



Advantages and Disadvantages of Securitization: Evidence from Commercial Mortgages

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Securitization

Securitization: The process of creating securities from other assets (usually loans)

Example: Create a security that consists of claims to the cash flows of 200 underlying residential mortgages

- Mortgages can be originated by different institutions
- A sponsor buys the loans from the originators and then issues a mortgage-backed security (MBS)
- MBS can then be sold to various investors (banks, insurers, hedge funds, pensions, etc...)
- MBS holder receives cash flows from all the mortgages in the pool



Prior to 2008-2009 financial crisis, securitization

- usual structure for financing residential mortgages in US
- common for commercial mortgages, bank loans, auto loans, student loans, and credit card receivables
- in 2007, approximately 25% of US non-real estate consumer debt was securitized

Although securitization is far from new (widespread securitization dates from 1850s in US), it has come under scrutiny since the financial crisis



Motivation

Concerns regarding securitization:

1. Regulatory arbitrage: e.g., Acharya, Schnabl, and Suarez (forthcoming)
2. Monitoring and renegotiating securitized loans may be more difficult
3. How to deal with “securitized-banking” runs? Gorton and Metrick (2012)
4. Potential for adverse selection / reduced scening
 - possibility that securitized loans are of lower quality based on unobservables or
 - possibility that originators of securitized loans do not acquire ‘soft’ information on loan quality



Motivation

Rulemaking pursuant to Dodd-Frank Act deals with the concern regarding adverse selection by forcing originators to retain some of the risk of any securitized loan on balance sheet (“skin in the game”)

- effective January 2013
- “qualified residential mortgages” exempt
- Dodd-Frank required originators to retain 5% of the risk of securitized loans
- most likely, implementation will be vertical retention of risk (i.e., retain 5% of every tranche)



This Paper

Compare securitized and balance sheet commercial mortgages to see which loans are more likely to be securitized

First paper with dataset that contains both securitized and balance sheet commercial mortgages from multiple lenders



This Paper

Advantages of commercial mortgage market

- Most research focused on residential mortgage market where presence of GSEs makes it difficult to extrapolate findings to other asset classes
- No requirement that CMBS issuers or loan sellers have any explicit “skin in the game” unlike in Collateralized Loan Obligation (CLO) market (Benmelch, Dlugosz, and Ivashina, 2012)
- Unique conduit model in commercial mortgage market: securitization status determined at origination rather than after origination
- Large loans with high property-specific (i.e., idiosyncratic) risk which may make it easier to detect risk sharing motives

This Paper: Findings

1. Main difference between CMBS and balance sheet loans is size
 - CMBS loans are much larger than balance sheet loans
 - diversification being a key motivation for securitization
2. Loans that require more monitoring are less likely to be securitized
3. Overall, CMBS loans do not perform worse than balance sheet loans after controlling for observables
 - no difference in likelihood of default or recovery rates
4. Defaulted CMBS loans slower to get resolved in the sense of property being disposed of by lender
 - agency problems with servicing CMBS mortgages
5. Some evidence consistent with adverse selection in subsamples



Data

- Data from Real Capital Analytics (RCA)
- Single-property purchase mortgages on office buildings in Boston, LA, Las Vegas, and NYC metro areas
 - culled from property sales
 - originated Jan. 2005 - Apr. 2012
 - cities account for about 35% of US office property market
 - securitization status at origination
- RCA's Troubled Assets database
 - indicates whether loan has experienced trouble (delinquency, foreclosure initiated, foreclosure completed, borrower bankruptcy, assorted other events)
 - resolution status
 - link with main RCA data using property address and origination year
- Cross-reference balance sheet loans with TREPP CMBS data



