

The Impact of Homeowners' Housing Wealth Misestimation on Consumption and Saving Decisions*

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Abstract

Using a unique dataset of 81,943 house value estimates by the homeowners and their financial institution, I find that homeowners overestimate their house value by 3.1%. After controlling for homeowners' socioeconomic characteristics, I find that *ex-ante* homeowners who rate (cash-out) refinance an existing loan to increase savings (consumption) are significantly more likely to underestimate (overestimate) their house value. Moreover, overestimators (underestimators) are more likely to increase (reduce) their spending *ex post*. Finally, I also find that underestimators are more likely to prepay their loans and overestimators are more likely to default on their loans.

JEL Classification: D11; E21; G21; R31

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Introduction

There is general agreement in the literature that homeowners significantly misestimate their house value.¹ The average absolute misestimation ranges between 14%-25%. Kish and Lansing (1954) and Kain and Quigley (1972) also find that homeowners' misestimation is systematically correlated to their socioeconomic characteristics.

Goodman and Ittner (1992) do not find any such correlation but argue that if socioeconomic characteristics are systematically related to homeowners' misestimation of the house value, then it would lead to errors in household consumption and savings decisions because of their perceived (versus actual) housing wealth.

The literature has studied the impact of the homeowners' housing wealth estimation on their consumption and savings decision using the Panel Study of Income Dynamics (PSID). Skinner (1989) finds that housing wealth increased consumption, while Engelhard (1996) finds that households experiencing capital losses reduced consumption. Haynes and McFadden (1997) do not find any correlation between expectations about capital gains in housing wealth and savings. Finally, Case, Quigley, and Shiller (2005) using a panel dataset find that housing wealth does impact consumption. Given these inconsistent findings, any strong conclusion is still difficult to make. Hence, in this paper I use a unique micro loan-level data to empirically examine the *differential* impact of the homeowners' housing wealth underestimation and overestimation on their consumption and saving behaviors.

Recently, low mortgage rates fueled many households to "rate refinance" their mortgage and lower their stream of mortgage payments and increase lifetime wealth.² In addition, about 45 percent of households "cash-out refinanced" in 2001-2002 to extract

the equity they accumulated in their homes.³ In fact, home equity grew by \$2 trillion between 2001-2003 reaching \$7.7 trillion, allowing homeowners to convert this equity into cash by taking out home equity lines of credit (Nothaft 2004). In 2002, homeowners were able to cash out over \$100 billion; over 61% of the families indicated that they would use the money towards home improvement or pay down debt.⁴

The recent increase in households *ex-ante* willingness to either cash-out housing wealth to smooth current consumption or to lower mortgage payments (increase lifetime wealth) provides us with an ideal economic setting to study the role of rate and cash-out refinancing on homeowners' misestimation of their house value and the impact of such house price misestimation on *ex-post* consumption and saving behaviors. One way homeowners' *ex-ante* reveal their consumption and saving preferences is through the reason for refinancing the loan (e.g., to lower interest payment, to finance home improvements, or to finance general consumption).⁵ Observing this information in the dataset, I compare the underestimation and overestimation behaviors of households who cash-out refinance the perceived additional housing equity in order to increase current consumption (i.e., *ex ante* spenders) to those households who rate refinance to lower interest rates in order to increase lifetime savings (i.e., *ex ante* savers).⁶ Homeowners who have lived in the house for a shorter time period are likely to be overconfident (Schrag and Rabin, 1999; Yariv, 2005; and Koszegi, 2005) about their house value estimate. And homeowners' who have lived in the house for a longer time period are likely to have imperfect knowledge of the true value of the house (Gabaix, Laibson, Moloche, and Weinberg 2006; and Agarwal, Driscoll, Gabaix, and Laibson, 2006).

Next I assess the impact of house price misestimation by households on their *ex post* consumption and saving behaviors. I measure the *ex post* consumption and saving patterns vis-à-vis changes in the credit line utilization *ex post*. Finally, the misestimation of the house value by the homeowners may also affect the risks of prepayment and default on their loans. Hence, I also estimate a competing risk model of home equity credit prepayment and default risks to assess whether house price misestimation by households *ex ante* can also provide information about their prepayment and default behaviors *ex post*.

I use a unique panel dataset of more than eighty one thousand home equity lines of credit issued to homeowners in 2002 and followed each account's utilization and performance on a monthly basis through 2005. Some of the critical information observed in the dataset is as follows. At loan origination, homeowners provide the bank with the following information: (i) the reason for loan origination – rate refinance, home improvement, or cash-out refinance (e.g., automobile purchase, vacation, etc); (ii) their own estimate of the house value; and (iii) credit line amount requested. Other important information observed is the bank's estimate of the house value, which is based on the Case-Shiller weighted repeat sales index (see Case and Shiller 1987, 1989, 1990),⁷ and the loan amount approved.

For the purposes of this study, I define house price misestimation as a 10% or more difference between the house value estimate of the homeowner and his financial institution (based on the Case-Shiller index). The 10% difference was also used by the financial institution to trigger an in-person appraisal with no cost to the borrower for the appraisal. Hence I define an underestimator as a homeowner whose house price estimate

is below 10% of the bank's estimate and an overestimator as a homeowner whose house price estimate is above 10% of the bank's estimate.

In addition, I also observe in the dataset a very rich set of demographic and credit risk characteristics of the homeowners. Thus, I am able to control for many socioeconomic factors such as owner's age, employment type, employment tenure, income, housing tenure, debt-to-income ratio, and credit risk (FICO score). Finally, I also control for whether or not the owner has a first mortgage as well as the mortgage balance, and whether he owns a second home or a condo.

