Mortgage Losses: Loss on Sale and Holding Costs

The 2019 ASSA-AREUEA Conferences

Session: Borrower Behavior and Mortgage Losses: January 6th 2019

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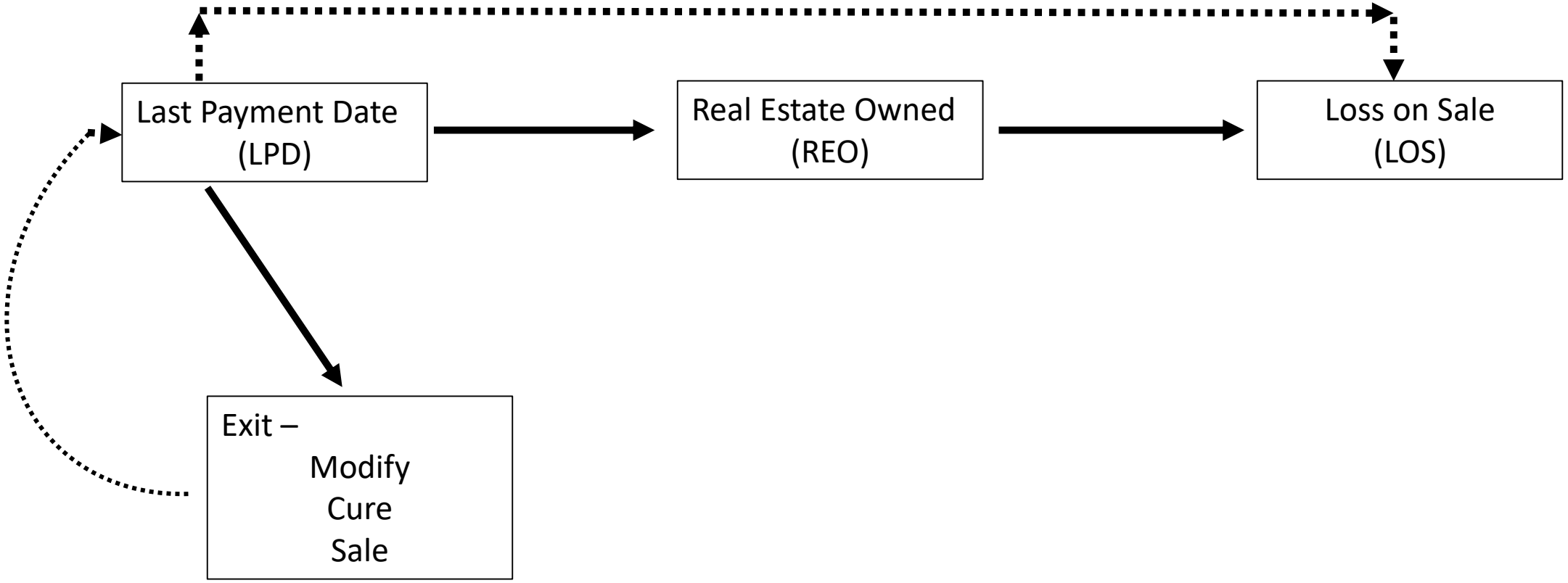
Introduction

- Losses on mortgages very important
  - Interest rates, capital standards (Basel II &III), regulatory agencies (OCC etc..) and model validation
- Two parts of losses
  - Probability of Default & Prepayment
    - Lots of data and lots of paper
  - Loss given default (lgd) – relatively short literature
    - Lekkas et al. 1993, Crawford and Rosenblatt 1995, Pennington-Cross 2003, Clauretie and Herzog 1990, and Zhang, Li, and Liu 2010 Calem and LaCour-Little 2004, Qi and Yang 2009, Cordell, Geng, Goodman, and Yang 2013, An and Cordell 2017.
    - Current LTV matters a lot, product type and likely foreclosure laws

