1.08	1.76
2011	-2.82	-1.55	-1.01	-0.37	0.08	0.91	1.70
2012	-2.36	-1.00	-0.52	-0.14	0.50	1.32	2.20
2013	-1.97	-1.23	-0.61	-0.14	0.48	1.47	2.40
2014	-1.60	-1.00	-0.31	0.10	0.52	1.96	2.87

Table B3: Underlying Distribution of Ranked Variables

The percentiles of the distribution reported in the column headings are calculated across our sample of households in Denmark with a single fixed rate mortgage, pooling data over 2010 through 2014. The blocks of statistics are presented for income (total taxable income for each household in million DKK); financial wealth (the value of cash, bonds, stocks, and mutual funds less non-mortgage debt, in million DKK); Housing value (the value of properties, in million DKK); education (the number of years it takes to reach the highest level of education possessed by any individual in the household, where a rule of thumb is that 12 years is a high school diploma, 16 is a Bachelor's degree, 18 is a Master's degree, and 20 is a PhD); and age (measured in calendar years). Within each block of statistics, percentiles are calculated for all households, and separately for the sub-populations of refinancing and non-refinancing households. To preserve confidentiality, percentiles are calculated as the average of the five nearest observations to the percentile point.

	1%	5%	25%	Median	75%	95%	99%
				Income			
All	0.140	0.192	0.363	0.560	0.740	1.098	1.595
Refinancing	0.151	0.231	0.426	0.606	0.775	1.140	1.647
Non-refinancing	0.139	0.188	0.353	0.548	0.731	1.088	1.582
				Financial Wealth			
All	-1.313	-0.643	-0.197	0.029	0.233	0.934	2.222
Refinancing	-1.417	-0.731	-0.277	-0.019	0.178	0.851	2.151
Non-refinancing	-1.286	-0.620	-0.178	0.037	0.245	0.950	2.239
				Housing Wealth			
All	0.364	0.552	0.957	1.374	2.029	3.493	5.909
Refinancing	0.417	0.626	1.043	1.512	2.139	3.650	6.039
Non-refinancing	0.356	0.540	0.937	1.364	1.986	3.454	5.892
				Education			
All	7	7	12	12	16	18	20
Refinancing	7	9	12	12	16	18	20
Non-refinancing	7	7	12	12	16	18	20
				Age			
All	26	31	42	52	63	76	85
Refinancing	26	30	39	49	61	73	82
Non-refinancing	26	31	43	53	64	77	85

Table B4: Household Characteristics and Refinancing Errors.

This table reports the mean difference in demographic characteristics between refinancing and non-refinancing households who commit errors of commission and omission. We report these differences using cutoff levels of 0 as well as 25 basis points. We calculate the levels of incentives to engage in refinancing using the interest rate spread between the old and new mortgages less the Agarwal et al. (2013) formula which quantifies the option-value of waiting, and we use these computed incentives (plus cutoff levels to control for noise in estimation) to classify errors. Positive (negative) numbers under columns marked "Increases in Errors of Commission" signify demographic characteristics which are associated with shifts of household-quarters into (out of) such errors, and similarly positive (negative) numbers under columns marked "Reductions in Errors of Commission" signify demographic characteristics which are associated with shifts of household-quarters out of (into) such errors. ***, **, and * indicate coefficients that are significant at the one, five, and ten percent level by standard t-tests, respectively.