Data

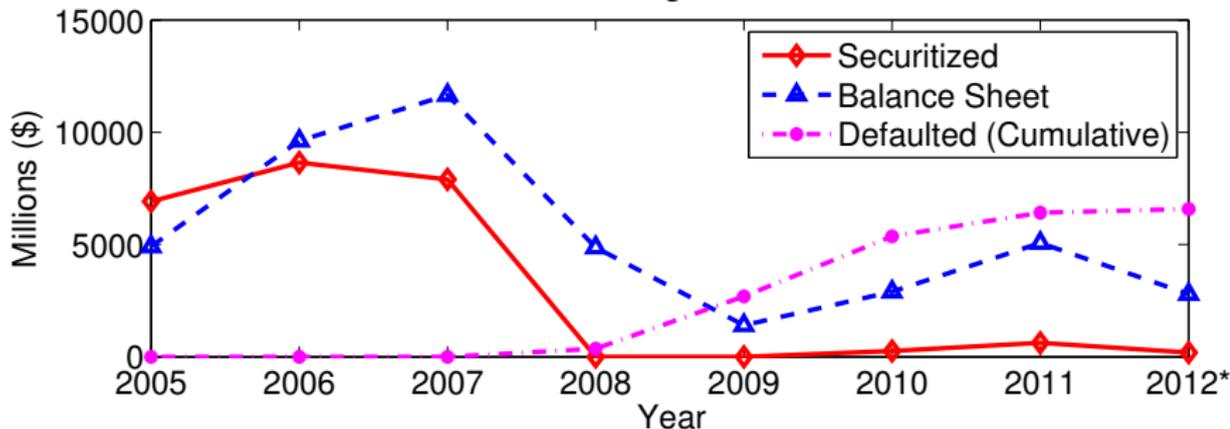
Defaulted Loans

- Have more info on securitized loans than on balance sheet loans
- TREPP, for example, records 30, 60, 90 day delinquencies, transfer to the special servicer, renegotiations, etc...
- Only count default events that are observable for both balance sheet and securitized loans
 - borrower bankruptcy
 - foreclosure initiated
 - foreclosure completed
- Our defaults are quite serious defaults
 - borrower almost always loses control of the property
- Dating of default is quite late into distress