Introduction

- Many ways to measure losses
  - Loss **on sale**: $los_i = (upb_i - nsp_i) / upb_i$ (Lekkas et al. 1993, Crawford and Rosenblatt 1995, and Pennington-Cross 2003).
    - economic and financial considerations should determine this loss rate, not servicer and lender operational efficacy.
    - costs of selling the property or the net sale proceeds (Park and Bang 2014)
  - Loss on **original balance** (Clauretie and Herzog 1990, and Zhang, Li, and Liu 2010).
  - **Closer to the full costs** associated with a default
    - Proxies of lost interest payments, and proxies for insurance costs and real estate taxes (Calem and LaCour-Little 2004, Qi and Yang 2009 and Cordell, Geng, Goodman, and Yang 2013, An and Cordell 2017).
- Discount of Foreclosed Property
  - Forced sale urgency
    - Bankruptcy – urgency matters to discount (Campbell, Giglio and Pathak 2011)
    - Fear of vandalism (Campbell, Giglio and Pathak 2011)
    - Short sales at smaller discount (Goodwin and Johnson, 2017)
  - Lack of maintenance theory -- for example, Pennington-Cross (2006)
    - High LTV – less maintenance -- Harding, Miceli and Sirmans (2000)
    - Forced sale due to death – timing does not matter – must be maintenance (Campbell, Giglio and Pathak (2011)
  - Foreclosed property values declined more – why defaulted
    - largely unobservable