	Cutoff = 0		*Cutoff = 0.25*	
	Increases in Errors of Commission	*Reductions in Errors of Omission*	*Increases in Errors of Commission*	*Reductions in Errors of Omission*
# of observations	3,335,839	2,267,894	2,457,227	1,532,371
Single male household	-0.015***	-0.034***	-0.020***	-0.049***
Single female household	-0.010***	-0.026***	-0.011***	-0.031***
Married household	-0.005***	0.031***	0.004**	0.056***
Children in family	0.045***	0.088***	0.049***	0.116***
Immigrant	-0.003***	-0.003***	-0.004***	-0.003***
Financially literate	0.013***	0.014***	0.010***	0.016***
Family financially literate	0.025***	0.032***	0.021***	0.038***
No educational information	-0.002***	-0.002***	-0.002***	-0.003***
Getting married	0.007***	0.006***	0.007***	0.006***
Having children	0.022***	0.023***	0.022***	0.025***
Rank of age	-0.057***	-0.078***	-0.052***	-0.089***
Rank of education	0.022***	0.050***	0.014***	0.067***
Rank of income	0.029***	0.068***	0.025***	0.092***
Rank of financial wealth	-0.070***	-0.052***	-0.081***	-0.055***
Rank of housing value	0.035***	0.009***	0.032***	0.068***
Region North Jutland	-0.008***	0.003***	-0.010***	0.003***
Region Middle Jutland	0.010***	0.028***	0.008***	0.033***
Region Southern Denmark	-0.007***	0.010***	0.000	-0.013**
Region Zealand	-0.022***	-0.031***	-0.016***	-0.031***
Region Copenhagen	0.027***	0.009***	0.018***	0.001***

Table B5: Costs of Errors of Omission

This table estimates the costs of errors of omission. We calculate the levels of incentives to engage in refinancing using the interest rate spread between the old and new mortgages less the Agarwal et al. (2013) formula which quantifies the option value of waiting, and we use these computed incentives (minus cutoff levels to control for noise in estimation) to classify errors. Each column shows cost estimates corresponding to the cutoff levels shown in the column header. For example, a cutoff level of 0 (0.25) corresponds to the interest rate spread being exactly equal to the computed Agarwal et al. (2013) threshold level (exceeding the Agarwal et al. (2013) threshold level by 25 basis points). Errors of omission occur for household-quarters with incentives above the cutoff, in which refinancing does not occur. The panel shows the cost of errors of omission calculated as the foregone annual interest saving (as a percentage of the outstanding mortgage balance) less the amortized fixed cost of refinancing given the available interest rates in each quarter of each year listed in the rows, as well as for all years pooled.

	Level of Cutoff						
	0	0.25	0.5	0.75	1	1.5	2.0
	Cost of errors of omission as % of outstanding mortgage						
All	1.50%	1.79%	2.08%	2.30%	2.60%	3.25%	3.75%
2010	1.25%	1.72%	2.03%	2.08%	2.20%	3.18%	3.61%
2011	1.28%	1.66%	2.06%	2.19%	2.51%	3.24%	3.93%
2012	1.56%	1.70%	1.90%	2.24%	2.65%	3.19%	3.85%
2013	1.68%	1.87%	1.99%	2.22%	2.77%	3.22%	3.78%
2014	1.63%	1.91%	2.39%	2.55%	2.69%	3.31%	3.70%
	Cost of errors of omission as % of all outstanding mortgages						
All	0.61%	0.49%	0.39%	0.31%	0.23%	0.12%	0.07%
2010	0.46%	0.30%	0.23%	0.20%	0.14%	0.05%	0.02%
2011	0.38%	0.26%	0.19%	0.15%	0.10%	0.05%	0.02%
2012	0.71%	0.61%	0.47%	0.32%	0.22%	0.12%	0.06%
2013	0.62%	0.56%	0.48%	0.36%	0.24%	0.15%	0.08%
2014	0.91%	0.78%	0.61%	0.56%	0.49%	0.29%	0.17%

Figure B1: Histogram of Estimated Mortgage Termination Probabilities.

This figure shows our estimated mortgage termination probabilities. To compute these estimates, we fit a simple probit model to realized mortgage terminations using all households with a single fixed-rate mortgage, conditioning the dummy variable for mortgage termination on household characteristics. We plot the fitted values from this probit model, with a dark dashed line at 10%, which is the Agarwal et al. (2013) suggested "hardwired" value.