Previewing the results, I find that homeowners on average significantly overestimate their house value by 3.1%, with mean absolute misestimation of 13.1%.⁸ Consistent with previous studies (e.g., Kish and Lansing, 1954; Kain and Quigley, 1972), I find house price misestimation to be significantly correlated with house tenure, income, borrower credit quality, borrower age, years on the job, and employment status. Specifically, homeowners who are less credit worthy, own the house more recently, having been at their job longer, self-employed or homemakers are more likely to overvalue their houses, while those who are older, with higher income, have lower debt-to-income ratio, are more credit worthy, have more years on the job, or own the home longer are more likely to underestimate their house values.

Moreover, I also find that homeowners' misestimation of their home values is highly correlated with their *ex ante* savings and consumption decisions (i.e., the reason for refinancing - rate versus cash-out). The results show that homeowners who rate refinance their existing loans (the *ex ante* savers) are 13.9% more likely to underestimate

their house values, while homeowners who cash-out refinance (the ex ante spenders) are 17.9% more likely to overestimate their house values.

Both underestimators and overestimators of housing wealth requested and received a walk-in appraisal. Underestimators with an in-person appraisal tend to be those who have higher income or higher LTV, while overestimators with an in-person appraisal tend to be those who are relatively older or face a higher bank-market APR differential. Equally important, underestimators with a walk-in appraisal tend to be ex ante savers, perhaps hoping to lower the LTV and thereby to lower APR and current mortgage payments (to increase their lifetime wealth). On the other hand, overestimators with a walk-in appraisal tend to be ex ante spenders, perhaps cashing out additional housing wealth to smooth current consumption.⁹

To study the ex-post spending and saving behaviors, I model the credit line usage behaviors of underestimators and overestimators. My objective is to test whether underestimators are indeed lowering their credit line usage (i.e., saving ex post) and overestimators are increasing their credit line usage (i.e., spending ex post).¹⁰ The regression results show that underestimators are 14.9% more likely to increase their savings ex post, while overestimators are 14.4% more likely to increase their spending ex post.¹¹

Finally, I find that overestimators, especially those who requested the bank for an in-person valuation, have a 14% higher risk of defaulting on their loans. It is possible that the default option to be “in-the-money” after the home equity has been cashed out to smooth current consumption. On the other hand, I find that underestimators, especially those who requested the bank for an in-person valuation, have a 10.2% higher risk of

prepayment. It may be the case that the interest rate did not maximize their lifetime savings, leaving the prepayment option still “in-the money”.

I describe the data in section 2 and present empirical results in section 3. Section 4 concludes.

Data

The data comes from a large financial institution (proprietary in nature) that originates home equity lines of credit. The sample consists of 81,943 credit lines issued to owner-occupants from March 2002 to December 2002; each account’s utilization and performance (default and prepayment) was observed through January 2005. These loans are typical credit lines that are open for the first five years, during which time the borrower is only required to make interest payments on the utilized line balance. After the fifth year, the line is closed and is converted to a fixed-rate term loan with a remaining term of 5 to 15 years. At this point, the borrower is required to make fixed monthly payments of principal and interest for the remaining period of the line. Consistent with other mortgage loans, the borrower may prepay or default on the line at any time. For our purposes, all credit lines have at least twenty-four months of performance data.

The majority of the credit lines in my sample are originated in eight Northeastern states (see Table 1); however, 1.53% originated in Florida, 1.38% in California, and 4.04% in 28 other states. Table 2 reports the descriptive statistics for the lines at origination. The descriptive statistics are segmented into five categories: (i) overall sample; (ii) underestimators; (iii) underestimators with additional walk-in appraisal; (iv)

overestimators; and (v) overestimators with additional walk-in appraisal. Once again, underestimators (overestimators) are homeowners with house price estimate below (above) 10% of the bank's estimate.¹² Below I describe the summary statistics in Table 2 for our entire sample as well as separately for the underestimators and overestimators.

All Accounts

In Table 2, the summary statistics for the overall sample (all accounts) indicate that homeowners overestimate their house value by 3.1% on average. The bank provides a loan of 1% *less* than the borrower-requested amount. The average borrower FICO score is 733 and interest rate is 4.6%.¹³ The appraised average loan-to-value (LTV) ratio at origination [calculated as total debt (bank approved credit line plus first-mortgage debt) divided by appraised house value] is 64%; about 15% of our sample has no first mortgage. Of the total borrowers requesting for a second mortgage line of credit, about 39% rate refinance their existing loan without cashing out the home equity, 25% cash out the home equity for home improvement, and the remaining 35% cash-out refinance for general consumption purposes. These observations are consistent with the survey findings by Nothaft (2004).

On the demographics, the average age of the homeowners is about 46 years and the average house tenure is slightly over 8 years. About 7% are self-employed, 7% are retired, and 1.2% are homemakers. The homeowners have on average 7.6 years on the last job and \$90,293 family income. And about 45% of the homeowners allow automatic payment of the credit line to the financial institution from their deposit (checking/savings) accounts.

Underestimators vs. Overestimators

When I compare the summary statistics for homeowners who underestimate their house value and those who overestimate their house value in Table 2, I observe some very interesting differences between the two groups. About 11% of homeowners undervalue their house, while about 21% of homeowners overvalue their house. On average, underestimators undervalue their house by about 12%, while overestimators overvalue their house by about 11%. In turn, underestimators requested for a *lower* loan amount than the bank is willing to lend by 6.6% on average, while overestimators requested for a *higher* loan amount than the bank is approving by 7.3%.

