Who Defaults? Who Goes into Foreclosure?

Eric Doviak[1] Sean MacDonald[2]

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[1]Brooklyn College, CUNY – eric@doviak.net
[2]NYC College of Technology, CUNY – smacdonald@citytech.cuny.edu

NYSBD Pre-Foreclosure Filings

- Under New York State law, mortgage servicers must:
  - send "pre-foreclosure filing" (PFF) notice to a borrower who has defaulted 90 days prior to lis pendens filing
  - file that notice with the NYS Banking Dept. (NYSBD) within three business days
  - follow up when the loan progresses to a lis pendens filing
- NYSBD transmits the information to non-profit mortgage counselors
- NYSBD collects an extraordinary level of detail on the loans

The Pre-Foreclosure Filing Data

- Some of the information that the NYSBD collects:
  - the delinquent contractual payment
  - how long the loan has been delinquent
  - monthly payment
  - interest rate
  - whether the interest rate is fixed, adjustable, etc.
  - amount of the original loan
  - date of original loan
  - lien type (i.e. first lien, junior lien or HELOC)
  - loan term
  - whether the loan is investor owned
  - whether the loan has been modified
  - whether the loan progresses to a lis pendens filing
  - name(s) of the borrower(s)
  - property address

Several Ways to Analyze the Data

- Who defaults?
  - We matched the PFF data to HMDA originations data
  - We compare borrowers who defaulted to those who did not
- Who goes into foreclosure?
  - The PFF data enables us to compare the loans that progressed from default to a lis pendens filing to those that did not
- Combined, we can track the universe of NYS home mortgages from origination to default to foreclosure
  - The data is not perfectly longitudinal however because the PFF data only provides data on borrowers who defaulted in 2010
- We can also compare defaulted loans across year of origination

Our Main Findings

- Strong racial and ethnic disparities in lending practices
  - Blacks and Latinos more likely to take high-cost loans and more likely to default
  - But HMDA does not include a borrower's credit score or the loan-to-value ratio
  - So we are reluctant to conclude that HMDA-measurable forms of discrimination increased a borrower's probability of default
- Reducing principal balances may help borrowers avoid default and foreclosure
- The HAMP loan modification program may have been more successful than its critics have argued

Why Discuss Race and Ethnicity?

- The foreclosure crisis disproportionately affects minority communities
- So we must understand its racial and ethnic dimensions
- This literature review will review some of the evidence that:
  - blacks and Latinos took a disproportionately high share of subprime loans and high-cost loans
  - high-cost loans helped trigger the subprime mortgage crisis

Trends in Subprime Lending

- Delinquency and foreclosure on subprime mortgages were the primary cause of the banking and financial crisis of 2008
- Trends in subprime lending (Doms et al., 2007):
  - virtually non-existent in 1989-90 – the peak of the previous real estate boom
  - by 1994, subprime loans had grown to 5 percent of total originations
  - in 2005, they constituted 20 percent of total originations

Race, Ethnicity and Subprime Lending (1)

- Bocian et al. (2006)
  - paired the 2004 HMDA data with a proprietary dataset of 177,000 subprime loans
  - found that black and Latino borrowers received a disproportionate share of high-cost loans
  - after controlling for other factors, such as the borrower's FICO score and the loan-to-value ratio
- Their study overcomes some of the limitations of the HMDA data, but:
  - they did not examine the universe of originations, so their findings do not necessarily apply to the broader market
  - their findings do not explain why borrowers took subprime loans instead of prime loans

Race, Ethnicity and Subprime Lending (2)

- Using the 2000 Census data, Squires et al. (2009) found that a 10 percent increase in black segregation was associated with a 1.4 percent increase in high-cost loans
- Bromley et al. (2008) found that subprime lenders' market share was positively correlated with a census tract's share of minority residents
- A HUD study (2000) found that borrowers in high-income black neighborhoods were two times more likely to take out a subprime loan than borrowers in low-income white neighborhoods

Race, Ethnicity and Foreclosures

- Rugh and Massey (2010) found that residential segregation and the share of high-cost loans are both positively correlated with the number and rate of foreclosures
- Unfortunately, their published paper lacks a regression of the high-cost lending share on measures of racial and ethnic segregation
- So they do not convincingly demonstrate that residential segregation enabled lenders to target minorities for high-cost loans