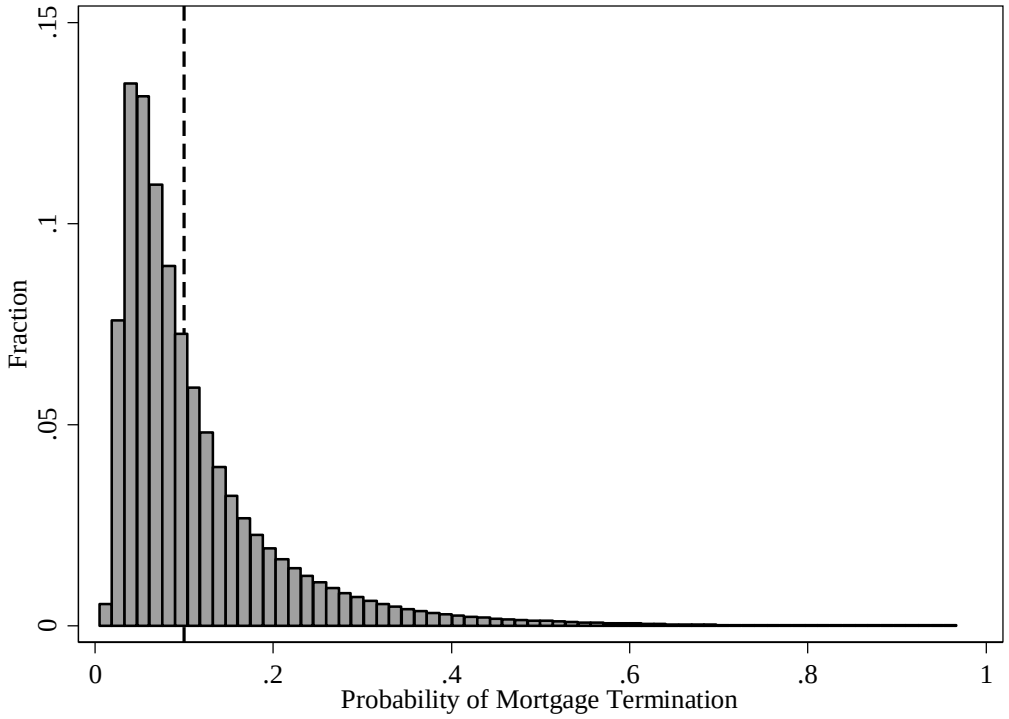


Figure B2: 30-year Danish Mortgage Rates, 2003-2016

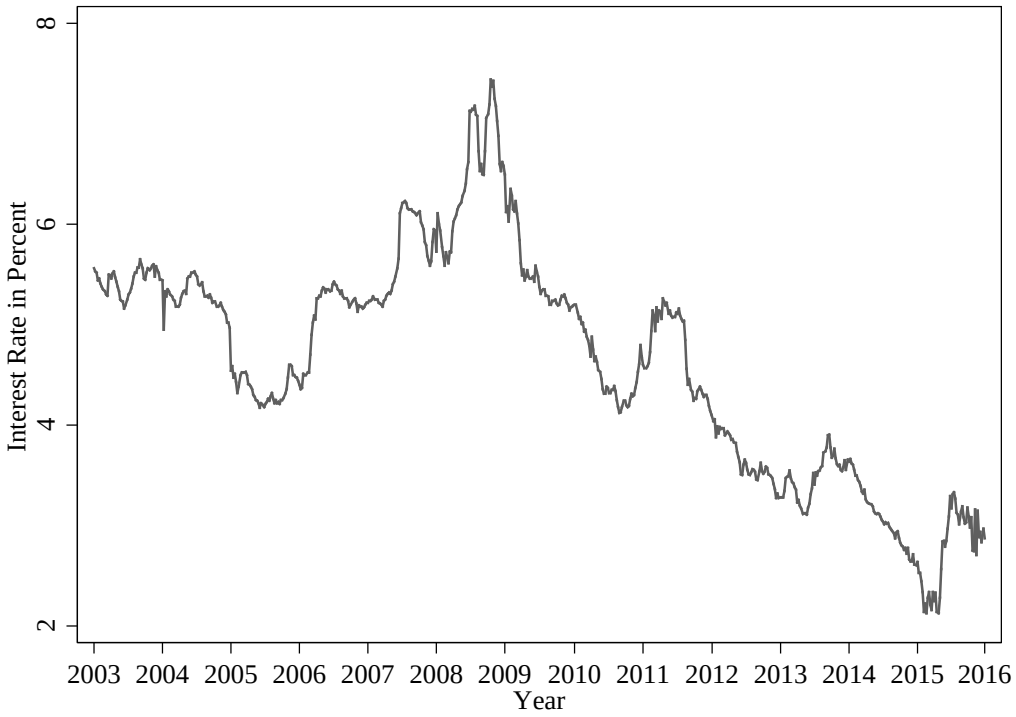


Figure B3: Refinancing Activity by New Mortgage Coupon Rates

This figure illustrates the history of refinancing activity in our sample of Danish fixed-rate mortgages. In each plot, the bars (left vertical axis) represent the number of refinancing households. The figure shades each of the bars according to the coupon rate on the new fixed rate mortgage into which households refinance. The bars labelled "non-FRM" capture households with FRMs refinancing into ARMs, capped ARMs, or other floating-rate mortgages.

