

Understanding the subprime crisis

A review of recent research at the Boston Fed

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Brandeis University, October 21, 2009

Disclaimer

- I am speaking today as a researcher and as a concerned citizen
- not as a representative of:
 - The Boston Fed
 - or the Federal Reserve System



- When I say “we”, I don’t mean Ben and me.

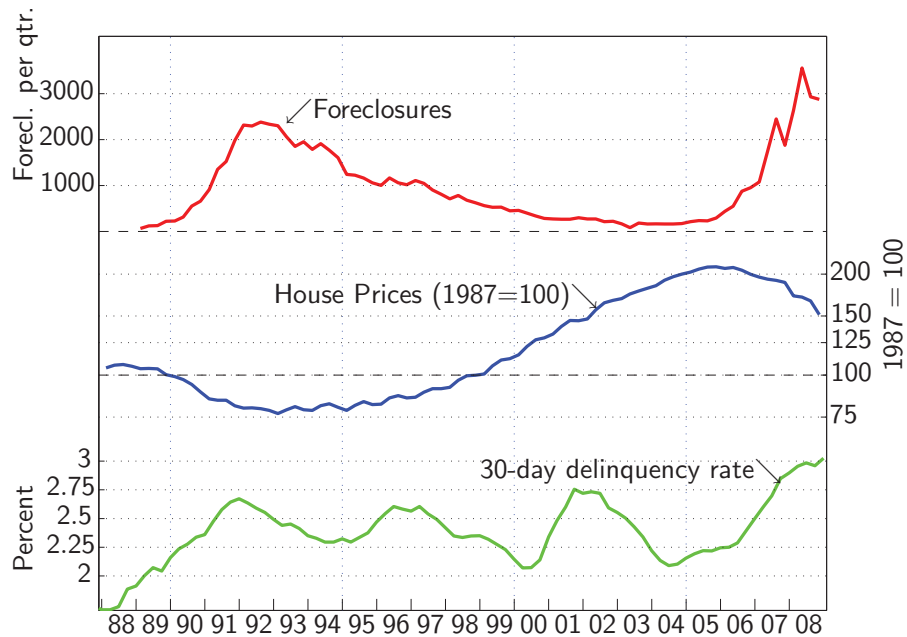
- Some papers on mortgages...

- 1 “Why Don’t Lenders Renegotiate More Home Mortgages? Defaults, Self-Cures and Securitization.” NBER WP 15159. With Manuel Adelino and Kris Gerardi. July 2009.
- 2 “Subprime Outcomes: Risky mortgages, homeownership and foreclosure.” With Kris Gerardi and Adam Shapiro. December 2007.
- 3 “Reducing Foreclosures.” With Chris Foote, Kris Gerardi and Lorenz Goette. *NBER Macro Annual 2009*, forthcoming.
- 4 “The Impact Of Deregulation And Financial Innovation On Consumers: The Case Of The Mortgage Market.” With Kristopher Gerardi and Harvey Rosen. *Journal of Finance*, forthcoming.
- 5 “Subprime Mortgages, Foreclosures, and Urban Neighborhoods.” With Kristopher Gerardi. 2009. *The B.E. Journal of Economic Analysis & Policy* 9(3, Symposium): Article 12.
- 6 “Making sense of the subprime crisis.” With Kris Gerardi, Andreas Lehnert and Shane Sherlund. 2008. “Making Sense of the Subprime Crisis.” *Brookings Papers on Economic Activity*, Fall: 69–145.
- 7 “Just the Facts: An initial analysis of the subprime crisis.” With Chris Foote, Kris Gerardi and Lorenz Goette. 2008. *Journal of Housing Economics*, 17(4):291-305.
- 8 “Negative Equity and Foreclosure: Theory and evidence.” With Chris Foote and Kris Gerardi. 2008. *Journal of Urban Economics*, 64(2):234-245.

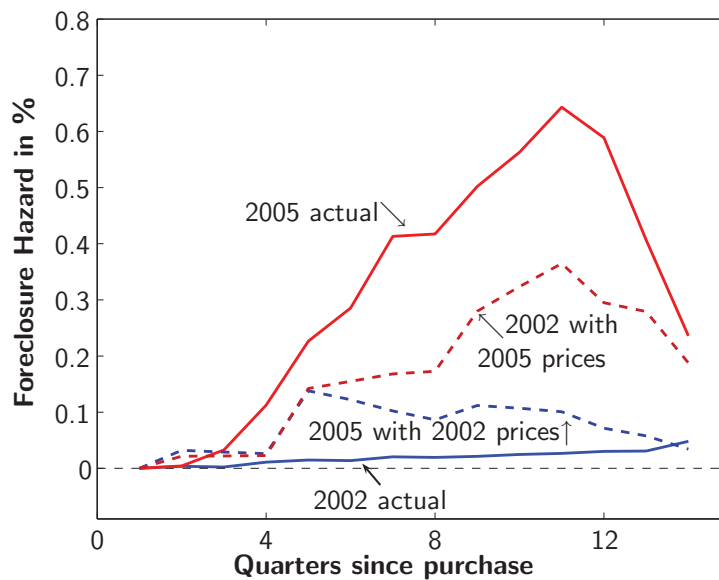
What causes foreclosure?