Race, Ethnicity and High-Cost Loans

- We observe similar patterns in the 2004-2008 HMDA data
- We focus on first-lien mortgages originated for owner-occupied properties in New York State
- High-cost loans:
  - Blacks and Latinos took a disproportionately high share
  - Asians took a disproportionately low share
- After matching the PFF data to the HMDA data, we find
  - Borrowers who took high-cost loans were more likely to default
  - Blacks and Latinos default at a disproportionately high rate

Table 9: High Cost Loans by Applicant Race

	non-high cost	high cost	total
Asian	89.7%	10.3%	89,998
Black/Afr. Am.	64.9%	35.1%	166,380
White	84.2%	15.8%	1,161,960
not provided	76.8%	23.2%	234,393
percent	81.5%	18.5%	1,674,840

Data: Combined HMDA-PFF

Table 10: High Cost Loans by Applicant Ethnicity

	non-high cost	high cost	total
Hispanic/Latino	71.9%	28.1%	134,937
Not Hispanic/Latino	82.8%	17.2%	1,263,971
not provided	77.5%	22.5%	232,693
percent	81.5%	18.5%	1,674,840

Data: Combined HMDA-PFF

Table 4: Pre-Foreclosure Filings by Loan Cost

	no PFF	received PFF	total
non-high cost	92.8%	7.2%	1,364,557
high cost	89.4%	10.6%	310,283
percent	92.2%	7.8%	1,674,840

Data: Combined HMDA-PFF

Table 11: Pre-Foreclosure Filings by Applicant Race

	no PFF	received PFF	total
Asian	92.8%	7.2%	89,998
Black/Afr. Am.	88.0%	12.0%	166,380
White	92.8%	7.2%	1,161,960
not provided	91.7%	8.3%	234,393
percent	92.2%	7.8%	1,674,840

Data: Combined HMDA-PFF

Table 12: Pre-Foreclosure Filings by Applicant Ethnicity

	no PFF	received PFF	total
Hispanic/Latino	89.0%	11.0%	134,937
Not Hispanic/Latino	92.4%	7.6%	1,263,971
not provided	92.0%	8.0%	232,693
total	92.2%	7.8%	1,674,840

Data: Combined HMDA-PFF

Loan Amount and Default

- Best predictor of default is a large loan amount
  - 56 percent who defaulted borrowed $250,000 or more
  - 43 percent who did not default borrowed $250,000 or more
- Helps explain why blacks and Latinos default at a higher rate
- Blacks and Latinos tended to borrow more
  - 38 percent of whites borrowed $250,000 or more
  - 60 percent of blacks borrowed $250,000 or more
  - 41 percent of non-Latinos borrowed $250,000 or more
  - 65 percent of Latinos borrowed $250,000 or more

Table 2: Pre-Foreclosure Filings by Loan Amount

	no PFF	received PFF	percent
under 50	4.9%	2.8%	4.8%
50 to 99	16.5%	13.4%	16.3%
100 to 249	36.1%	27.7%	35.4%
250 to 399	25.8%	33.7%	26.4%
400 to 499	8.3%	12.7%	8.6%
500 and up	8.4%	9.7%	8.5%
total	1,544,118	130,722	1,674,840

Data: Combined HMDA-PFF

Table 15: Loan Amount by Applicant Race

	Asian	Black/Afr. Am.	White	not provided	percent
under 50	1.0%	3.2%	5.7%	2.7%	4.8%
50 to 99	6.3%	8.4%	19.1%	12.1%	16.3%
100 to 249	26.3%	28.3%	37.2%	35.2%	35.4%
250 to 399	33.3%	40.5%	23.0%	29.9%	26.4%
400 to 499	18.0%	12.8%	7.1%	9.4%	8.6%
500 and up	15.1%	6.8%	7.8%	10.7%	8.5%
total	89,998	166,380	1,161,960	234,393	1,674,840

Data: Combined HMDA-PFF

Table 16: Loan Amount by Applicant Ethnicity

	Hispanic/Latino	Not Hispanic/Latino	not provided	percent
under 50	2.1%	5.4%	2.9%	4.8%
50 to 99	7.1%	17.8%	12.7%	16.3%
100 to 249	26.4%	36.1%	35.6%	35.4%
250 to 399	41.7%	24.4%	29.0%	26.4%
400 to 499	13.6%	8.1%	9.0%	8.6%
500 and up	9.2%	8.1%	10.7%	8.5%
total	134,937	1,263,971	232,693	1,674,840