About 41% of the underestimators rate refinance without cashing out the equity in the house, while only about 31% of the overestimators rate refinance without cashing out the equity. On the other hand, 34% of the underestimators refinance to cash out the equity to finance general consumption, while 44% of the overestimators do so. About 25% of both underestimators and overestimators cash out to finance home improvement.

In addition, about 26% (16%) of underestimators (overestimators) do not have a first mortgage. For homeowners with a first mortgage, underestimators (overestimators) have a first mortgage balance of \$166,406 (\$177,914). Furthermore, underestimators have lived at the current address for almost 12 years on average, compared to 8 years for overestimators. Underestimators on average, tend to be significantly older (47 years old on average) than overestimators (41 years old on average). Underestimators earn relatively higher income (almost \$12,000 higher) and have slightly lower debt-to-income ratio (3 percentage points lower) than overestimators.

Walk-in Appraisals: Underestimators vs. Overestimators

If the owner's estimate is more than 10% *below* that of the bank's estimate, the owner has the incentive to and can request the bank to conduct a walk-in appraisal on the house. I define these homeowners as underestimators with additional walk-in appraisal. If the owner's estimate is more than 10% *above* the bank's estimate, the bank conducts a walk-in appraisal. I define these homeowners as overestimators with additional walk-in appraisal.

The overall house price misestimation by the underestimators with walk-in appraisals is -13.3%, compared to the -12.2% for all underestimators. The misestimation by the overestimators with walk-in-appraisals is 11.8%, compared to the 11.4% for all overestimators. These observations are consistent with underestimators having a relatively longer tenure at their house than the overestimators, and thereby may not be as informed and knowledgeable about the housing market. As a result, it is beneficial for the underestimators to request a walk-in appraisal. Overall, the loan amount approved by the bank is on average 4.1% *more* than that requested by the underestimators with a walk-in appraisal, and on average 2.9% less than that requested by the overestimators with a walk-in appraisal.

Results

The result section is divided into three main parts: section 3.1 focuses on the impact of ex-ante consumption and saving expectation on the likelihood of homeowners to underestimate and overestimate their house value; section 3.2 presents the impact of house price underestimation and overestimation on the ex-post consumption and saving

patterns; and section 3.3 presents the effect of house price underestimation and overestimation on the prepayment and default risks.

Ex-ante Consumption and Saving Behaviors

I estimate a multinomial logit model to assess the impact of an ex-ante consumption or saving decision on the likelihood of a homeowner underestimating and overestimating his house value. The model specification treats underestimation and overestimation as competing options. The results are reported in Table 3. With respect to socioeconomic characteristics, I find that on average an older homeowner is more likely to misestimate (both underestimate and overestimate) his house value. Furthermore, a homeowner who does not have a first mortgage is more likely to both underestimate as well as overestimate his house value, while one who has a second home or a condo is less likely to both underestimate and overestimate the price of his home.

Moreover, I find that a borrower who is a homemaker or is retired is less likely to underestimate his house value. A homeowner with high LTV or lower credit quality is *less* likely to underestimate (instead is *more* likely to overestimate) his house value. A homeowner with longer home tenure or has higher income is more likely to underestimate (instead is less likely to overestimate) his house value. These results are consistent with the findings of Kane and Quigley (1972).

Finally, a homeowner who indicates that he intends to use the funds for general consumption purposes (i.e., ex-ante spenders) is almost 17.9% more likely to *overestimate*, while a homeowner who indicates that he intends to use the funds to rate refinance the existing mortgage (i.e., ex-ante savers) is almost 13.9% more likely to *underestimate* his house value. Moreover, a homeowner who requests for a larger loan

amount is less likely to underestimate (instead he is more likely to overestimate) the house value. These results indicate that homeowners who are ex-ante spenders are more likely to overestimate their house values, while those who are ex-ante savers more likely to underestimate their house values.¹⁴

The likelihood of a walk-in appraisal

Next, I look at a subset of homeowners who, after reviewing the bank's loan amount and contract rate offer, request the bank to conduct a walk-in-appraisal of their house. I estimate a logit model of the likelihood that an *underestimator* or *overestimator* requesting and receiving a walk-in appraisal. I explicitly control for the difference in the bank's interest rate and the average interest rate in the market for a home equity line of credit (APR differential).¹⁵ If a homeowner is sensitive to interest rate, he will compare the bank rate to the market rate.

The results (in Table 4) indicate that higher APR differential increases the likelihood of an underestimator (but not an overestimator) requesting for a walk-in-appraisal by 8.2%. On the other hand, greater loan differential increase the likelihood of an overestimator (not an underestimator) requesting and receiving a walk-in appraisal by 8.6%. Moreover, an underestimator who's an ex-ante saver (who rate refinance without cashing out in order to lower interest payment) is 10.2% more likely to receive a walk-in appraisal, while an overestimator who is an ex-ante spender (who cash-out refinance to fund consumptions) is 12.3% more likely to receive a walk-in appraisal.

Ex-Post Savings and Consumption Behaviors

Thus far I have shown that *ex-ante* consumption and saving decisions by the homeowner impact his house price misestimation. Now I want to see whether house price

misestimation by the homeowner affect his *ex-post* consumption and saving behaviors. To quantify a homeowner's *ex-post* spending and saving behaviors, I first construct a variable to measure the homeowner's utilization of the home equity line of credit over the two-year period. Specifically, I define *ex-post spending* as a 10% increase in utilization over a two-year period and *ex-post saving* as a 10% decrease in utilization over a two-year period.