- Negative equity is necessary for default to make sense
 - If house is worth more than outstanding balance on mortgage
 - Sell!
 - In fact, servicers will usually force you to sell.
- But most people with negative equity don’t default
 - IN 1991 in MA, we estimate that about 100,000 people had negative equity
 - Over the next three years, only about 7 percent lost their homes
- Irrational?
 - No!
- Negative equity is not sufficient for optimal default!
 - Even in a completely frictionless world.

Figure: Foreclosures and house prices in Mass., 1989-present. Source: Boston Fed and The Warren Group.



“Subprime Outcomes”



Did agency problems cause the subprime crisis?

- Did the “Originate-to-Distribute” model of mortgage origination cause the crisis?

We show that the transfer of credit risk through the “Originate-to channel resulted in the origination of inferior quality mortgages.

- From the top:

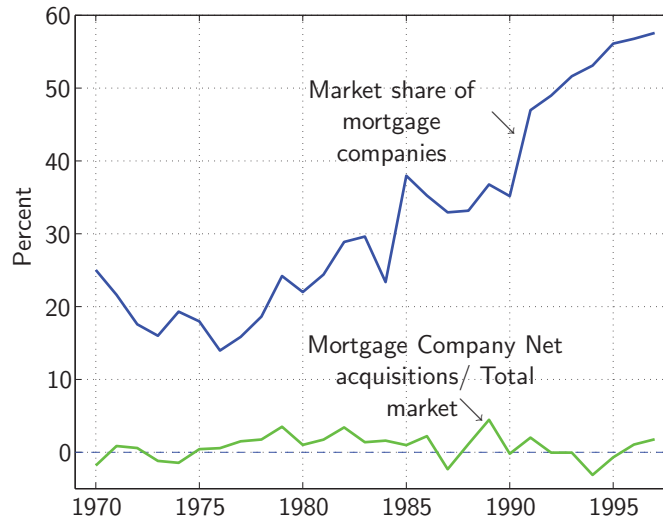
*...by breaking the direct link between borrowers and lenders, securitization led to an erosion of lending standards, resulting in a market failure that fed the housing boom and deepened the housing bust.
(Geithner and Summers, 6/15/2009)*

A Brief History of “OTD”

- “OTD” is not new. Link between borrower and lender broken long ago.
- “Mortgage Companies”: stand-alone companies that originate but don’t hold mortgages.
 - The Mortgage Bankers Association was founded in 1909.
 - As far back as the 1950s, MCs accounted for 25 percent of new originations
 - And much of the institutional framework existed:
 - “Originate”
 - “Service”
- Mortgage Companies include
 - New Century
 - Option One
 - Countrywide
 - And many banks do much of their mortgage business through mortgage company subs.

The Growth of Mortgage Companies

- Mortgage companies accounted for a non-trivial share of originations in 1970
- And their share grew steadily over the 1970s.
- And they held almost nothing on their books

