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Some Loans Are More Equal Than Others: Third-Party Originations and Defaults in the Subprime Mortgage Industry

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Outline

- Subprime Industry
- Difference Between Retail and Third Party Originated Loans
- Borrower Repayment Behavior
- Mortgage Duration Model
- More Controls or Price the Risk?



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1. Data

Subprime Industry Background

- Loans to Individuals with Troubled or Thin Credit
- Loans are 2 to 7% Higher than Conforming Rates
- 1995 Originations \$18 billion
1997 Originations \$66 billion
- Loan Portfolios Often Funded via Securitization
- Subprime Industry Problems



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Agency Costs

- Lenders Obtain Loans From Several Sources
- Retail:
Consumer Deals Directly With Company that Intends to Hold or Securitize Loan and Acts as Underwriter
- Third Party Originators (TPOs):
More Concerned About Volume,
Which Generates Fees from Borrower and/or
Premiums from Lender
- Key Distinction:
Retail Bear Prepayment and Default Risk
TPOs Don't



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- LaCour-Little & Chun (1999) show TPOs have Incentives to 'Churn' Borrower
- TPOs have Incentive to Game Underwriting Process, Resulting in Higher Defaults
- Passive Gaming: Insufficient Underwriting
- Active Gaming: Exaggerate Credit Worthiness or Home Value
- Is This Fraud?
 - First Payment Defaults
 - Even Loans Vigorously Underwritten May Default Due to Economic Downturns, Unemployment, Housing Deflation

Competing Risks

- Borrower Repayment Behavior Over Life of Loan
- Each Month, Borrower Chooses to:
 - Make Monthly Payment
 - Pay Outstanding Balance
 - Default
- Is This Fraud?
Ability-to-Pay Views Home Ownership as a Consumption Good and Borrowers Default When They Can No Longer Make Payments



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- Or Rational Investing?

Home Ownership is an Investment Where Mortgage Contains:

- Call Option

Borrower Prepays and Calls in the Old Loan When Market Interest Rate Falls Below Contract Rate

- Put Option

Borrower Defaults and Puts the House to the Lien Holder When Home Value Drops Below Loan Value



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2. Mortgage Duration Model

- Sample 23,200 Loans Originated or Acquired by a National Subprime Mortgage-Lending Firm
- Individual First-Lien Fixed-Rate Loans Secured by Residential Real Estate Originated Between 1 Jan 1996 and 31 Dec 1998
- Follow Loans through Sep 2000

For any given loan, observe $t = \min(t_d, t_p, c)$ and the type of termination where

t_d = mortgage duration until default

t_p = mortgage duration until prepayment

c = observed length due to censoring



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Joint Survival Function

$$\begin{aligned} & S(t_d, t_p \mid X_d(t_d), X_p(t_p), \theta_d, \theta_p, \beta_d, \beta_p) \\ &= P[T_d > t_d, T_p > t_p \mid X_d(t_d), X_p(t_p), \theta_d, \theta_p, \beta_d, \beta_p] \\ &= \exp \left(\begin{aligned} & -\theta_d \sum_{n=1}^{t_d} \exp(\alpha_{dn} + \beta'_d X_d(t_d)) \\ & -\theta_p \sum_{n=1}^{t_p} \exp(\alpha_{pn} + \beta'_p X_p(t_p)) \end{aligned} \right) \end{aligned}$$

where

$X_d(t_d)$ and $X_p(t_p)$ Possibly Time-Varying Covariates

β_d and β_p Corresponding Parameters

θ_d and θ_p Allow Correlated Risks



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Unobserved Frailty

- Two Groups With Different Willingness to Exercise Option: Ruthless and Woodhead
- Frailty: For Ruthless, $(\theta_{dR}, \theta_{pR})$ and For Woodhead, $(\theta_{dW}, \theta_{pW})$
- $\theta_{dW} < \theta_{dR} \Rightarrow$ Facing Similar Mortgage Situations, the Ruthless Group is More Likely to Exercise Default Option than Woodhead Group
- Mixture Model with
$$\gamma_R = P[\text{Ruthless}] \quad \gamma_W = P[\text{Woodhead}]$$

Maximum Likelihood Estimation of

$\beta_d, \beta_p, \theta_{dR}, \theta_{pR}, \theta_{dW}, \theta_{pW}, \gamma_R, \gamma_W$

Default:

Covariate	Hazard Ratio
TPO	1.2776
Put	2.1561
Put if Put>1	3.7716
Call	0.9220
A- Grade	0.7320
B+ Grade	1.0000
B Grade	1.3558
B- or Lower Grade	2.0534
30 Year Term	1.4134
Loan Amount (\$1000)	0.9987
%Δ Employment	0.9647

$$\hat{\theta}_{dW}=0.0002 \text{ and } \hat{\theta}_{dR}=0.0033$$

$$\hat{\gamma}_R=0.62 \text{ and } \hat{\gamma}_W=0.38$$



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Prepayment:

Covariate	Hazard Ratio
TPO	0.9538
Put	0.4193
Call	1.0694
Call if Call > 0	1.1539
A- Grade	0.9475
B+ Grade	1.0000
B Grade	1.0613
B- or Lower Grade	1.2498
30 Year Term	1.2536
Loan Amount (\$1000)	1.0022

$$\hat{\theta}_{dW}=0.0017 \text{ and } \hat{\theta}_{dR}=0.0207$$

$$\hat{\gamma}_R=0.62 \text{ and } \hat{\gamma}_W=0.38$$



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3. Pricing

- TPO Loan is 27.76% More Likely to Default Than a Similar Retail Loan
- Create More Controls or Write an Incentive-Efficient and Enforceable Contract with TPO Requires Directly Connecting the TPO Actions to Loan Default
- In Efficient Markets, Investors Price Risk
- As Managers Learn About TPO Default Risk, Expect Them to Price Default Risk by Charging Higher Interest Rates to TPO Generated Loans



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Subprime Risk Premium:

Difference in Loan Contract Rate and 10 Year Treasury

Explanatory Variable	Coefficient
TPOE=1 if TPO Originated 1 Jan 1996 - 28 Feb 1997	-2.769
TPOL=1 if TPO Originated After 1 Mar 1997	49.459
A- Grade	-8.322
B+ Grade	0.0000
B Grade	94.096
B- or Lower Grade	163.295
LTV for A- & B+ Grade	0.204
30 Year Term	1.942
Loan Amount (\$1000)	-0.001

Test for TPOE=TPOL, $F=525.8$, $p\text{-value}<0.0001$

As Subprime Industry Matured and TPO Risk Discovered, A 50-Basis-Point Premium Was Charged to Compensate for Extra Risk

Summary

- Are All Loans Created Equal?
- No: Loans That Appear Equal (Similar Loan Grade, Term, Amount, Option Incentives) Are Not Equal in their Subsequent Performance
- Yes: Market Became Efficient With Respect to Agency Risk, So Investors are Indifferent Between Retail and TPO Loans



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