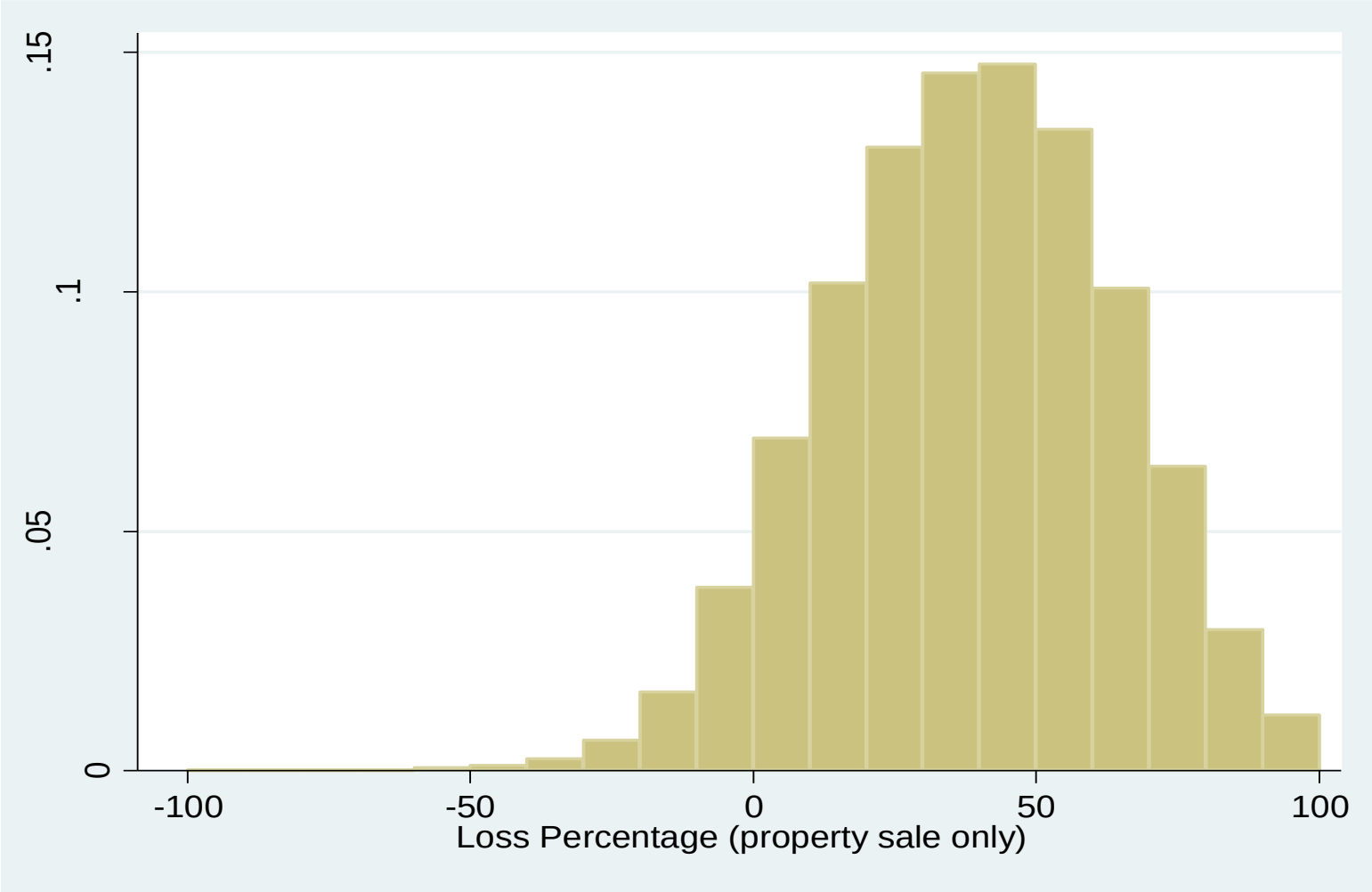
The Process


Last Payment Date
(LPD)
Real Estate Owned
(REO)
Loss on Sale
(LOS)
Exit –
Modify
Cure
Sale

The Plan

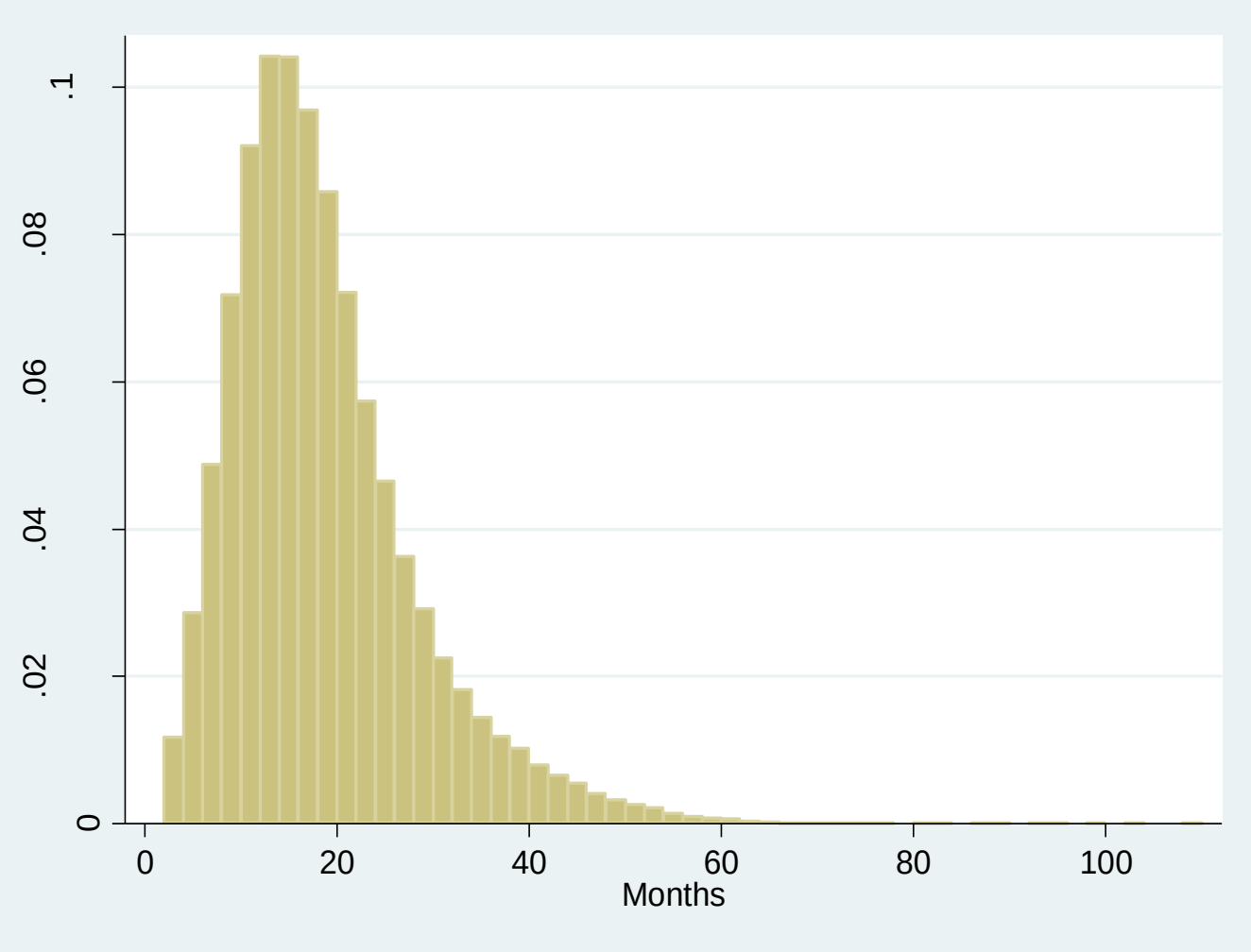
- Estimate loss on the sale: $los_i = (upb_i - nsp_i) / upb_i$
- Estimate default timeline: last payment date to zero balance date
- Estimate holding costs
- Calculate total losses
  - Holding + sale
- Issues
  - Selection
  - Endogeneity
    - Does length of the timeline affect the loss on sale?
  - Legal Rights of the borrower and lender