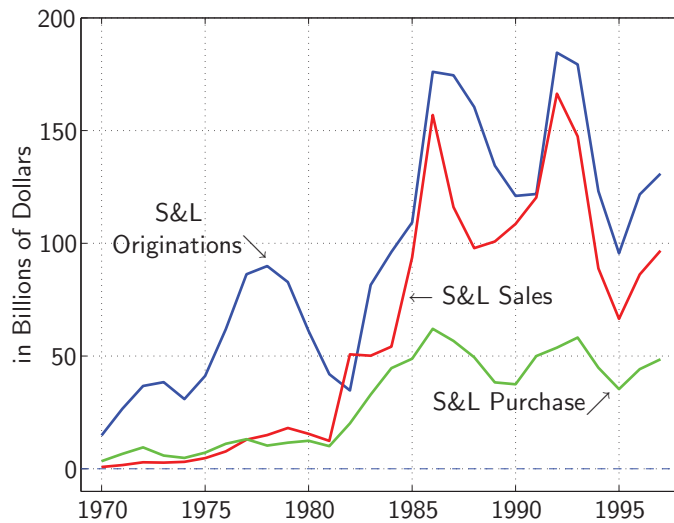


Savings and Loans



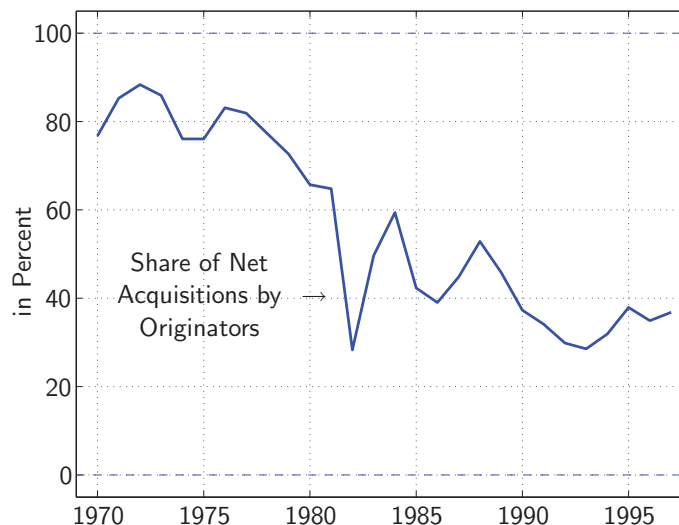
Figure: George Bailey and Old Man Potter.

- In the 1980s, S&L’s became mortgage companies.



The growth of “OTD”

- Originators provided a decreasing share of the funds for mortgage finance.
- Most “origination” was for the purpose of distribution in 1985.
- By the 1990s, it was more than 2/3.



When did the link break?

- Only the phrase “Originate-to-Distribute” is new.
- The investor changed over time:
 - 1950: Life Insurance Company
 - 1970: GNMA
 - 1985: FNMA and FHLMC
 - 2000: Private Label Security
- But the link had been broken.
- If you want to make the case that “Private Label Securitization” was the problem
 - You need a much more subtle argument than that the originator didn’t take on any credit risk.

The role of asymmetric information

- Asymmetric info is at the heart of the case against OTD:
 - Moral Hazard: Originator has no incentive to screen.
 - Adverse Selection: Originator has private information about the quality of the loan.
- But standard models of asymmetric information do not say
 - If seller has private information, buyer gets screwed.
- Because buyer KNOWS that seller has private information.
 - Price falls and volume of trade falls
 - But buyer gets exactly what he expects – rational expectations condition.
- For OTD to explain crisis, need to show that investors did not realize that originator had private information
 - It is not enough to show that OTD lenders made “inferior quality loans.”
 - Must show that investors did not realize that loans were “inferior quality.”
- Did investors make systematic mistakes?

“Making Sense of the Subprime Crisis”

- *Brookings Papers on Economic Activity*, Fall 2008: 69–145.
- Lehman Brothers: “U.S. ABS Weekly Outlook,” August 15, 2005.
- “HEL Bond Profile Across HPA Scenarios”

#	Name	Scenario	Loss	Probability
(1)	Aggressive	11% HPA over the life of the pool	1.4%	15%
(2)		8% HPA for life	3.2%	15%
(3)	Base	HPA slows to 5% by end-2005	5.6%	50%
(4)	Pessimistic	0% HPA for the next 3 years 5% thereafter	11.1%	15%
(5)	Meltdown	-5% for the next 3 years, 5% thereafter	17.1%	5%

- Actual HPA: -10% annualized from Q4, 2005 to Q4, 2008
- Forecast losses as of 2/2009 in 2006-1 ABX from JPM: 23.44% (assuming -30% HPA in 2009!)

Loan Renegotiation

- Loan renegotiation is
 - Safe
 - Legal
 - and RARE!
- We look at loans after they became 60 days delinquent:
 - Over the next year, only about 3 percent of the loans got lowered payments.
 - 97% of borrowers paid as much or more after they got into trouble.
- Broader definition of renegotiation shows more help...
 - Over the next year, only about 9 percent of the loans received some form of modifications
 - But all these incremental “renegotiations” involved the same or higher payments.