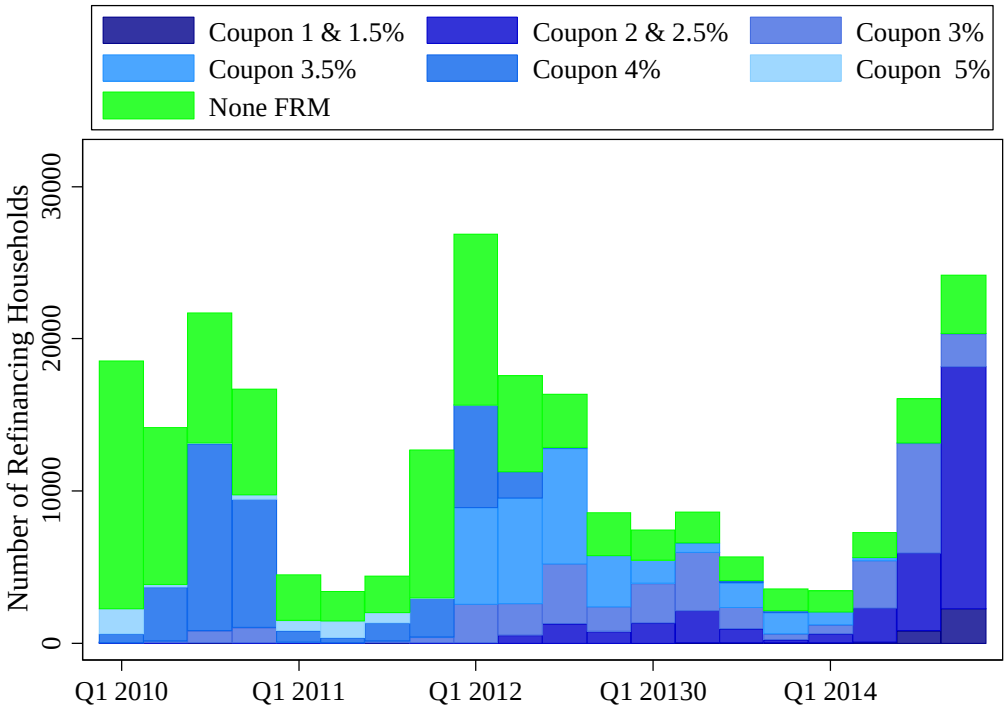


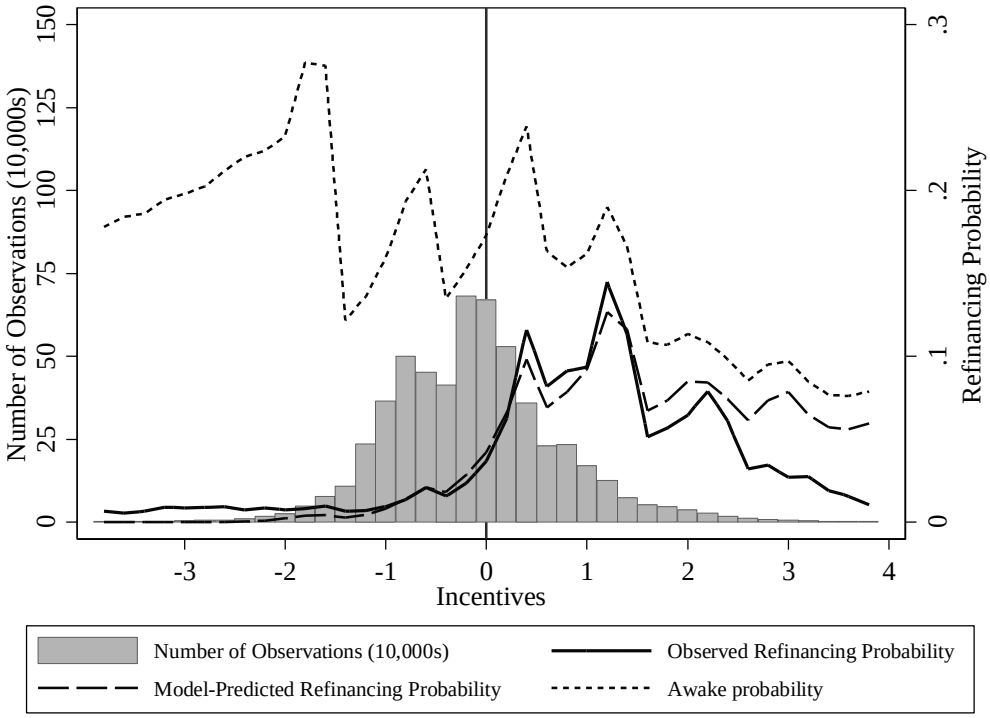
Table C1: Using a Fixed Mortgage Termination Probability

In this specification, the dependent variable takes the value of 1 for a refinancing in a given quarter, and 0 otherwise. We estimate this specification using all households in Denmark with an unchanging number of household members, with a single fixed rate mortgage in the beginning of each year from 2010-2014. Each column reflects the estimated coefficients of our model of refinancing: β captures unobserved heterogeneity in psychological costs across refinancing households for each demographic characteristic; φ is the level of psychological costs as a function of demographic characteristics, and χ is the probability that a household is awake and responding to refinancing incentives. When calculating incentives, in this table we fix the mortgage termination probability at 10% rather than estimating this using an auxiliary model. The coefficients include non-linear transformations, f(x), of all the ranked control variables in addition to their levels, where f(x) = $\sqrt{2}x^2$. Pseudo R^2 is calculated using the formula R^2 = 1- L_1/L_0, where L_1 is the log likelihood from the given model and L_0 is the log likelihood from a mixture model which only allows for a constant probability of being awake. ***, **, and * indicate coefficients that are significant at the one, five, and ten percent level, respectively, using standard errors clustered at the level of households.