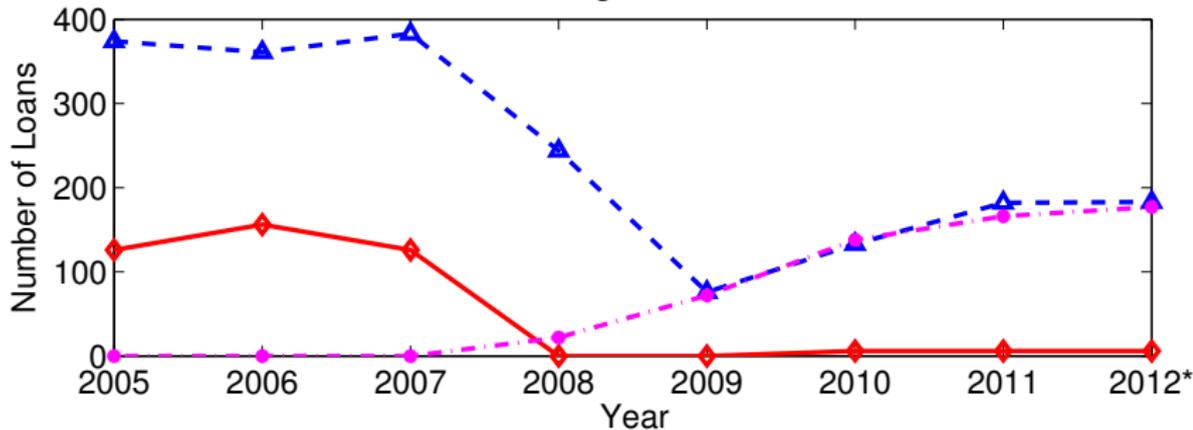
Summary Statistics

Characteristic	Mean	SD	Min	Max	No. Obs.
CMBS	0.19	0.39	0	1	2236
Loan Amount (\$M)	29	83	0.2	1,900	2236
Loan-to-Value (LTV)	0.75	0.46	0.03	9.73	2235
Origination Year	2007.16	1.99	2005	2012	2236
Property Price (\$M)	45	144	1.6	2,950	2235
Price / Square Foot (\$)	328	328	11	4,933	2234
Year Built	1963.95	32.77	1732	2011	2176
Square Feet ($\times 10^3$)	122.91	234.18	0.90	2,961.07	2234
Floors	6.43	8.47	1	77	1836
Multiple Building	0.07	0.25	0	1	1965
CBD	0.32	0.47	0	1	2236
NYC Metro	0.40	0.49	0	1	2236
LA Metro	0.43	0.49	0	1	2236
Boston Metro	0.13	0.33	0	1	2236
Las Vegas Metro	0.04	0.20	0	1	2236
Developer/Owner	0.65	0.48	0	1	2236
Equity Fund	0.08	0.27	0	1	2236
Corporate	0.06	0.24	0	1	2236
REIT	0.04	0.20	0	1	2236
Unknown	0.09	0.28	0	1	2236

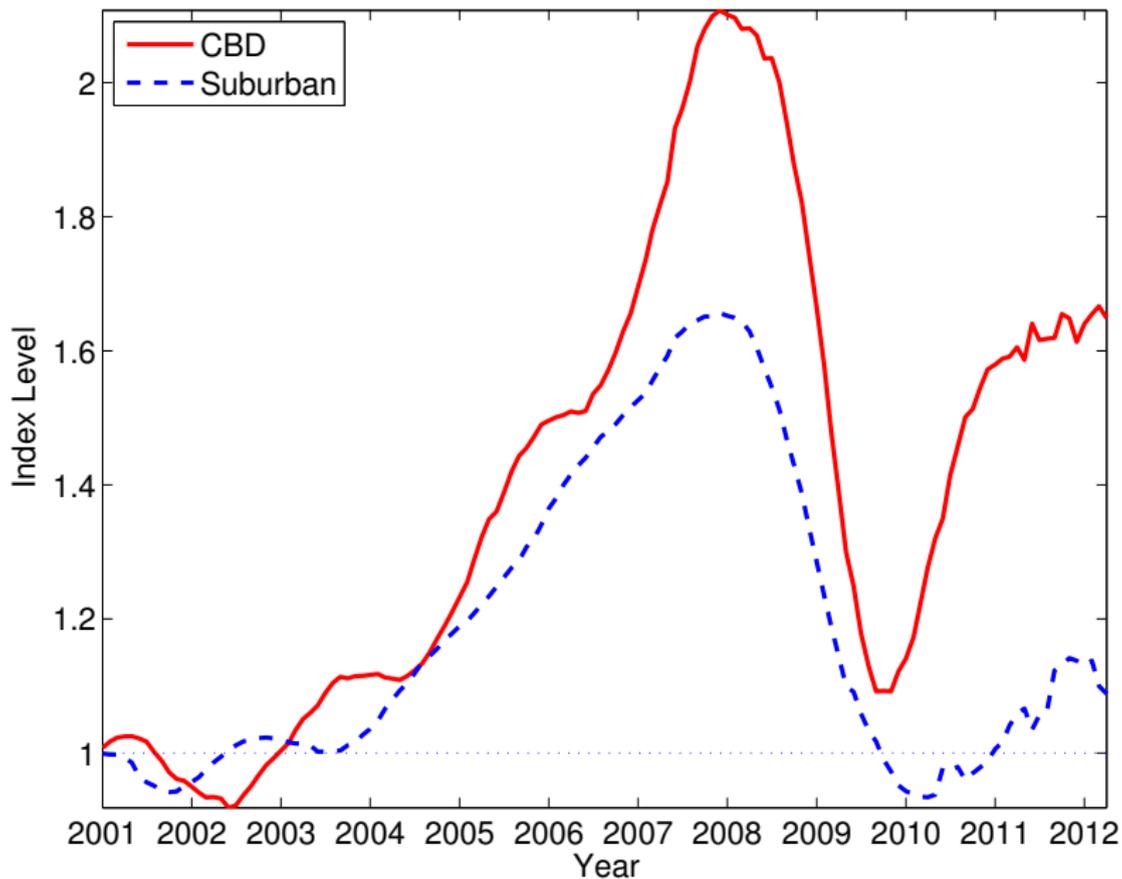
Panel A: Dollar Value of Originated and Defaulted Loans