The role of securitization

- Contrary to popular belief, this has *nothing* to do with the fact that many loans are securitized.
- Unconditional percentages of mortgages that received a modification within 12 months of first 60-day delinquency:
- Sample Size 66,541
- Results stronger for broader definitions of renegotiations

	Concessionary Mods	All Mods	All Mods + Prepayments
Portfolio	3.2%	8.7%	14.7%
Private-label	2.6%	8.4%	15.5%
Marginal Effect	-0.3%	0.2%	0.9%
(z-stat)	-1.69	0.58	1.95

“Common Sense” and Public Policy

- “Common Sense” often contradicted by data and/or economic theory.
- Examples:
 - Protectionism
 - Central Planning
- Common Sense: Loans with increasing payments are crazy
 - Data: Resets of adjustable rate mortgages played little or no role in causing the crisis.
- Common Sense: Renegotiation of mortgages should be common
 - Economic theory: Moral hazard problem.
 - Data: Very little renegotiation
- Common Sense: Dispersed ownership makes renegotiation difficult
 - Theory: Contracts can solve this problem.
 - Data: Dispersed ownership does not present a big problem

LPS Data

- Dataset formerly known as McDash
- 9 of the top 10 servicers
 - 29 million active residential loans
 - 60% of all active residential loans
 - \$6.5 trillion
- Dataset includes
 - 1 securitized subprime
 - 2 securitized alt-A
 - 3 securitized jumbo
 - 4 securitized conforming
 - FHLMC
 - FNMA
 - GNMA
 - 5 portfolio

Fields

- Static: All the origination information
 - FICO, DTI, amount, LTV
 - Zip Code, Date
 - ARM, FRM, interest rate
 - lien type
 - NO information about second liens or CLTV
- Dynamic: Updated monthly
 - Balance
 - Monthly payment
 - Interest rate
 - Delinquency status

Modifications

- LPS does not flag a loan as modified or describe changes.
- OCC/OTS has data but won’t release it!
 - Not a “Chinese Wall”
 - Nor a “Firewall”
 - A “Chinese Firewall”
 - The “Great Firewall of China”
- But we have detailed payment information, so we can identify changes

Mod Example #1: Fixed-rate loan originated Jan 2007

Date	MBA Delinq. Stat.	Interest Rate	Monthly Payment	Outstanding Balance	Remaining Term in Months
2008m10	9	6.5	907	141,323	340
2008m11	9	6.5	907	141,323	339
2008m12	9	6.5	907	141,323	338
2009m1	C	4.5	660	146,686	479

- This borrower was 90 days delinquent, but then became current
- He then received an interest rate reduction (on a supposedly fixed-rate loan)
- His monthly payment *declined* while his outstanding balance *rose* (to make up for past arrears)
- The borrower also received a term extension to a 40-year loan

Mod Example #2: Hybrid-ARM originated Dec 2006

Date	MBA Delinq. Stat.	Interest Rate	Monthly Payment	Outstanding Balance	Remaining Term in Months
2008m5	6	9.25	1,726	208,192	346
2008m6	9	9.25	1,726	208,192	346
2008m7	9	9.25	1,726	208,192	346
2008m8	C	9.25	1,815	218,316	341
2008m9	C	9.25	1,815	218,184	340

- Borrower rolls into 90-day delinquency in June 2008 and receives a modification in October.
- Standard payment-increasing modification: Payment rises as past arrears are capitalized into loan balance
- No reduction in interest rate

Quality of the Modifications Algorithm

- Data from Wells Fargo Corporate Trust Servicers
- Includes only private securitized loans and has flags for modifications from servicers

	No Mod Using Our Algorithm	Mod Using Our Algorithm	Total
No Mod in WF Data	2,329,187	3,559	2,332,746
Mod in WF Data	3,627	17,514	21,141
Total	2,332,814	21,073	2,353,887

- Overall: 16.9% false positives; 17.2% false negatives

Modification Statistics by Type: 2007:Q1–2008:Q4

	# Loans Modified	Interest Rate Reductions		Principal Balance Reductions		Principal Balance Increases		Term Extensions	
		#	(% total)	#	(% total)	#	(% total)	#	(% total)
2007:Q1	10,940	600	5.3	700	6.2	8,660	76.4	1,380	12.2
2007:Q2	14,600	820	5.4	550	3.7	11,630	77.3	2,050	13.6
2007:Q3	17,720	770	4.1	810	4.3	15,170	81.2	1,940	10.4
2007:Q4	27,150	2,990	9.7	700	2.3	22,520	72.8	4,740	15.3
2008:Q1	36,230	6,010	13.8	900	2.1	32,100	73.8	4,500	10.3
2008:Q2	44,750	9,050	16.4	1,300	2.4	39,750	72.1	5,030	9.1
2008:Q3	62,190	16,280	20.3	940	1.2	56,940	70.9	6,110	7.6
2008:Q4	74,800	28,630	26.7	1,450	1.4	65,960	61.5	11,230	10.5

Why so rare?