	χ	φ	β
Single male household	0.112***	0.988***	-0.055***
Single female household	0.214***	0.986***	-0.040**
Married household	0.058***	1.057***	0.013
Children in family	-0.035**	1.696***	-0.003
Immigrant	-0.151***	-0.417	-0.032**
Financially literate	0.067**	-0.244	-0.064***
Family financially literate	0.062***	-0.647**	0.023**
No education information	-0.136	0.573	0.039
Getting married	0.073*	-1.197**	-0.040
Having children	0.097***	-0.997***	-0.034**
Region of Northern Jutland	0.328***	-0.468	0.147***
Region of Middle Jutland	0.291***	-0.432	0.105***
Region of Southern Denmark	0.145***	-0.650**	0.041***
Region of Zealand	-0.054***	0.719**	0.014
Demeaned rank of:	-0.506***	1.368***	-0.190***
Age	0.199***	-1.181***	0.148***
Length of education	0.692***	7.194***	0.277***
Income	0.375***	12.402***	-0.065***
Financial wealth	0.539***	0.499	0.345***
Housing wealth			
	0.306***	-9.359***	0.084***
Non-linear transformation f(x), x is the demeaned rank of:	-0.131***	-0.227	0.258***
Age	-0.410***	3.047***	-0.267***
Length of education	0.169***	1.698**	-0.470***
Income	0.077*	5.208***	-0.553***
Financial wealth			
Housing wealth	-2.016***	10.020***	0.670***
Intercept			
Current quarter dummies		Yes	
Mortgage age dummies		Yes	
Pseudo R^2		0.087	
Log Likelihood		-847,278	
Observations		5,603,733	

Figure C1: Refinancing, Incentives and Model Implied Refinancing Probabilities, with Hardwired Moving Probability.