Panel B: Number of Originated and Defaulted Loans



RCA Repeat Transaction Office Property Prices



Balance Sheet vs. CMBS Loans

Characteristic	Balance Sheet		Securitized (CMBS)		Difference in Means
	Mean	SD	Mean	SD	
Loan Amount (\$M)	23	72	58	118	-35***
LTV	0.75	0.50	0.72	0.17	0.03
Origination Year	2007.40	2.07	2006.16	1.15	1.25***
Property Price (\$M)	34	121	91	210	-57***
Price / Sq. Foot (\$)	331	350	317	210	14
Year Built	1962.16	33.15	1971.47	30.03	-9.30***
Square Feet	99,480	201,537	223,509	321,936	-124,028***
Floors	5.88	7.83	8.90	10.57	-3.01***
Multiple Building	0.05	0.22	0.12	0.33	-0.07***
CBD	0.33	0.47	0.27	0.44	0.06**
NYC Metro	0.39	0.49	0.44	0.50	0.04
LA Metro	0.44	0.50	0.37	0.48	0.07***
Boston Metro	0.13	0.34	0.13	0.33	0.00
Las Vegas Metro	0.04	0.19	0.07	0.25	-0.03***
Developer/Owner	0.66	0.47	0.62	0.49	0.04
Equity Fund	0.07	0.25	0.14	0.34	-0.07***
Corporate	0.07	0.26	0.02	0.13	0.05***
REIT	0.03	0.16	0.09	0.29	-0.07***
Unknown	0.10	0.30	0.05	0.22	0.05***



Predicting Securitization

- Estimate probit model of securitization
- Dependent variable takes a value of 1 if loan is securitized, 0 otherwise
- Independent variables:
 - log loan amount
 - proxy for development / redevelopment loan ($LTV \geq 1$)
 - Loan to Value (LTV)
 - price per square foot
 - Central Business District (CBD) dummy
 - multi-building dummy
 - dummy for depository US institution
 - year of origination dummies (2005, 2006, and 2007)
 - MSA dummies
 - property age dummies
 - borrower type dummies