- The leading explanation:

The complex webs that securitization weaves can be a trap and leave no one, not even those who own the loans, able effectively to save borrowers from foreclosure. With the loan sliced and tranced into so many separate interests, the different claimants with their antagonistic rights may find it difficult to provide borrowers with the necessary loan modifications, whether they want to or not. In the tranche warfare of securitization, unnecessary foreclosures are the collateral damage.

Kurt Eggert
in *Housing Policy Debate*
(2007)

Our evidence

- Using our baseline specification, we find no statistically meaningful difference.
- Are our result robust?
 - ① What if we look at subsamples? Unobserved heterogeneity?
 - ② Maybe we are looking too late – maybe portfolio servicers assist before borrower gets to 60 days.
 - ③ Maybe portfolio lenders do “better” modifications – less likely to default.
 - ④ Maybe our algorithm completely misses something.

(1) Different Subsamples

- Subprime loans – 7% of the loans in McDash (underrepresented) and 40% of the seriously delinquent.
- Subsamples less likely to have unobserved heterogeneity
 - < 620 FICO – better screening (see Keys et al. (2009) and Bubb and Kaufman (2009))
 - Sample with more information

(1) Different Subsamples

- Logit model with dep. variable is probability of modification in 12 mos. after first serious delinquency.

Panel A: Concessionary Modifications					
	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.032	0.047	0.034	0.028	0.023
Private-label Mean	0.026	0.037	0.031	0.033	0.037
Marginal Effect (private-label)	-0.003	-0.004	-0.003	0	0.007
	-1.69	-0.94	-0.77	-0.14	1.46
# Mortgages	66,541	33,719	27,639	25,543	18,097

Panel B: All Modifications					
	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.087	0.111	0.097	0.092	0.077
Private-label Mean	0.084	0.103	0.109	0.107	0.124
Marginal Effect (private-label)	0.002	0.004	0.007	0.006	0.025
	0.58	0.61	1.06	0.97	2.94
# Mortgages	66,541	33,719	27,639	25,543	18,097

(2) Different definition of delinquency

- Transition from 30 days delinquent to modification:

Panel A: Concessionary Mods					
	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.014	0.025	0.016	0.014	0.012
Private-label Mean	0.014	0.021	0.016	0.017	0.019
Marginal Effect (Logit)	-0.003	-0.005	-0.001	-0.002	0.001
	-2.72	-2.31	-0.55	-1.57	0.37
Hazard Ratio (Cox)	1.03	1.147	1.027	0.969	1.237
	0.59	1.83	0.31	-0.42	2.34
# Mortgages	120,558	51,285	43,550	47,993	34,403

Panel C: All Mods + Prepayment					
	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.145	0.195	0.152	0.147	0.13
Private-label Mean	0.174	0.211	0.218	0.185	0.198
Marginal effect (Logit)	0.023	0.021	0.044	0.016	0.029
	7.31	2.98	6.46	3.47	4.54
Hazard Ratio (Cox)	1.158	1.05	1.181	1.098	1.202
	9.09	1.69	5.72	3.88	6.56
# Mortgages	120,558	51,285	43,550	47,993	34,403

(3) “Better” versus More Renegotiation

- Differences in manner in which modifications are performed?
 - Not a contract issue – PSAs don’t restrict behavior of servicer on intensive margin.
- Look at re-defaults after modification:

	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.308	0.386	0.332	0.228	0.249
Private-label Mean	0.358	0.392	0.371	0.362	0.359
Marginal effect (Logit)	0.016	-0.001	-0.015	0.03	-0.004
	0.66	-0.03	-0.35	0.81	-0.1
# Mortgages	4,626	2,514	1,562	1,475	1,135

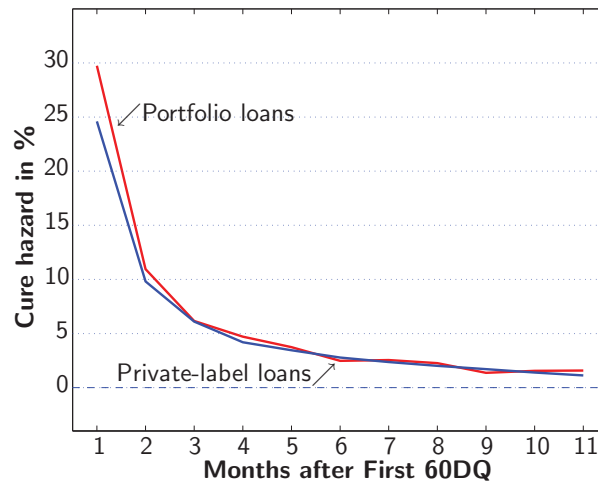
	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.393	0.53	0.444	0.404	0.403
Private-label Mean	0.449	0.5	0.501	0.482	0.482
Marginal effect (Logit)	0.008	-0.023	-0.009	-0.021	-0.033
	0.58	-0.84	-0.38	-0.97	-1.24
# Mortgages	14,796	7,073	5,344	4,594	3,620