1. Loss on Sale distribution



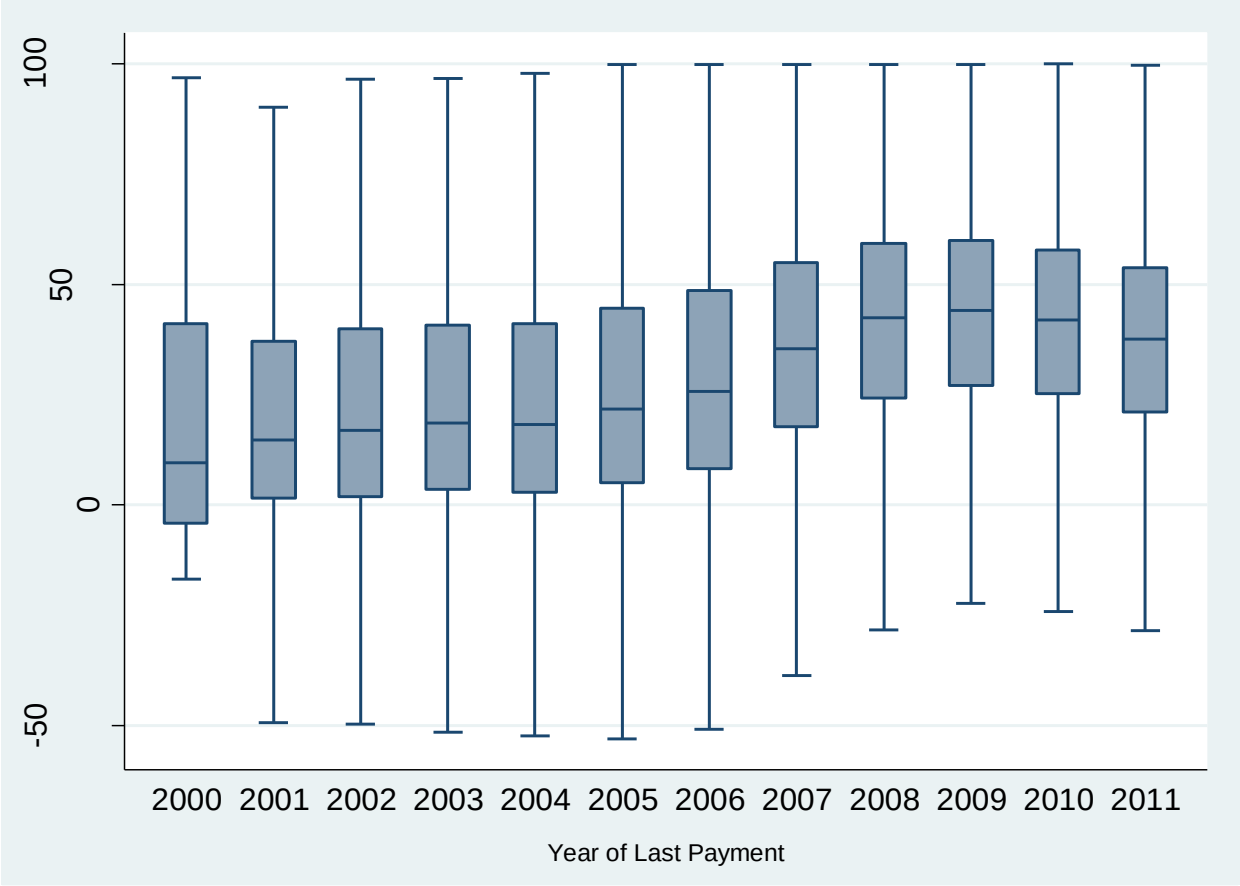
Loss Percentage equals unpaid balance at the end of the loan's life less the sale price divided by unpaid balance at the end of the loan's life. Each column represents the fraction of all loans in the bucket. The bucket is 10 percentage points wide. For example, the column just to the right of 0 on the x-axis indicates that approximately 7.5 percent of the loans had a loss percentage >= 0 and < 10.