Data: Combined HMDA-PFF

Income and Default

- Middle-income borrowers were more likely to default
  - Define "middle-income" as $80,000 to $200,000
  - 50 percent who defaulted were middle-income
  - 44 percent who did not default were middle-income
- Helps explain why blacks and Latinos default at a higher rate
  - 42 percent of white borrowers were middle-income
  - 50 percent of black borrowers were middle-income
  - 43 percent of non-Latino borrowers were middle-income
  - 57 percent of Latino borrowers were middle-income

Table 3: Pre-Foreclosure Filings by Applicant Income

	no PFF	received PFF	percent
under 40	10.9%	9.9%	10.8%
40 to 59	18.0%	15.6%	17.8%
60 to 79	19.2%	18.3%	19.1%
80 to 99	15.8%	17.3%	15.9%
100 to 119	10.9%	12.9%	11.1%
120 to 159	11.9%	14.0%	12.0%
160 to 199	5.0%	5.4%	5.0%
200 and up	8.4%	6.6%	8.2%
total	1,465,078	123,878	1,588,956

Data: Combined HMDA-PFF

Table 13: Applicant Income by Applicant Race

	Asian	Black/Afr. Am.	White	not provided	percent
under 40	4.0%	8.0%	12.2%	8.7%	10.8%
40 to 59	11.7%	16.5%	18.9%	16.1%	17.8%
60 to 79	16.3%	23.0%	18.7%	19.4%	19.1%
80 to 99	17.3%	20.1%	15.1%	16.0%	15.9%
100 to 119	14.4%	13.6%	10.4%	11.0%	11.1%
120 to 159	17.6%	12.4%	11.5%	12.5%	12.0%
160 to 199	8.3%	3.7%	4.9%	5.5%	5.0%
200 and up	10.5%	2.7%	8.4%	10.8%	8.2%
total	85,965	156,030	1,105,913	220,741	1,588,956

Data: Combined HMDA-PFF

Table 14: Applicant Income by Applicant Ethnicity

	Hispanic/Latino	Not Hispanic/Latino	not provided	percent
under 40	5.8%	11.6%	8.9%	10.8%
40 to 59	12.9%	18.5%	16.3%	17.8%
60 to 79	20.6%	18.9%	19.2%	19.1%
80 to 99	21.4%	15.4%	15.8%	15.9%
100 to 119	15.9%	10.6%	10.9%	11.1%
120 to 159	14.8%	11.7%	12.4%	12.0%
160 to 199	4.8%	5.0%	5.5%	5.0%
200 and up	3.8%	8.2%	11.0%	8.2%
total	125,440	1,203,686	219,669	1,588,956

Data: Combined HMDA-PFF

Foreclosure Filings

- Large original loan amount is one of the best predictors of progression from default to foreclosure
  - 56 percent who progressed borrowed $250,000 or more
  - 44 percent who did not progress borrowed $250,000 or more
- Large monthly payment is also a good predictor
  - 58 percent who progressed had monthly payment over $2000
  - 46 percent who did not had monthly payment over $2000
- The variability of the interest rate has a small effect on the borrower's probability of progressing to foreclosure
- There is no relationship between the interest rate and the borrower's probability of progressing to foreclosure

Table 3: Lis Pendens Filing by Loan Amount (in thousands)

	no lis pendens	lis pendens	percent
under 50	6.3%	3.4%	5.9%
50 to 99	19.7%	14.1%	18.8%
100 to 249	29.9%	26.2%	29.3%
250 to 399	26.3%	33.1%	27.4%
400 to 499	9.4%	12.4%	9.9%
500 and up	8.2%	10.8%	8.6%
total	36,865	7,152	44,017

Data: Short PFF

Table 4: Lis Pendens Filings by Monthly Payment

	no lis pendens	lis pendens	percent
under 1,000	26.2%	17.1%	24.7%
1,000 to 1,499	14.6%	12.3%	14.2%
1,500 to 1,999	13.3%	13.1%	13.3%
2,000 to 2,499	13.3%	15.5%	13.7%
2,500 to 2,999	12.5%	15.3%	13.0%
3,000 to 3,999	13.0%	17.6%	13.7%
4,000 and up	7.0%	9.2%	7.4%
total	36,865	7,152	44,017