(4) Broadest possible definition of renegotiation

- Possible our algorithm is completely missing some renegotiation
 - Forbearance?
 - Repayment Plans?
 - Errors must be substantially biased toward portfolio.
 - PSAs do not limit these!
- Successful renegotiation ⇒ Cure
- Broadest possible definition

	All Loans	Subprime	FICO < 620	Non-missing Documentation and DTI	Fully Documented
Portfolio Mean	0.300	0.257	0.320	0.280	0.299
Private-label Mean	0.256	0.289	0.328	0.289	0.324
Marginal effect (Logit)	-0.022	0.043	0.004	0.022	0.025
	-4.32	4.31	0.44	2.8	2.43
# Mortgages	66,451	33,719	27,639	25,543	18,097

Understanding the cures



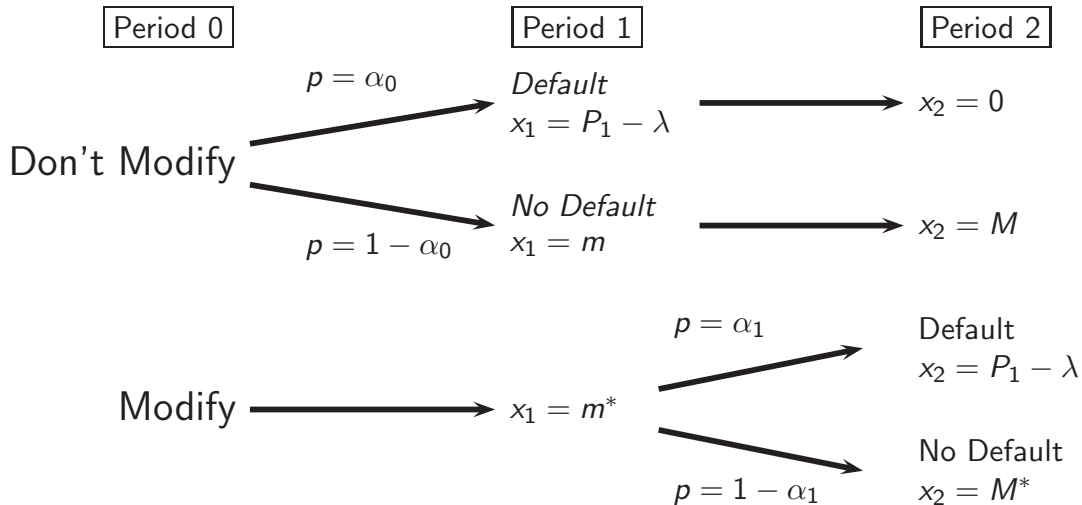
- Most of the cures are “self-cures”
 - 1 85% of cures occur in first two months.
 - 2 Almost certainly self-cures
 - 3 Unobserved heterogeneity.

Why is renegotiation so rare?

- Logic is that foreclosure costs lender a lot
- Wouldn't a concession to borrower cost less
- What's the risk of giving the borrower a chance?
 - Redefault risk: Renegotiate and borrower defaults anyway – house price falls
 - Self-cure risk: Borrower repays with assistance. Lender wastes money helping borrower who doesn't need it.

A model

- Three periods: $t = 0, 1, 2$
- Mortgage is a stream of payments x_1, x_2



The gains to renegotiation

t	Mortgage	House Price	Foreclosure	Renegotiation
1	m	P_1	$P_1 - \lambda$	m^*
2	M	P_2	$P_2 - \lambda$	M^*

- Value of loan without renegotiation:

$$V_{\text{no mod}} = \alpha_0(P_1 - \lambda) + (1 - \alpha_0)[m + (1/R)M].$$

- Value of loan with renegotiation:

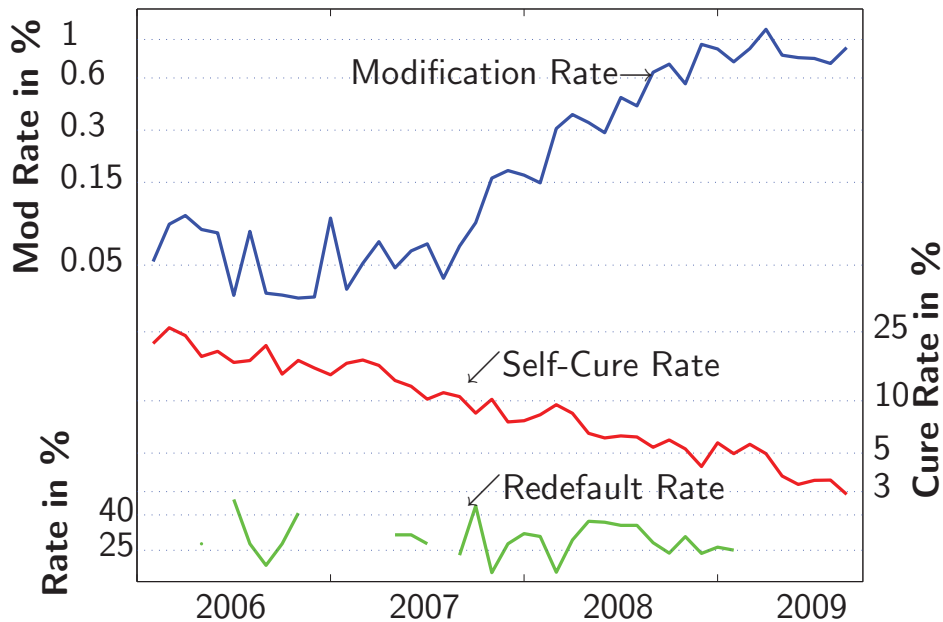
$$V_{\text{mod}} = m^* + (1/R)\alpha_1(P_2 - \lambda) + (1/R)(1 - \alpha_1)M^*.$$

- NPV Test: Modify if $V_{\text{mod}} > V_{\text{no mod}}$

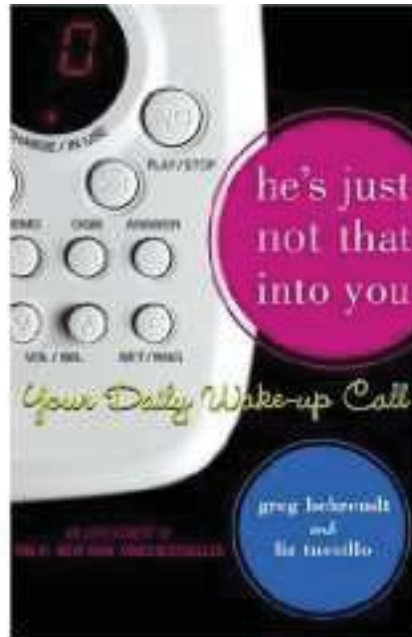
$$V_{\text{mod}} - V_{\text{no mod}} = (\alpha_0 - \alpha_1)[m^* + \frac{1}{R}M^* - (P_1 - \lambda)] - (1 - \alpha_0)[m + \frac{1}{R}M - (m^* + \frac{1}{R}M^*)] + \alpha_1[m^* + \frac{1}{R}(P_2 - \lambda) - (P_1 - \lambda)] > 0 \quad (1)$$

$1 - \alpha_0$	$\alpha_0 - \alpha_1$	α_1
Borrower always repays	Renegotiation effective	Borrower never repays
Lender loses because borrower would have paid in full	Lender gains because modified payments worth more than foreclosure	Foreclosure is delayed May or may not help lender
$m + \frac{1}{R}M - (m^* + \frac{1}{R}M^*)$	$m^* + \frac{1}{R}M^* - (P_1 - \lambda)$	$m^* + \frac{1}{R}(P_2 - \lambda) - (P_1 - \lambda)$
"Self-cure risk" Costly assistance to borrowers who can pay	Successful Renegotiation Don't help borrowers who would have defaulted	"Redefault risk" Lender loses if R is large or if $P_2 - P_1$ is big

Results



Maybe the investors just aren’t that into modification



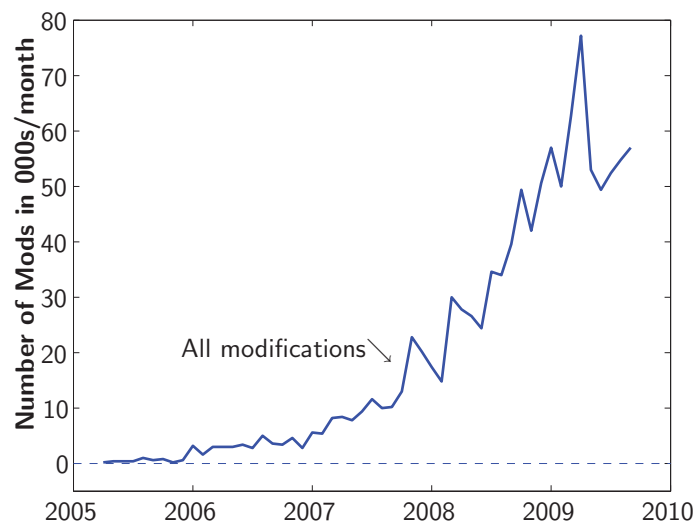
HAMP

- MHA – “Making Home Affordable”
 - HARP – “Home Affordable Refinance Program.”
 - HAMP – “Home Affordable Modification Program.”
- HAMP:
 - Reduce Monthly Payment to 31% of income
 - Servicer paid for
 - \$1000 for doing modification
 - “Pay for success” – \$1000 for each year with no redefault.