2. Default Timeline distribution: last payment date to resolution date



Months equals the number of months from when the last payment was made by the borrower until the loan is fully resolved by Freddie Mac. The bucket is 2 months wide. For example, the column just to the right of 0 on the x-axis indicates that 0 percent of the loans were in default for months >= 0 and < 2.

2. Default timelines over time: last payment year – box charts



The box includes the 25th to 75th percentile of the distribution and the line in the box is the median. The whiskers or lines leading out of the box extend to the last adjacent value (next value is more than one unit away).

3. Holding Costs

Variable	Mean	Standard Deviation
house value$_i$	$164.64	85.95
months$_i$	21.33	9.46
legal$_i$	$3.89	1.92
maintenance$_i$	$6.71	6.84
taxes and insurance$_i$	$5.83	6.26
miscellaneous$_i$	$0.63	1.15

This information was only available for the 2005-2014 time period.

All dollars in 1,000s. Months is the number of months from the last payment date to zero balance. House Value is the estimate of the value at the zero balance date.

1. Estimate loss on the sale

$$los_i = (upb_i - nsp_i) / upb_i$$

1. Loss on Sale (los_{it}) Results

	V: Servicer & State	
Variable	Coeff.	SE
ltv_{it}	0.50***	0.02
upb_{it}	-0.11***	0.00
$fico_i$	-0.88***	0.16
$first_i$	-1.55***	0.21
$\Delta urate_{it}$	0.70***	0.13
$retail_i$	-3.04***	0.22
$cashrefi_i$	7.82***	0.36
$nocashrefi_i$	5.81***	0.31
fixed effects:		
origination year	x	
last payment year	x	
servicer	x	
state	x	
constant	9.21	8.59
R^2	0.38	
N	207,162	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level. Ordinal Least Squares results allowing the errors to correlate within 3-digit zip codes.

1. Loss on Sale (los_{it}) Robustness

	I: State-Year Interactions		III: Purchase Only	
Variable	Coeff.	SE	Coeff.	SE
ltv_{it}	0.50***	0.02	0.49***	0.02
upb_{it}	-0.11***	0.00	-0.11***	0.00
$fico_i$	-0.88***	0.15	-0.14	0.17
$first_i$	-1.46***	0.21	-1.06***	0.21
$\Delta urate_{it}$	0.70***	0.13	0.87***	0.15
$retail_i$	-3.06***	0.21	-1.73***	0.28
$cashrefi_i$	7.75***	0.35		
$nocashrefi_i$	5.73***	0.30		
fixed effects:				
origination year	x		x	
last payment year	x		x	
last payment year *state	x			
state	x		x	
servicer	x		x	
constant	-21.06	5.99	-8.34	10.53
R^2	0.39		0.40	
N	207,162		82,574	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level. Ordinal Least Squares results allowing the errors to correlate within 3-digit zip codes.

1. Loss on Sale (los_{it}) Selection

Probit 1st Stage Results

Variables	Coeff.	SE
$fico_i$	-0.404	0.004
$debt_i$ / $income_i$	0.837	0.018
ltv_i	0.027	0.000
$(ltv_i>80)*ltv_i$	-0.001	0.000
loan $amount_i$	-0.059	0.003
two $borrowers_i$	-0.272	0.000
fixed effects:		
origination year	x	
state	x	
servicer	x	
constant	-2.545	0.070
Psuedo R^2	0.27	
N	519,520	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level. Standard errors are clustered at the three-digit zip code level. All variables are measured at origination. The left hand side variable is an indicator equal to 1 if the loan is ever foreclosed across all observed time periods. A random sample of loans originated in each year is included. Each loan is weighted by the inverse of the probability that it is included in the sample. Foreclosed loans are oversampled with a probability of 100%. The additional variables are the debt to income ratio (debti / incomei), a spline that allows the coefficient for ltvi to change for loans with ltv's greater than 80 ((ltvi>80)*ltvi), and a dummy variable indicating loans with 2 or more borrowers (two borrowersi).