Table 5 presents preliminary evidence of *ex-post* utilization behaviors. Generally, I find that *ex-ante* savers tend to reduce their spending *ex-post*, while *ex-ante* spenders tend to increase their spending *ex-post*. Specifically, I find that 14.6% of the *ex-ante savers* actually lowered their credit line utilization *ex-post*, while only 7% of them increased their spending *ex-post*. In contrast, only 4.3% of *ex-ante* spenders lowered their credit line utilization *ex-post*, while about 16.5% of them increased their spending *ex-post*. The small percentage of homeowners who intended to save (spend) but find themselves spending (saving) may be those who faced to *ex-post* negative (positive) income shocks respectively (see Agarwal, Chomsisengphet, Liu, and Souleles 2006, who find that a small percentage of credit card borrowers *ex post* revolve higher debt than expected).

Table 6 estimates a multinomial logit model to determine the likelihood of an underestimator decreasing his utilization of the home equity line of credit (i.e., saving *ex post*) and an overestimator increasing his utilization of the home equity line of credit (i.e., spending *ex post*). After controlling for all the variables in previous estimates, the results show that an underestimator is 14.9% more likely to pay down the home equity account

balance (i.e., increase saving ex-post), while an overestimator is almost 14.4% more likely to increase spending ex-post.

Prepayment and Default Behaviors

Finally I want to test whether a homeowner's house price underestimation and overestimation his loan prepayment and default patterns. To this end, I estimate a Cox proportional hazard model with competing risks and time-varying covariates to determine if the underestimation and overestimation of the home value by the owner influence his prepayment and default decisions, after controlling for the traditional variables as predicted by the option theory.¹⁶

Table 7 presents the results. Most of the signs on the traditional variables are consistent with past studies of home equity lines prepayment and default behavior (e.g., Agarwal, Ambrose, Chomsisengphet and Liu 2006). Specifically, I find that higher interest rate differential significantly increases the likelihood of a homeowner prepaying her home equity.¹⁷ A borrower with lower credit score, higher LTV or higher loan balance is more likely to default.

Other socioeconomic variables are also significant determinants of default and prepayment. For example, a homeowner with higher LTV is less likely to prepay and more likely to default, while a self-employed homeowner is more likely to default on the loan and less likely to prepay, while a retired homeowner is more likely to prepay. These results are also consistent with those of Agarwal, Chomsisengphet and Hassler (2005).

Next, I turn my attention to the variables of interest. I find that on average an overestimator is 10% more likely to default, while an underestimator is 7.5% more likely to prepay his loan. The results suggest that an underestimator is more likely to prepay his

loan, and an overestimator is more likely to default on his loan. These results provide a new prospective to the extensive prepayment and default literature.

Conclusion

A number of studies have pointed out that homeowners either underestimate or overestimate their house value between 2% to 4%. Furthermore, homeowners' misestimation of the house value could lead to errors in household consumption and savings decisions because of their perceived (versus actual) housing wealth. In this paper, with the help of a unique proprietary panel dataset from a large financial institution of more than eighty one thousand home equity lines of credit issued to homeowners in 2002 and followed through 2005, I assess how ex ante saving/consumption decisions affect homeowners' misestimation of their house value, and the impact of such house price misestimation on households' consumption and saving behaviors ex post. In addition, I also look at the impact of house price misestimation on the risks of homeowners to prepay and default on their home equity line of credit.

The results are consistent with the previous studies – that is homeowners on average overestimate their house value by 3.1%, with mean absolute misestimation of 13.1%. I find that house price misestimation is highly correlated with homeowners' ex ante consumption and saving decisions. Specifically, homeowners who take out a loan to rate refinance their existing loan without cashing out the equity are almost 13.9% more likely to underestimate their house value. On the other hand, homeowners who cash-out refinance to extract their housing equity to fund consumption are almost 17.9% more likely to overestimate the value of their homes.

Among the homeowners who underestimate, those that are more likely to request for and receive an in-person appraisal tend to be those who have higher income or higher LTV, while overestimators requesting an in-person appraisal tend to be those who are relatively older or face a higher bank-market APR differential. Equally important, underestimators with a walk-in appraisal tend to be ex ante savers, perhaps hoping to lower the LTV and thus lower APR and current mortgage payments (to increase their lifetime wealth). On the other hand, overestimators with a walk-in appraisal tend to be ex ante spenders, cashing out additional housing wealth in order to smooth current consumption. These results provide additional support that homeowners tend to underestimate their house value in order to perhaps lower their current mortgage payments and increase their lifetime wealth, while homeowners tend to overestimate their house value when cashing out home equity to smooth current consumption.

In addition, I model the credit line usage behaviors of underestimators and overestimators. The objective here is to test whether underestimators are indeed reducing their credit lines (i.e., ex post saving) and overestimators are indeed increasing their credit lines (i.e., ex post spending). The regression results show that underestimators are 14.9% more likely to increase saving ex post, while overestimators are almost 14.4% more likely to increase spending ex post. These results support the findings of Case, Quigley, and Shiller (2005) but go one step further and show a differential impact of the homeowners' housing wealth misestimation on their consumption and saving decisions.

Finally, I estimate a competing risks model of home equity line default and prepayment to assess whether house price misestimation by the borrowers can also provide information about their prepayment and default risks. I find that overestimators,

especially those who requested the bank for an in-person valuation, have a 14% higher risk of default. On the other hand, I find that underestimators, especially those who requested the bank for a walk-in appraisal, have a 10.2% higher risk of prepayment.