Data: Short PFF

Table 6: Lis Pendens Filing by Loan Detail

	no lis pendens	lis pendens	total
Fixed Rate	84.4%	15.6%	35,117
Adj. Rate	82.6%	17.4%	7,309
Pay. Op. Adj. Rate	78.5%	21.5%	451
Interest Only	73.5%	26.5%	1,140
percent	83.8%	16.2%	44,017

Data: Short PFF

Table 5: Lis Pendens Filings by Interest Rate

	no lis pendens	lis pendens	percent
under 4.000	4.5%	3.5%	4.4%
4.000 to 4.999	4.3%	4.1%	4.3%
5.000 to 5.999	21.9%	20.6%	21.7%
6.000 to 6.999	34.4%	39.6%	35.3%
7.000 to 7.999	17.5%	17.1%	17.4%
8.000 to 9.999	12.1%	11.1%	11.9%
10.000 and up	5.3%	4.1%	5.1%
total	36,865	7,152	44,017

Data: Short PFF

HAMP modifications

- Participants in the HAMP loan modification program appear to progress from default to foreclosure at a higher rate
- But much of this can be explained by the fact that HAMP modifications were in a later stage of delinquency when they were reported to the NYS Banking Dept.
- Loans in a later stage of delinquency are more likely to progress to a lis pendens filing
- The regression models indicate that participation in HAMP *reduces* the borrower's probability of progressing to foreclosure

Table 10: Lis Pendens Filings by Modification

	no lis pendens	lis pendens	total
No modification	83.9%	16.1%	34,962
HAMP modification	81.3%	18.7%	4,335
Non-HAMP modification	85.2%	14.8%	4,720
percent	83.8%	16.2%	44,017

Data: Short PFF

Table 12: Modifications by Delinquency Length

	No mod.	HAMP	non-HAMP	percent
less than 60 days	54.9%	28.9%	68.0%	53.7%
61-90 days	16.1%	13.4%	11.0%	15.3%
91-120 days	6.6%	11.7%	5.8%	7.0%
over 120 days	22.4%	46.0%	15.2%	24.0%
total	34,962	4,335	4,720	44,017

Data: Short PFF

Table 11: Lis Pendens Filings by Length of Delinquency

	no lis pendens	lis pendens	percent
less than 60 days	58.0%	31.8%	53.7%
61-90 days	15.1%	16.3%	15.3%
91-120 days	6.5%	9.9%	7.0%
over 120 days	20.5%	42.0%	24.0%
total	36,865	7,152	44,017

Data: Short PFF

Basic Regression Analysis

- We use Tobit models to predict each borrower's rate spread
- We use the predicted rate spread as an instrument in a probit model of the probability of default
- We also ran probit models to predict the probability of progression to foreclosure
- This is a very basic analysis
  - No theoretical framework
  - Little effort to check for robustness across specifications

Predicting Rate Spread and Default (1)

- *Tobit:* Loans originated to blacks and Latinos carried a higher rate spread
  - But HMDA omits credit score and loan-to-value ratio,
  - So we are reluctant to conclude that this is evidence of discrimination
- *Probit:* Blacks and Latinos were more likely to default
- Black race and Latino ethnicity may be acting as a proxy for a missing variable, such as:
  - Racial and ethnic disparities in effect of recession
  - Forms of discrimination that HMDA does not capture

Predicting Rate Spread and Default (2)

- Larger loan amount associated with higher default probability
- Lower income associated with higher default probability
  - We could have used a quadratic term
  - But we were reluctant to overfit the model
- Larger decrease in county-level employment was associated with higher default probability
- Coefficient on the percentage change in regional home index:
  - was only significant at the 10 percent level in model #1
  - was not statistically significant in model #2