1. Loss on Sale (los_{it}) Selection

	IV: Selection Correction	
Variable	Coeff.	SE
ltv_{it}	0.48***	0.02
upb_{it}	-0.11***	0.00
$fico_i$	**0.41**	**0.31**
$first_i$	-1.66***	0.21
$\Delta urate_{it}$	0.77***	0.13
$retail_i$	-2.91***	0.22
$cashrefi_i$	8.41***	0.34
$nocashrefi_i$	6.25***	0.30
Inverse Mills$_i$	**-4.09*** **	**0.66**
fixed effects:		
origination year	x	
last payment year	x	
last payment year *state		
state	x	
servicer	x	
constant	-4.23	5.10
R^2	0.38	
N	202,640	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level. Ordinal Least Squares results allowing the errors to correlate within 3-digit zip codes.

2. Estimate default timeline: last payment date to zero balance date

2. Default Timeline Results (log of months)

	II. Reo defaults: Full timeline	
Variable	Coeff.	SE
$lnltv_{it}$	-0.096***	0.014
$lnupb_{it}$	0.096***	0.004
$lnfico_{i}$	-0.323***	0.015
$first_{i}$	0.012***	0.003
$\Delta urate_{it}$	0.006***	0.002
$retail_{i}$	-0.019***	0.002
$cashrefi_{i}$	0.021***	0.004
$nocashrefi_{i}$	0.016***	0.003
fixed effects:		
origination year	x	
last payment year	x	
servicer	x	
state	x	
constant	3.349***	0.106
R^2	0.33	
N	140,305	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level.
Ordinal Least Squares results allowing the errors to correlate within 3-digit zip codes.

2. Default Timeline & Loss on Sale

	I: OLS		II: Contemporaneous IV		III: One Year Lag IV	
Variable	Coeff.	SE	Coeff.	SE	Coeff.	SE
IV months$_{it}$	**0.01**	**0.02**	**0.03**	**0.04**	**-0.01**	**0.04**
ltv$_{it}$	0.50***	0.02	0.95***	0.03	0.49***	0.02
upb$_{it}$	-0.11***	0.00	0.19***	0.01	-0.11***	0.00
fico$_i$	-0.85***	0.15	-0.94***	0.18	-0.14	0.17
…						
origination year	x		x		x	
last payment year	x		x		x	
state	x		x		x	
servicer	x		x		x	
constant	-9.54	8.58	-9.83	8.59	-2.35	12.62
R^2	0.38		0.38		0.38	
N	207,162		207,162		206,773	
Endog. F-Stat	0.16		0.42		0.42	
First Stage Robust Partial R2	0.37		0.31		0.31	

*, **, and *** indicate that the coefficient is significant at the 10, 5, or 1 percent level. The instrument is the number of months from the last payment date to the end of the loan for the 3-digit zip code the property is located in. Specification II uses the contemporaneous zip code months. Specification III uses one-year lagged months. Specification IV uses 2-year lagged months. The standard errors are clustered at the three-digit zip code level.

WHAT?

- **Longer foreclosure holding period – higher losses:** An and Cordell (2017)
  - Why different?
    - Losses include lost interest and proxies for holding costs
      - by definition increases with the holding period
- **Lack Maintenance and Vandalism is the reason for the foreclosure discount:** Campbell, Giglio and Pathak 2011
  - Why different?
    - Only GSEs in this paper
    - GSEs do substantial maintenance
      - Bring back to average market quality for sale
    - Only include foreclosed property
- **Can directly measure maintenance costs**

3. Estimate holding costs

3. Maintenance and other Holding Costs

	I. Legal		II. Maintenance		III. Taxes and Insurance	
Variable	Coeff.	SE	Coeff.	SE	Coeff.	SE
house value$_{it}$	1.47	0.04	16.25	0.18	25.49	0.13
month_ltz$_{it}$	46.35	0.46	141.31	1.87	327.96	1.38
zero balance year						
2006	231.76	26.89	-31.99	109.60	59.71	80.93
2007	355.50	26.41	-581.79	107.63	34.95	79.48
2008	579.30	23.88	-1,638.82	97.31	150.30	71.86
2009	806.27	21.76	-1,400.67	88.69	609.22	65.49
2010	978.16	20.67	-915.26	84.23	726.03	62.20
2011	1,109.96	20.47	768.82	83.41	825.51	61.60
2012	1,270.87	20.70	2,220.34	84.36	1,037.38	62.29
2013	913.45	21.31	4,900.31	86.86	745.33	64.14
state	x		x		x	
constant	1,486.47	114.52	-973.69	466.71	-7,609.06	344.64
R^2	0.42		0.24		0.50	
N	184,033		184,033		184,033	