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Table 1: Distribution by State

State	Percentage
NJ	27.54%
MA	21.30%
NY	20.36%
CT	9.40%
PA	5.29%
ME	3.42%
RI	2.93%
NH	2.81%
FL	1.53%
CA	1.38%
Others*	4.04%

*Others include the following states:
AZ, CO, DC, DE, GA, IA, ID, IL, IN, KS, KY, L
A, MD, MI, MN, MO, NC, NM, NV, OH, OK, O
R, SC, TN, UT, VA, WA, WI

Table 2: Descriptive Statistics by Underestimation and Overestimators and Appraisal Type for Home Equity Lines of Credit

	All Accounts	Underestimators		Overestimators		Within 10%
		All	Walk-in Appraisal	All	Walk-in Appraisal	
Homeowner Estimate	\$346,065	\$302,143	\$306,000	\$387,363	\$398,492	\$333,322
Bank Estimate	\$335,797	\$344,289	\$352,800	\$347,758	\$356,340	\$326,105
Homeowner Price Misestimation	3.1%	-12.2%	-13.3%	11.4%	11.8%	2.2%
Loan requested by borrower	\$61,347	\$52,700	\$54,564	\$68,718	\$71,168	\$59,140
Loan approved by bank	\$60,725	\$56,425	\$56,892	\$64,019	\$69,160	\$59,262
Borrower loan request misestimation	1.0%	-6.6%	-4.1%	7.3%	2.9%	-0.2%
First Mortgage Balance	\$154,444	\$116,406	\$149,452	\$177,914	\$198,841	\$146,871
Customer LTV	62	55	66	63	67	61
Appraised LTV	64	50	59	69	74	63
Months at Address	99	140	123	97	90	93
No First Mortgage	15%	26%	28%	16%	18%	12%
Second Home	3%	1%	3%	4%	5%	3%
Condo	6%	2%	14%	1%	10%	8%
Rate Refinancing	39%	41%	44%	31%	29%	39%
Home Improvement	25%	25%	25%	25%	26%	26%
Cash-Out Refinance	35%	34%	31%	44%	45%	35%
Borrower Age	46	47	46	41	41	47
Self Employed	7.76%	5.90%	6.90%	8.40%	10.00%	7.50%
Retired	7.74%	7.00%	6.40%	9.50%	7.30%	6.50%
Home Maker	1.31%	1.00%	1.00%	1.60%	1.20%	1.30%
Employed	83.19%	86.10%	85.70%	80.50%	81.50%	84.70%
Years on the Last Job	7.62	8.93	7.55	8.52	7.32	7.29
Income	\$90,293	\$94,452	\$95,345	\$82,718	\$83,480	\$93,051
DTI	41	38	40	41	44	42
APR	4.60%	4.31%	4.22%	4.71%	4.87%	4.59%
FICO	733	741	744	739	721	731
Account Balance	\$33,848	\$50,039	\$53,407	\$35,543	\$38,754	\$23,521
Account Balance Avg2yrs	\$36,727	\$40,271	\$44,615	\$43,485	\$45,674	\$31,950
Frequency	81,943	8,845	2,021	17,125	6,901	47,051
Percentage Dist	100%	11%	2%	21%	8%	57%
Percentage Prepayment	26%	35%	21%	19%	18%	27%
Percentage Default	0.62%	0.40%	0.35%	0.77%	1.20%	0.53%

Notes: The data covers home equity originations from March 2002 to December 2002. All the statistics are reported at account origination. Except for Account Balance Avg (average account balance over the performance period), default and prepayment rates. They are reported over the entire performance window.

Table 3: Determinants of Underestimation and Overestimation at Home Equity Line Origination

Variable	<u>Underestimation</u>				<u>Overestimation</u>			
	Coeff.	Std. Err.	t-stat	Marginal	Coeff.	Std. Err.	t-stat	Marginal
Intercept	-0.8786	0.1972	-4.46		-0.7870	0.1401	-5.62	
Borrower Age	0.0093	0.0012	7.85	0.58%	0.0072	0.0009	8.11	0.83%
Retired	-0.2205	0.0438	-5.03	-1.87%	0.0171	0.0351	0.49	1.81%
Home Maker	-0.2344	0.1027	-2.28	-1.76%	0.1910	0.0660	2.89	3.76%
Self Employed	-0.0793	0.0427	-1.86	-2.83%	0.1227	0.0285	4.31	4.07%
Years on the Job	-0.0063	0.0013	-4.96	-0.54%	0.0025	0.0010	2.60	0.25%
Income	0.0000	0.0000	4.94	0.01%	0.0000	0.0000	1.19	0.01%
No First Mortgage	0.2144	0.0290	7.39	4.28%	0.2298	0.0220	10.45	4.55%
LTV	-0.1723	0.0323	-5.33	-0.46%	0.0776	0.0141	5.50	0.21%
Years Home Owned	0.0015	0.0001	15.30	0.60%	-0.0007	0.0001	-9.15	-0.26%
Second Home	-0.2715	0.0681	-3.99	-2.52%	-0.4373	0.1531	-2.86	-1.17%
Condo	-0.0570	0.0494	-1.15	-2.15%	-0.0669	0.0378	-1.77	3.85%
Rate Refinancing	0.1441	0.0260	5.54	13.90%	-0.1009	0.0191	-5.28	-3.09%
Cash-Out Refinance	0.1199	0.1880	0.64	0.47%	0.0062	0.0011	5.70	17.92%
Loan Amount Requested	0.0000	0.0000	-16.47	-0.01%	0.0000	0.0000	9.39	0.06%
FICO	0.0009	0.0002	3.86	0.20%	-0.0005	0.0002	-2.69	-0.26%
DTI	-0.0057	0.0007	-7.83	-0.62%	0.0004	0.0005	0.97	0.38%
Zip Code Dummies	Yes							
Month Origination Dummies	Yes							
Number of Under/Over Est.	10,866				24,026			
Number of Obs	81,943							
Log Likelihood	5,631							
Pseudo R-Square	0.47							

Notes: Estimate a multinomial logit model of homeowners' underestimation and overestimation of the house value at loan origination. Underestimation and overestimation is defined as a greater than 10% difference in the house value estimate of the homeowner in comparison to the Cash-Shiller Indexes. After controlling for socioeconomic characteristics, I test if ex ante consumption and saving (refinance vs. consumption) are a determinant of misestimation. The estimates are derived with heteroscedasticity-corrected standard errors.