Table 17: Two-Stage: Tobit predicts Rate Spread, then Probit predicts PFF

	Model #1				Model #2			
	Tobit		probit		Tobit		probit	
Intercept	−0.0513	***	−2.1133	***	0.0037		−2.1071	***
	(0.0004)		(0.1183)		(0.0054)		(0.1715)	
Pred. Rate Spread			0.4093	.			0.3302	
			(0.2434)				(0.3173)	
ln(Loan Amount)	−0.0005	***	0.2511	***	−0.0005	***	0.2486	***
	(0.0001)		(0.0252)		(0.0001)		(0.0366)	
ln(App. Income)	−0.0014	***	−0.2067	***	−0.0009	***	−0.2054	***
	(0.0001)		(0.0251)		(0.0001)		(0.0365)	
Co-Applicant	−0.0053	***	−0.1044	***	−0.0049	***	−0.1059	**
	(0.0001)		(0.0243)		(0.0001)		(0.0352)	
Conv'l Loan	0.0156	***			0.0158	***		
	(0.0002)				(0.0002)			
Home Purchase	0.0114	***			0.0112	***		
	(0.0001)				(0.0001)			
Home Improve.	0.0075	***			0.0073	***		
	(0.0001)				(0.0001)			
Hispanic/Latino	0.0092	***	0.1705	***	0.0064	***	0.1702	**
	(0.0001)		(0.0424)		(0.0001)		(0.0616)	
Asian	−0.0017	***	−0.0447		−0.0034	***	−0.0456	
	(0.0002)		(0.0510)		(0.0002)		(0.0742)	
Black/Afr. Am.	0.0136	***	0.2381	***	0.0086	***	0.2396	***
	(0.0001)		(0.0395)		(0.0001)		(0.0575)	
Race not provided	0.0060	***	0.0662	*	0.0047	***	0.0640	
	(0.0001)		(0.0334)		(0.0001)		(0.0485)	
Female	0.0019	***	−0.0174		0.0018	***	−0.0180	
	(0.0001)		(0.0249)		(0.0001)		(0.0363)	
Δ ln(County Emp.)			−1.8524	**			−1.9836	*
			(0.5722)				(0.8206)	
Δ ln(House Price Idx.)			−0.3514	.			−0.3530	
			(0.1844)				(0.2678)	
Minority Pop. Pct.					0.0001	***		
					(0.0000)			
ln(HUD Median Family Income)					−0.0059	***		
					(0.0005)			

Continued on the next page.

Table 17 (continued)

	Model #1				Model #2			
	Tobit		probit		Tobit		probit	
Purch. Type = 5	0.0288	***			0.0282	***		
	(0.0001)				(0.0001)			
Purch. Type = 6	0.0114	***			0.0112	***		
	(0.0001)				(0.0001)			
Purch. Type = 7	0.0186	***			0.0183	***		
	(0.0001)				(0.0001)			
Purch. Type = 8	0.0030	***			0.0030	***		
	(0.0001)				(0.0001)			
Purch. Type = 9	0.0196	***			0.0192	***		
	(0.0001)				(0.0001)			
Capital	0.0058	***			0.0132	***		
	(0.0001)				(0.0002)			
Central	0.0065	***			0.0134	***		
	(0.0002)				(0.0002)			
Finger Lakes	0.0058	***			0.0126	***		
	(0.0001)				(0.0002)			
Long Island	0.0012	***			0.0083	***		
	(0.0001)				(0.0002)			
Mid-Hudson	0.0004	***			0.0058	***		
	(0.0001)				(0.0001)			
Mohawk Valley	0.0116	***			0.0182	***		
	(0.0002)				(0.0002)			
North Country	0.0119	***			0.0180	***		
	(0.0002)				(0.0003)			
Southern	0.0099	***			0.0165	***		
	(0.0002)				(0.0002)			
Western	0.0073	***			0.0140	***		
	(0.0001)				(0.0002)			
New York County	−0.0233	***			−0.0206	***		
	(0.0004)				(0.0004)			
orig. 2005	0.0110	***	0.1604	***	0.0111	***	0.1589	**
	(0.0001)		(0.0402)		(0.0001)		(0.0583)	
orig. 2006	0.0146	***	0.3100	***	0.0147	***	0.3096	***
	(0.0001)		(0.0498)		(0.0001)		(0.0723)	
orig. 2007	0.0096	***	0.3678	***	0.0099	***	0.3642	***
	(0.0001)		(0.0542)		(0.0001)		(0.0785)	
orig. 2008	0.0041	***	0.2130	***	0.0049	***	0.2098	**
	(0.0001)		(0.0546)		(0.0001)		(0.0790)	
AIC	−561,338		827,003		−572,134		826,728	

*** $p < 0.001$, ** $p < 0.010$, * $p < 0.050$, . $p < 0.100$

Standard errors in parenthesis.