4. Calculate total losses

4. Total Losses

	Representative loan
Total I	42.3%
Total II	48.3%
Loss on sale	32.7%
Holding Cost	7.9%
Legal	2.4%
Maintenance	2.3%
Tax and Insurance	2.9%
Miscellaneous	0.3%
Carrying Cost	
I: Mortgage & Treasury	1.8%
II: Mortgage Rate	7.8%

Representative Loan

- Average: ltv_{it}, upb_{it}, $fico_{it}$, $first_{it}$, $\Delta urate_{it}$, state fixed effect, and servicer fixed effects
- retail, purchase
- originated in 2006 & last payment made in 2010
- real estate owned

5. Legal rights of the borrower and lender

5. Borrower and lender rights & mortgages

- **judicial foreclosure** proceedings
  - the foreclosure process takes longer
  - defaulted loans may modify a little more
  - cure less or more (in other words, empirical results are mixed)
  - little impact on the final outcome for the borrower.
- the right to **redeem** the property
  - less clear in terms of default rates but again is associated with longer foreclosure timeline.

(Collins, Lam and Gerardi 2011, Demiroglu, Dudley and James 2014, Lambie-Hanson and Willen 2013, Cordell, Geng, Goodman and Yang 2013, and Clauretie and Herzog 1990).

- Lender **recourse** beyond property taking
  - Decrease foreclosure rates – esp. if negative equity, ltv>100
  - (Ghent and Kudlyak 2011, Cha, Haughwout, Hayashi and Klaauw 2015).
- **Impact of losses?**
  - Time cost, dollar cost, or both?

5. Loss on Sale & Borrower and Lender Rights

	I. Complete Sample		II. Border Samples		III. Matched Samples on the Borders	
Variable	Coeff.	SE	Coeff.	SE	Coeff.	SE
$judicial_i$	**3.30****	1.46	-1.73	2.23	-0.71	2.32
ssr_i	1.66	1.27	0.46	0.91	-0.04	1.41
$recourse_i$	0.75	1.17	-0.49	1.07	-1.20	1.02

Border Sample: 3-digit zip codes along state borders where the neighboring state has a different law. Different sample for each test

Matched Sample: Closest 1 to 1 match across the border: unpaid balance, current ltv and last payment year.

20 Judicial Borders: ARLA, AZNM, FLAL, FLGA, GASC, IAMO, ILMO, KSMO, KSOK, MDVA, MDWV, MIIN, MIOH, MNWI, MSLA, NCSC, NDMN, OHWV, PAWV, and TXLA

21 SRR Borders: ALFL, ALGA, ALMS, ARLA, AROKTX, CANV, IANE, IAWI, IDMT, IDUT, IDWA, ILIN, ILWI, KSNE, KSOK, KYIN, MIIN, MIOH, NJPA, ORNV, and ORWA

11 Recourse Borders: AZNM, CANV, IAIL, IAMO, IANE, IDWA, ILWI, NCSC, NCVA, ORNV, and TNNC

5. Holding Period & Borrower and Lender Rights

	III. Matched Samples on the Borders	
Variable	Coeff.	SE
$judicial_i$	0.286***	0.025
srr_i	0.046*	0.024
$recourse_i$	-0.044**	0.021

Border Sample: 3-digit zip codes along state borders where the neighboring state has a different law. Different sample for each test

Matched Sample: Closest 1 to 1 match across the border: unpaid balance, current ltv and last payment year.

Conclusion – Mortgage Losses

- Huge spatial variation – across states and within states
  - Empirical model does surprisingly well
- Loan, property and borrower characteristics matter
- Holding costs matter but not as much as the sale
- No evidence holding period affects loss on the sale
  - Does affect total losses
- Legal
  - No evidence affect loss on sale
  - Strong impacts on the default holding period
    - Judicial extends holding period and holding costs
    - Recourse reducing the holding period
- Living in the GSE world