Table 4: Determinants of Walk-in Appraisal

Variable	<u>Underestimators</u>				<u>Overestimators</u>			
	Coeff.	Std. Err.	t-stat	Marginal	Coeff.	Std. Err.	t-stat	Marginal
Intercept	-1.2294	0.5024	-2.45		-0.3075	0.2926	-1.05	
Borrower Age	-0.0004	0.0028	-0.16	-0.25%	0.0051	0.0017	2.95	0.14%
Retired	0.0646	0.1057	0.61	2.08%	0.1121	0.0687	1.63	0.43%
Home Maker	0.1879	0.2464	0.76	1.09%	-0.0725	0.1344	-0.54	-0.49%
Self Employed	0.4341	0.0941	4.61	2.34%	0.2522	0.0537	4.70	1.91%
Years on the Job	0.0040	0.0030	1.35	0.52%	0.0015	0.0019	0.80	0.29%
Income	0.0000	0.0000	2.73	0.00%	0.0000	0.0000	0.69	0.01%
No First Mortgage	0.3190	0.0646	4.94	4.72%	0.2817	0.0418	6.74	4.06%
LTV	0.4062	0.0864	4.70	0.72%	1.1890	0.9384	1.27	0.62%
Years Home Owned	0.0015	0.0002	6.11	0.25%	-0.0016	0.0002	-10.00	-0.14%
Second Home	0.3647	0.1325	2.75	1.37%	0.3371	0.1043	3.23	2.69%
Condo	0.2217	0.0955	2.32	2.25%	0.1951	0.0764	2.55	3.17%
Rate Refinancing	0.1413	0.0634	2.23	10.22%	-0.0054	0.0382	-0.14	-1.24%
Cash-Out Refinance	0.1095	0.0704	1.56	0.68%	0.0571	0.0216	2.64	12.38%
Loan Amount Difference	0.0006	0.0007	0.76	2.82%	0.0039	0.0005	8.27	8.58%
FICO	-0.0015	0.0006	-2.70	-0.51%	-0.0038	0.0003	-11.02	-0.28%
DTI	0.0046	0.0015	3.01	0.51%	0.0048	0.0009	5.58	0.38%
APR differential	0.0062	0.0015	4.11	8.23%	0.0055	0.0273	0.20	0.24%
Zip Code Dummies	Yes				Yes			
Month Origination Dummies	Yes				Yes			
Number of Walk-in Appraisal	2,021				6,901			
Number of obs	10,866				24,026			
Log Likelihood	973				4,836			
Pseudo R-Square	0.34				0.58			

Notes: Estimate a logit model of underestimation who request an in-person appraisal (to those who do not request an in-person appraisal) of the house value at loan origination. After controlling for socioeconomic characteristics, I test if the interest rate differential (interest rate offered – average market interest rate) lead underestimators or overestimators to request and receive a walk-in appraisal. The estimates are derived with heteroscedasticity-corrected standard errors.

Table 5: Ex-Ante and Ex-Post Distribution of Savings and Consumption

Ex Post \ Ex Ante	Home Improvement	Refi with cash out (Consumption)	Refi with no cash out (Saving)	Total
Less than 10% Δ Utilization	10.73	14.7	17.55	42.98
Saving	12.39	4.29	14.56	31.24
Spending	2.22	16.46	7.1	25.78
Total	25.34	35.45	39.21	100

Notes: Distribution of ex-ante reasons for the loan (home improvement, consumption, and refinancing) and ex-post utilization of the line of credit. Spending is defined as an increases the utilization over a two years period by more than 10%, and saving as a decrease utilization by more than 10%.