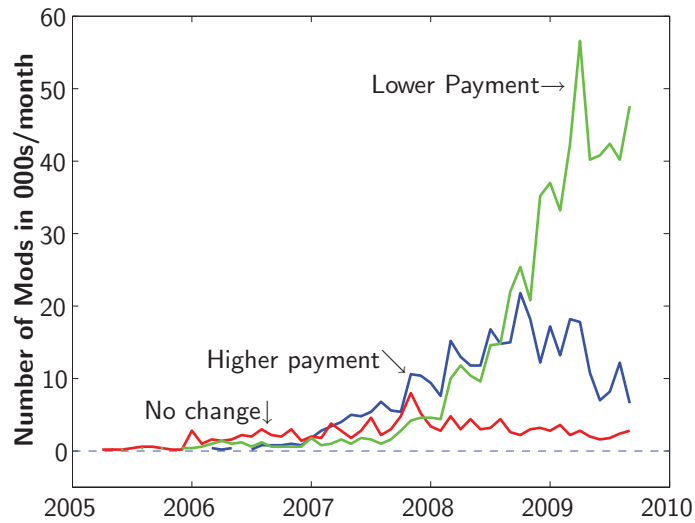
Problems

- 1 *Unemployed borrowers*
 - 31% of nothing is nothing
- 2 Financial incentive is small
- 3 Financial incentives may lead servicer to modify the wrong loans
 - Borrowers least likely to redefault are borrowers least likely to default.
 - Modifying creditworthy borrowers could be very profitable.

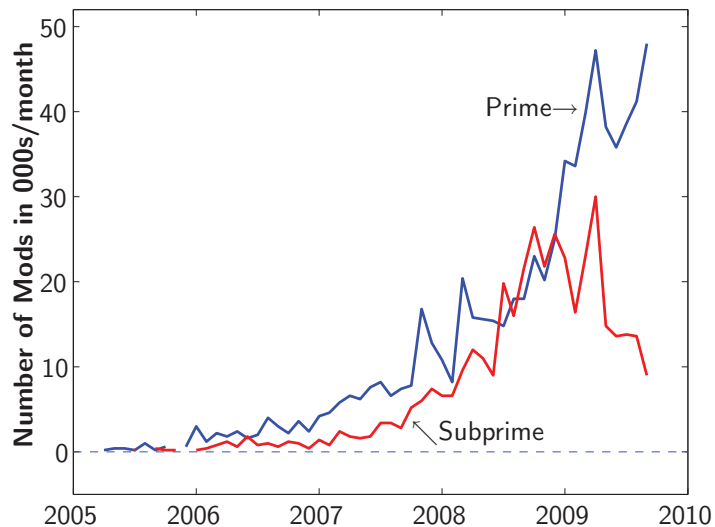
Results



Types of Mods



Prime v. Subprime



Social NPV

- Modifications may not make sense for investors
- But they may well make sense for society.
- And it would make sense for us to spend money!
- The Social NPV of a modified loan may exceed that of a foreclosure.

A Proposal to Help Distressed Homeowners: A Government Payment-Sharing Plan

- Chris Foote, Jeff Fuhrer and Paul Willen (Boston Fed) and Eileen Mauskopf (Board of Governors).
- A government payment-sharing arrangement that works with the homeowner’s existing mortgage:
 - 1 A loan or...
 - 2 A grant.
- Homeowners who participate must provide evidence that
 - Home equity position is negative,
 - Have suffered a job loss or other income disruption.
- Payment is temporary.
- Requires only minimal assistance from servicer.
- Cost: \$25 billion.

The political economy of foreclosure prevention

- Who gains?
 - Buyers vs. renters.
 - Zero down vs. high down payment.
 - Investors in ABS, MBS, CDOs
 - Job losers vs. job keepers.
- Who loses?
 - Taxpayers...
- But if the economy recovers more quickly...
- We can prevent foreclosures!
- The problem is fairness.
 - A person smokes in bed...
 - Do firefighters let the house burn down.

The slide you’ve all been waiting for...

- The end.