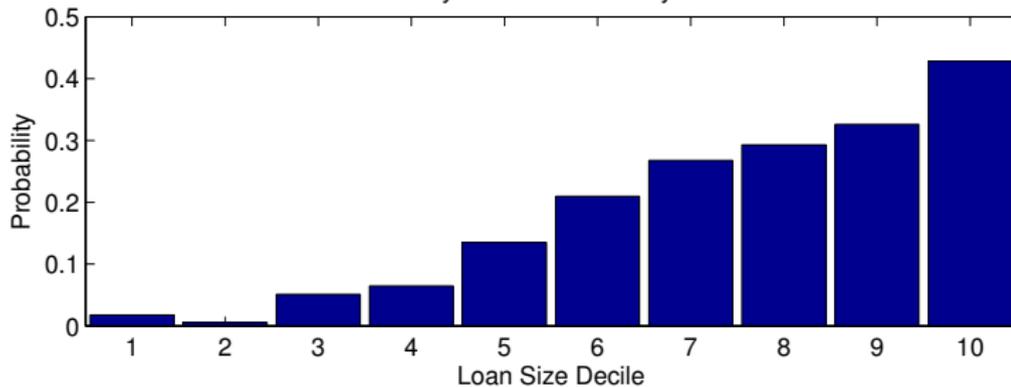


Probit Estimation of Securitization

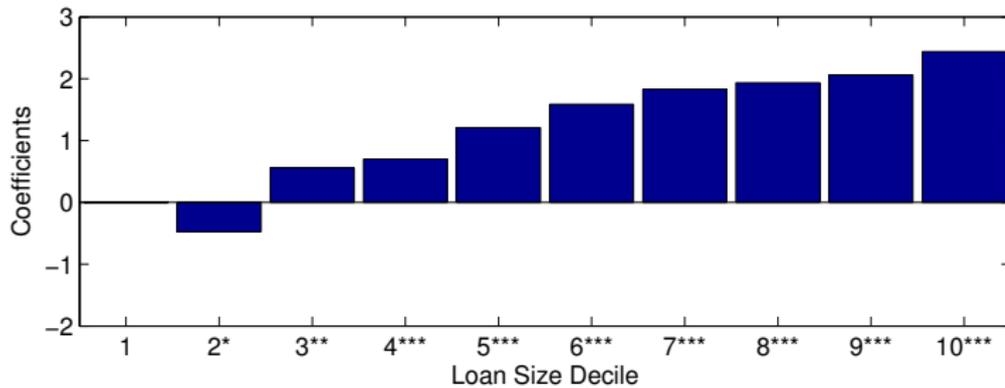
Dependent Variable is CMBS (=1 if Securitized)

	ALL	ALL	US Dep.	US Dep.	Top 10
Log Loan Amt.	8.9%***	Deciles	9.6%***		8.5%***
Lender Size			2.5%***	4.3%***	
Rel. Loan Amt.				251%***	
Development	-22%***	-20%***	-27%***	-36%***	-38%***
LTV	-4%	-6%**	2%	13%***	3%
Price / Sq. Ft.	-0.0073%**	-0.0028%	-0.0016%	0.0026%	-0.0015%
CBD	-12%***	-10%***	-13%***	-2%	-11%**
Multi-building	4.5%	4.8%*	10.7%**	20.1%***	5.1%
Depository Inst.	3.8%**				
Orig. Yr. FEs	Yes	Yes	Yes	Yes	Yes
MSA FEs	Yes	Yes	Yes	Yes	Yes
Prop. Age FEs	Yes	Yes	Yes	Yes	Yes
Borrower Types	Yes	Yes	Yes	Yes	Yes
Originator FEs	No	No	No	No	Yes
Number of Obs.	1962	1962	825	825	514
Pseudo- R^2	33%	35%	41%	30%	44%

Panel A: Probability of Securitization by Loan Size Decile



Panel B: Probit Coefficients on Loan Size Decile





Predicting Securitization: Summary

Differences:

- large loans are much more likely to be securitized
 - robust to including measures of size of institution
 - effect persists within lender
- development loans are less likely to be securitized
- loans originated depository institutions more likely to be securitized
- loans originated by large institutions more likely to be securitized

Sensitivity Analyses:

- different measures of size
- only 2005-2007 originations
- logit instead of probit



Predicting Default

- Estimate probit model of default
- Dependent variable takes a value of 1 if loan defaults, 0 otherwise
- Independent variables:
 - indicator for CMBS
 - log loan amount
 - development loan proxy
 - LTV
 - price per square foot
 - CBD dummy
 - year of origination dummies (2005, 2006, and 2007)
 - MSA dummies
 - property age dummies
 - borrower type dummies



Probit Estimation of Default

Dependent Variable is Default (=1 if Default)

	ALL	ALL	US Dep.	US Dep.	Top 10
CMBS	1.0%	1.2%	3.2%*	4.4%*	4.7%*
Log Loan Amount	2.1%***	1.9%***	1.0%	1.2%	1.6%
Log Lender Assets				-0.066%*	
Development	1.5%	1.4%	1.5%	0.8%	9.3%*
LTV	1.9%*	1.9%*	2.9%	3.2%	-7.0%
Price per Sq. Foot	-0.0004%	-0.0004%	-0.0032%	-0.0044%	-0.0070%
CBD	0.1%	0.3%	3.4%	5.3%*	-2.6%
Multi-building	-1.0%	-1.9%	-4.3%	-4.6%	-5.3%
Depository US Inst.		-2.0%*			
Orig. Yr. FEs	Yes	Yes	Yes	Yes	Yes
MSA FEs	Yes	Yes	Yes	Yes	Yes
Prop. Age FEs	Yes	Yes	Yes	Yes	Yes
Borrower Types	Yes	Yes	Yes	Yes	Yes
Originator FEs	No	No	No	No	Yes
Number of Obs.	1962	1962	1066	825	514
Pseudo- R^2	11%	11%	13%	11%	16%