Table 6: Households Utilization Behavior of their Credit Line

Variable	<u>Ex post Savings</u>				<u>Ex post Consumption</u>			
	Coeff.	Std. Err.	t-stat	Marginal	Coeff.	Std. Err.	t-stat	Marginal
Intercept	1.92884	0.18946	10.18		-0.70238	0.28938	-2.43	
Borrower Age	0.03436	0.00493	6.96	0.36%	0.00923	0.00535	1.73	0.30%
Borrower Age(sq)	-0.00029	0.00004	-7.17	0.00%	0.00028	0.00022	1.27	0.00%
Retired	-0.13490	0.03565	-3.78	-1.69%	0.14359	0.05880	2.44	1.41%
Home Maker	0.04325	0.06933	0.62	0.83%	0.03985	0.06833	0.58	0.69%
Self Employed	0.29238	0.03944	7.41	2.30%	0.28905	0.05933	4.87	1.93%
Years on the Job	0.00029	0.00014	2.10	0.01%	0.00509	0.00235	2.17	0.01%
Income	0.00000	0.00000	7.15	0.00%	0.00000	0.00000	9.23	0.00%
Income(sq)	0.00000	0.00000	17.74	0.00%	0.00000	0.00000	-10.00	0.00%
No First Mortgage	0.00634	0.02944	0.22	3.70%	0.43890	0.05898	7.44	3.10%
LTV	0.38983	0.05093	7.65	0.42%	0.15848	0.03897	4.07	0.28%
Years Home Owned	0.00007	0.00009	0.79	0.05%	-0.00033	0.00018	-1.81	-0.01%
Second Home	-0.04097	0.05933	-0.69	-0.23%	-0.07239	0.08439	-0.86	-0.20%
Condo	-0.12399	0.03386	-3.66	-3.30%	0.00383	0.04583	0.08	-0.25%
Underestimator	0.01946	0.00294	6.62	14.93%	-0.10438	0.06489	-1.61	-0.94%
Underestimator_with_walk-in	0.02044	0.00292	6.99	15.95%	0.12985	0.18935	0.69	0.79%
Overestimator	0.04095	0.03933	1.04	1.18%	0.00389	0.00184	2.11	14.49%
Overestimator_with_walk-in	0.01350	0.05748	0.23	0.52%	0.10348	0.03610	2.87	15.43%
FICO	0.00124	0.00026	4.79	-0.29%	0.00007	0.00024	0.29	-0.11%
APR	-0.33290	0.09050	-3.68	-4.26%	0.23095	0.39835	0.58	-3.57%
DTI	0.00793	0.05341	0.15	0.15%	0.01484	0.00424	3.50	0.13%
AutoPay	0.06872	0.01735	3.96	5.28%	-0.03485	0.03983	-0.87	-0.24%
Zip Code Dummies	Yes							
Month Origination Dummies	Yes							
Number of Savers/Consumers	25,402				20,485			
Number of Obs	81,943							
Log Likelihood	4,163							
Pseudo R-Square	0.48							

Notes: Estimate a multinomial logit model of ex-post saving and spending, where ex post saving (spending) are defined as 10% increase (decrease) in credit line utilization over a two years period. The estimates are derived with heteroscedasticity-corrected standard errors.

Table 7: Determinants of Default and Prepayment for Home Equity Lines of Credit

Variable	Default				Prepayment			
	Coeff.	Std. Err.	t-stat	Marginal	Coeff.	Std. Err.	t-stat	Marginal
Intercept	11.8983	0.8490	14.01		2.7439	0.2200	12.47	
Borrower Age	-0.0748	0.0194	-3.86	-0.01%	-0.0456	0.0049	-9.36	-0.69%
Borrower Age(sq)	0.0008	0.0002	4.19	0.00%	0.0003	0.0000	6.98	0.01%
Retired	0.3716	0.2481	1.50	0.56%	0.2280	0.0428	5.32	3.46%
Home Maker	0.4328	0.3792	1.14	0.34%	0.0118	0.0818	0.14	0.21%
Self Employed	0.5263	0.1594	3.30	0.31%	-0.1448	0.0363	-3.99	-1.89%
Years on the Job	0.0044	0.0069	0.63	0.02%	0.0008	0.0011	0.68	0.01%
Income	0.0000	0.0000	-3.01	0.00%	0.0000	0.0000	-5.89	0.00%
Income(sq)	0.0000	0.0000	2.33	0.00%	0.0000	0.0000	6.01	0.00%
No First Mortgage	-0.1944	0.1645	-1.18	-0.16%	-0.6708	0.0275	-24.35	-6.99%
LTV	0.2586	0.1197	2.16	0.21%	-0.0872	0.0237	-3.67	-0.31%
Years Home Owned	-0.0002	0.0001	-1.98	-0.01%	0.0002	0.0001	2.36	0.32%
Second Home	0.0938	0.3043	0.31	0.17%	0.0755	0.0620	1.22	1.08%
Condo	-0.2911	0.2306	-1.26	-0.62%	0.0698	0.0289	2.42	1.94%
Underestimate	-0.0664	0.1983	-0.33	-0.02%	0.1015	0.0325	3.12	7.51%
Underestimate_Upgrade	-0.3854	0.2411	-1.60	-0.04%	0.0821	0.0237	3.46	10.27%
Overestimate	0.0863	0.0381	2.27	10.02%	0.0409	0.0396	1.03	1.23%
Overestimate_Upgrade	0.1856	0.0418	4.44	14.01%	0.0206	0.0543	0.38	0.57%
FICO	-0.0258	0.0010	-25.49	-0.90%	-0.0050	0.0002	-23.95	-0.74%
PPOption	0.4482	0.0768	5.84	0.36%	0.1389	0.0168	8.26	6.21%
DTI	0.0075	0.0032	2.37	0.11%	-0.0005	0.0006	-0.94	-0.07%
AutoPay	-1.5012	0.1406	-10.68	-7.07%	-0.2626	0.0201	-13.04	-4.06%
Account Balance	0.0000	0.0000	4.33	0.00%	0.0000	0.0000	2.51	0.00%
Zip Code Dummies	Yes							
Month Origination Dummies	Yes							
Time Dummies	Yes							
Number of Default/Prepay	507				20,924			
Number of Accounts	81,943							
Log Likelihood	15,717							
Pseudo R-Square	0.53							

Notes: This table shows results of a proportional hazard model of prepayment and default using monthly date for home equity lines of credit from March 2002 to March 2005. Prepayment is defined as actual payment of the loan amount prior to contract terms and default is defined as 90 days past due. The independent variables control for loan origination month, calendar time, state dummies, credit risk, current loan-to-value ratio, prepayment option, various demographic variables (age, income, occupation, etc.), and the reasons for the loan (refinance versus consumption). All time varying variables are lagged by six months to avoid any endogeneity. The competing risks model is estimated as a multinomial logit via maximum likelihood.