Data: Combined HMDA-PFF

Predicting Foreclosure

- Large original loan amount and large monthly payment are the the best predictors of progression from default to foreclosure
- The interest rate does not affect the probability of progressing to foreclosure
- Participation in HAMP *reduces* the probability of progressing to foreclosure
- Investor-owned loans were less likely to progress to foreclosure
- Larger servicers are more likely to take a defaulted loan to foreclosure

Table 13: Probit Models, dependent variable: Lis Pendens Filing

	model #1		model #2		model #3		model #4	
ln(Orig. Loan Amount)	0.0795	***			0.0592	*	0.0658	*
	(0.0171)				(0.0275)		(0.0273)	
ln(Amt. Delinq. Pay.)	0.0456	***	0.0424	**	0.0411	**	0.0386	**
	(0.0123)		(0.0131)		(0.0131)		(0.0131)	
ln(Monthly Pay.)			0.0779	***	0.0283		0.0267	
			(0.0182)		(0.0294)		(0.0292)	
Delinq. 61-90 days	0.3429	***	0.3444	***	0.3443	***	0.3483	***
	(0.0219)		(0.0220)		(0.0220)		(0.0220)	
Delinq. 91-120 days	0.5230	***	0.5258	***	0.5260	***	0.5315	***
	(0.0290)		(0.0291)		(0.0291)		(0.0291)	
Delinq. over 120 days	0.6607	***	0.6664	***	0.6674	***	0.6716	***
	(0.0253)		(0.0262)		(0.0262)		(0.0262)	
Current Int. Rate	−0.0049		−0.0090	.	−0.0060		−0.0050	
	(0.0049)		(0.0048)		(0.0050)		(0.0050)	
Adj. Rate	0.0190		0.0242		0.0199			
	(0.0212)		(0.0211)		(0.0212)			
Pay. Op. Adj. Rate	0.0178		0.0524		0.0275			
	(0.0708)		(0.0705)		(0.0715)			
Interest Only	0.1984	***	0.2121	***	0.2005	***		
	(0.0431)		(0.0428)		(0.0432)			
Not Fixed Rate Mortgage							0.0468	*
							(0.0196)	
modified via HAMP	−0.1350	***	−0.1358	***	−0.1358	***	−0.1404	***
	(0.0254)		(0.0255)		(0.0255)		(0.0254)	
modified, not HAMP	0.0058		0.0090		0.0063		0.0050	
	(0.0255)		(0.0255)		(0.0255)		(0.0255)	
Add'l Borrower on Loan	−0.0678	***	−0.0678	***	−0.0682	***	−0.0711	***
	(0.0157)		(0.0157)		(0.0157)		(0.0157)	
Pay. inc. Escrow	0.1697	***	0.1558	***	0.1650	***	0.1700	***
	(0.0200)		(0.0202)		(0.0206)		(0.0204)	
Loan Investor Owned	−0.1576	***	−0.1567	***	−0.1567	***	−0.1507	***
	(0.0186)		(0.0186)		(0.0186)		(0.0185)	
ln(No. Filings by Servicer)	0.0474	***	0.0470	***	0.0468	***	0.0464	***
	(0.0067)		(0.0068)		(0.0068)		(0.0067)	
AIC	36,545		36,549		36,546		36,558	

*** $p < 0.001$, ** $p < 0.010$, * $p < 0.050$, . $p < 0.100$

Standard errors in parenthesis. All models also contain an intercept term and dummies for region and year of origination. Those coefficients are not shown.

Data: Short PFF

Conclusion

- Reducing principal balances may help borrowers avoid default and foreclosure
- But such a remedy for the forclosure crisis may be impractical
- Lenders would have to weigh the benefits of lower foreclosure costs (e.g. legal fees, loss of property value, etc.) to the cost of writing off a portion of the loan
- It may be possible to construct well-structured modifications, so in future work we will:
  - attempt to quantify the costs and benefits
  - attempt to find other mutually beneficial options
- What modifications would reduce the industry's losses AND keep borrowers in their homes?