Predicting Default: Summary of Full Sample Results

- Overall, CMBS loans do not default more than balance sheet loans
- Loans from depository institutions default less
- Loans from larger institutions are less likely to default
- Loans on newer properties more likely to default
- Loans on property in Las Vegas more likely to default



Predicting Default: Subsample Results

- Within set of higher quality of originators (depository institutions) where we can control for originator size, some evidence that CMBS loans default more
- Within set of large originators with significant balance sheet and CMBS programs, and for which we can control for originator fixed effects, some evidence that CMBS loans default more
- Suggests there is substantial heterogeneity in quality of loans from various originators
- Many low quality loans held on balance sheet by non-depository originators may mask differences in default between CMBS and balance sheet loans in full sample



Predicting Default: Sensitivity Analysis

- Potential collinearity between size and CMBS:
 - estimate only with large loans (above median size) omitting size as control
 - estimate with size in only four categories
 - drop size outliers
- Other Sensitivity Analyses:
 - estimate using only 2005-2007 originations
 - exclude development loans
 - proportional hazards model using only information known at origination
 - proportional hazards model using characteristics known at origination and dynamic information on MSA level employment and office property prices



Resolution of Defaulted Loans

- Resolved loans: Loans for which balance sheet lender / CMBS trust has disposed of asset
- Recovery rate on resolved CMBS loans: 72%
- Recovery rate on resolved balance sheet loans: 70%
- By end of sample, 55% of defaulted balance sheet loans had been resolved
- By end of sample, only 31% of defaulted CMBS loans had been resolved



Probit Estimation of Resolution

Dependent Variable is Resolved (=1 if Resolved)

	(1)	(2)	(3)
Constant	0.03 (0.43)	-0.62 (0.41)	-0.86* (0.51)
CMBS	-0.67*** (0.24) -24%	-0.56** (0.24) -19%	-0.57** (0.24) -19%
Log Loan Amount	-0.074 (0.088) -2.7%	-0.068 (0.091) -2.3%	-0.077 (0.093) -2.6%
Orig. Yr. FEs (2005, 2006, and 2007)	Yes	No	Yes
MSA FEs	Yes	Yes	Yes
Default Yr FEs (2008, 2009, 2010)	No	Yes	Yes
Number of Obs.	175	175	175
Pseudo- R^2	8.3%	14.2%	14.6%



Disentangling Adverse Selection from Causal Effects of Securitization

We observe only default, not distress

Some literature (Gan and Mayer, 2007; Ambrose, Sanders, and Yavas, 2009) suggests securitization impedes renegotiation of distressed commercial mortgages

How do we interpret the lack of differences in default in terms of a model of adverse selection based on risk?

Although securitization status usually determined at origination, do loans end up in the securitized market because they have weaker soft information characteristics?



Simple Model to Disentangle Adverse Selection

$$Y_{i,t}^* = x_{i,t-1}\beta + \gamma\varepsilon_{i,t}^{DISTRESS} + \varepsilon_{i,t}^{CMBS}. \quad (1)$$

- $Y_{i,t}^*$ is latent variable for securitization (securitized loan if $Y_{i,t}^* > 0$)
- $\varepsilon_{i,t}^{DISTRESS}$ and $\varepsilon_{i,t}^{CMBS}$ are orthogonal to each other
- $\varepsilon_{i,t}^{DISTRESS}$ represents unobservables that affect the likelihood that a loan will be in distress and at risk of default
- $\varepsilon_{i,t}^{DISTRESS}$ captures soft information
- $\varepsilon_{i,t}^{DISTRESS}$ is not directly observable from the data
- $\gamma > 0$ indicates adverse selection