¹See Kish and Lansing 1954; Kain and Quigley 1972; Robins and West 1977; Follain and Malpezzi 1981; Ihlanfeldt and Martinez-Vazquez 1986; DiPasquale and Somerville 1995; and Bucks and Pence 2005. Specifically, Kain and Quigley (1972) and Follain and Malpezzi (1981) find that homeowners underestimate their house value by 2%, while Kish and Lansing (1954) and Goodman and Ittner (1992) find that homeowners overestimate their house value by about 4%.

² According to Canner, Dynan and Passmore (2002), 52 percent of households who rate refinanced in 2001 and early 2002 were able to lower their monthly payment due to changes in interest rates, loan maturities, and amounts owned. All else being equal, the average rate refinancing household were able to save about \$98 in monthly payment due to lower interest rates and \$135 a month due to increase in maturity.

³ A WSJ article (7/26/2001) cites several examples including a consumer who says, “I just didn’t want to let \$70,000 sit in the home”. While homeowners could also tap the home equity by refinancing the first mortgage, Agarwal, Driscoll, and Laibson (2004) point out that there are significant costs to refinancing a first mortgage; on the other hand, there are no costs to originate a home equity line of credit.

⁴ See Nothaft, 2004.

⁵ Hurst and Stafford (2004) develop a theoretical model of refinancing behavior of homeowners who refinance to lower payments and thereby increase their lifetime wealth position versus those who refinance to extract home equity in order to smooth current consumption.

⁶ The behavioral economics literature may classify the homeowners who have lived in the house for a shorter time period as overconfident (Schrag and Rabin, 1999) in their house value estimate. And homeowners’ who have lived in the house for a longer time period as having imperfect knowledge of the true value of the house (Gabaix and Laibson, 2005). Also see, Koszegi (2005) Yariv (2005), and Agarwal, Driscoll, Gabaix, and Laibson (2006).

⁷ The weighted repeat sales index method was originally proposed by Bailey, Muth, and Nourse (1962). The Case-Shiller indexes control for the changes in property characteristics and can pick up turns in price direction. Additionally, the index segments price gains by house price tier (low, middle, and high). Case and Shiller (2003) use the indexes as a measure of house price

appreciation in comparison to the homeowners' estimate. Kain and Quigley (1972) also compare the homeowners' estimate to the appraisals based on the repeat sales of comparable properties. The bank validated the Case-Shiller indexes to in-person house appraisal and actual house sale prices (for a subset of the houses) and found, on average, the differences between the indexes, in-person appraisals and the sale price are statistically insignificant. However, the validation dataset is not available for the purposes of this study. Loeb (2005) also finds an "absence of statistically significant bias" in the Case-Shiller index when compared to the actual sale price. He compared the Case-Shiller index to the sale price for over 77,708 properties and found a 0.8% difference between the two. Alternatively, he also compared the Case-Shiller to the full appraisal for 15,524 properties and found a difference of -3.6%.

⁸ The overestimation is 4.64% if I also include homeowners who were either rejected by the bank or who turned down the loan. Following Kain and Quigley (1972), I also analyze the homeowners of multi-family houses (condominiums), the results confirm their findings that condo owners over-estimate their house value by as much as 4.5%.

⁹ To test for selectivity bias, I also analyze the behavior of homeowners who rejected the bank's offer for the loan. I find that 29% of the homeowners who rejected the loan offer were underestimators and 38% were overestimators.

¹⁰ While we know from the previous section that refinancing with no cash out is the primary motive of the underestimators and refinancing with cash out is the primary motive of the overestimators. However, homeowners could have changed their mind subsequent to originating the line of credit, these results will confirm if underestimators do actually save and overestimators do actually spend over the two years period.

¹¹ Though not reported, I also find that the initial utilization for underestimators was higher and for overestimators was lower.

¹² I choose the 10% differential because the bank uses the same criterion to approve the loan without review. I tried alternative segments at 5% and 15%, the results are qualitatively the same. This is also consistent with Kain and Quigley.

¹³ Borrower credit scores are provided by Fair, Isaac and Company (FICO). Higher scores indicate higher credit quality.

¹⁴ I also test for selectivity bias and analyze the behavior of homeowners who reject the bank's offer for the loan. I find that 18% of the homeowners who rejected the loan were underestimators and 25% were overestimators. The regression results confirm that underestimators who rejected the loan were highly sensitive to the interest rates (i.e., trying to maximize their lifetime savings) and the overestimators who rejected the loan were highly sensitive to the loan amount approved (i.e., trying to maximize their lifetime or smooth current consumption). These results provide additional evidence that homeowners' misestimation of house value does provide valuable information about their savings and consumption behaviors.

¹⁵ Current period average home equity line interest rates were obtained from the Heitman Group (www.heitman.com).

¹⁶ See, Deng, Quigley, and Van Order (2000) and Agarwal, Ambrose, and Liu (2006) and the references therein.

¹⁷ I approximate the interest rate differential (prepayment option) as outlined in Deng, Quigley, and Van Order (2000)

$$OPTION_{i,t} = \frac{V_{i,t} - V_{i,t}^*}{V_{i,t}}$$

where $V_{i,t}$ is the market value of loan i at time t (i.e., the present value of the remaining mortgage payments at the current market mortgage rate), and $V_{i,t}^*$ is the book-value of loan i at time t (i.e., the present value of the remaining mortgage payments at the contract interest rate).