The bars in this figure show the number of household-quarters (scale on the left vertical axis) and the line shows the fraction of these household-quarters that refinance (scale on the right vertical axis) at each level of refinancing incentives shown on the horizontal axis. The centers of the bars are on 20-basis-point incentive intervals. This figure plots refinancing probabilities from the mixture model estimated in Table C1, as a function of refinancing incentives. The solid line shows the actual refinancing probability observed in the data, the long-dashed line shows the model-predicted refinancing probability, and the short-dashed line shows the fraction of households that the model estimates are attentive in each period.



Appendix D:

Table D1: Excluding Cash-out and Extension Refinancing

In this specification, the dependent variable takes the value of 1 for a refinancing in a given quarter, and 0 otherwise. We estimate this specification using all households in Denmark with an unchanging number of household members, with a single fixed rate mortgage in the beginning of each year from 2010-2014. Each column reflects the estimated coefficients of our model of refinancing: β captures unobserved heterogeneity in the psychological threshold across refinancing households for each demographic characteristic; φ is the level of psychological refinancing costs as a function of demographic characteristic, and χ is the probability that a household is awake and responding to refinancing incentives. The model is estimated on data which excludes all cash-out and maturity extension refinancing from the sample. The coefficients include non-linear transformations, f(x), of all the ranked control variables in addition to their levels, where f(x) = $\sqrt{2}x^2$. Pseudo R^2 is calculated using the formula $R^2 = 1- L_1/L_0$, where L_1 is the log likelihood from the given model and L_0 is the log likelihood from a mixture model which only allows for a constant probability of being awake. ***, **, and * indicate coefficients that are significant at the one, five, and ten percent level, respectively, using standard errors clustered at the level of households.

	χ	φ	β
Single male household	0.084***	0.345	-0.056***
Single female household	0.176***	0.173	-0.036**
Married household	0.069***	1.551***	0.013
Children in family	-0.066***	1.351***	0.009
Immigrant	-0.165***	-0.632*	-0.031**
Financially literate	0.077***	0.194	-0.071***
Family financially literate	0.064***	-0.640**	0.013
No education information	-0.179**	-0.281	0.041
Getting married	0.066	-1.151**	-0.045
Having children	0.097***	-1.112***	-0.032**
Region of Northern Jutland	0.349***	-0.803***	0.147***
Region of Middle Jutland	0.321***	-0.583**	0.109***
Region of Southern Denmark	0.170***	-0.672**	0.051***
Region of Zealand	-0.042**	0.848**	0.018
Demeaned rank of:			
Age	-0.444***	3.406***	-0.247***
Length of education	0.204***	-1.354***	0.134***
Income	0.649***	6.216***	0.354***
Financial wealth	0.417***	12.529***	-0.049***
Housing wealth	0.499***	0.900**	0.318***
Non-linear transformation f(x), x is the demeaned rank of:	0.112**	-13.907***	0.074**
Age	-0.152***	-1.056	0.250***
Length of education	-0.397***	3.609***	-0.265***
Income	0.121***	0.655	-0.422***
Financial wealth	0.114***	5.526***	-0.526***
Housing wealth			
	-1.856***	14.084***	0.625***
Intercept			
Current quarter dummies		Yes	
Mortgage age dummies		Yes	
Pseudo R^2		0.096	
Log Likelihood		-803,556	
Observations		5,491,934	

Figure D1: Refinancing probability by types, and the fraction of refinancing. (NOT UPDATED)

The bars in this figure show the number of household-quarters (scale on the left vertical axis) and the line shows the fraction of these household-quarters that refinance (scale on the right vertical axis) at each level of refinancing incentives shown on the horizontal axis. The centers of the bars are on 20-basis-point incentive intervals. This figure plots refinancing probabilities from the mixture model estimated in Table D1, as a function of refinancing incentives. The solid line shows the actual refinancing probability observed in the data, the long-dashed line shows the model-predicted refinancing probability, and the short-dashed line shows the fraction of households that the model estimates are attentive in each period.