Distress (not directly observable)

$$Z_{i,t+1}^* = \tilde{x}_{i,t-1}\eta + \varepsilon_{i,t+1}^{DISTRESS} \quad (2)$$

- note that securitization does not affect whether loan gets distressed

$$\varepsilon_{i,t+1}^{DISTRESS} = \varepsilon_{i,t}^{DISTRESS} + v_{i,t+1} \quad (3)$$

- $v_{i,t+1}$ is i.i.d. zero-mean random variable



Default and Distress

$$\begin{aligned} P(D_{i,t+1} = 1) &= P(D_{i,t+1} = 1 | Distress_{i,t+1} = 1) * P(Distress_{i,t+1} = 1) \\ &= p_{i,t+1} P(Z_{i,t+1}^* > 0) \\ &= p_{i,t+1} \Phi(\tilde{x}_{i,t-1}\eta) \end{aligned}$$

- $D_{i,t+1}$ is default
- $p_{i,t+1}$ is probability that loan defaults conditional on loan being distressed
- $p_{i,t+1} = 1$ if all distressed loans default
- $p_{i,t+1}$ could be higher for CMBS than for balance sheet loans
- $p_{i,t+1}$ is only causal channel through which securitization affects loan performance



Estimating the Model

We adopt the simple function

$$p_{i,t+1} = \begin{cases} 1 & CMBS_{i,t} = 1 \\ \alpha & CMBS_{i,t} = 0 \end{cases} \quad (4)$$

Now, can estimate default equation using MLE for a given α

Estimating default equation and using generalized residuals (Chesher and Irish, 1987) gives us $\hat{\varepsilon}_{i,t+1}^{DISTRESS}$

Set $\hat{\varepsilon}_{i,t}^{DISTRESS} = \hat{\varepsilon}_{i,t+1}^{DISTRESS}$

Now can estimate equation governing selection into securitization

Estimation of Loan Securitization

	Full Sample		Depository Originator	
	$\alpha = 1$	$\alpha = 0.8$	$\alpha = 1$	$\alpha = 0.8$
Constant	-3.00*** (0.25)	-3.01*** (0.25)	-5.71*** (1.17)	-5.71*** (1.17)
Log Loan Amount	0.50*** (0.04)	0.50*** (0.04)	0.61*** (0.07)	0.60*** (0.07)
Log Lender Assets			0.15*** (0.03)	0.15*** (0.03)
Development (LTV ≥ 1)	-1.22*** (0.25)	-1.23*** (0.25)	-1.73*** (0.50)	-1.74*** (0.50)
LTV	-0.23 (0.15)	-0.22 (0.15)	0.10 (0.31)	0.11 (0.31)
Price per Square Foot	-0.42** (0.19)	-0.43** (0.19)	-0.09 (0.29)	-0.10 (0.29)
CBD	-0.67*** (0.16)	-0.67*** (0.16)	-0.78*** (0.26)	-0.77*** (0.26)
Multi-building	0.25 (0.16)	0.25 (0.16)	0.67** (0.33)	0.67** (0.33)
Depository US Inst.	0.22*** (0.08)	0.22*** (0.08)		
γ	0.0368 (0.0706)	-0.0483 (0.0768)	0.1933 (0.1195)	0.1239 (0.1277)



Conclusions

Key difference between securitized and balance sheet loans is size

- Diversification benefit of securitization

Loans that require more monitoring less likely to get securitized

Securitized loans take longer to get resolved

- Agency issues with servicers?

Weak evidence of adverse selection into securitization

Model illustrates difficulty of detecting adverse selection if securitization also has a causal impact on performance



Conclusions

Collapse of securitization in commercial mortgages (and failure to restart) may not be due to particularly poor performance of securitized loans

Similar pattern to commercial mortgage securitization in the 1920s (Goetzmann and Newman, 2010)

Need more research into variation over time in securitization rates