The Cost of Debt Servicing Pools

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Importance of Servicers in Liquidity Provision

Servicer Background:

- Mortgages require servicers to collect payments and pass them through to investors
- 45% of mortgages are serviced by someone other than the originator

Servicer Importance:

- Servicers provide relief to borrowers facing liquidity shocks
- Servicers bridge liquidity shocks to investors that arise from borrower relief
  - e.g., payment advances to investors

Little is known about how servicers are compensated and the incentives it creates

This Paper: How Are Servicing Fees Priced and the Consequences?

Conceptual Framework: Servicing revenue depends on loan level prepayment and default, these events curtail servicing fee income

- Servicers are paid a fraction of the principal balance monthly
- Servicers have ability to take private action to influence outcomes that affect investors
- Thus, how does investor compensate the servicer?

Hypothesize: Servicers use average cost pricing across a group of loans.

- Questions:
  - How does pricing servicing fees at group level distort servicing incentives at loan level?
  - What are the consequences to investors?
  - What are consequences to borrowers?

Main Findings

1. Servicing fees not priced at loan level
   - They are set at Deal-Pool (DP) level
     - They do not consider credit score, LTV, DTI & other loan characteristics
2. Lack of loan level pricing leads servicers to deprioritize underpriced loans during liquidity shocks
   - Leads to more foreclosures and fewer modifications and prepayments

Data

Data

- Non-Agency Residential MBS loan level data
  - Origination and performance data
  - Covers 95% of the Non-Agency Market

Establishing Uniform Pricing

Servicing Fee Decomposition

- Show evidence that servicing fees are set according to uniform pricing within a group
- Estimate OLS regression of servicing fee on series of fixed effects
- Below R^2 table regresses servicing fee on a series of fixed effects
  - Including only the deal $\times$ pool fixed effects alone, explains 67.5% of the variation in servicing fee
  - Most incremental explanatory power from deal and pool
  - Little additional variation from zip code, loan type, credit score, DTI, LTV

Servicing Fee Decomposition - R^2 Table

	Deal	Pool	Orig	Serv	Month	Zip	Loan Type	FICO	DTI	LTV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
R-Squared (%)	65.4	67.6	69.3	70.7	70.8	70.9	70.9	71	71	71.3
Adj R-Squared	65.4	67.5	69.2	70.6	70.6	70.7	70.7	70.7	70.7	71.2
Deal F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
xPool F.E.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
xOrig F.E.			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
xServ F.E.				Yes	Yes	Yes	Yes	Yes	Yes	Yes
+Month F.E.					Yes	Yes	Yes	Yes	Yes	Yes
+Zip F.E.						Yes	Yes	Yes	Yes	Yes
+Loan Type F.E.							Yes	Yes	Yes	Yes
+FICO								Yes	Yes	Yes
+DTI									Yes	Yes
+LTV										Yes
Obs (millions)	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8

Focus on Fixed Price Deal Pools

- Since our R-squared table shows that the DP level explains a large part of the pricing, we focus our remaining analysis on fixed price pools
- The fixed price pools make up 60% of all the pools

Fair Market Value of Servicing Fee

Conceptual Framework: Fair Market Value of Servicing Fee

- Given that servicer has the ability to take hidden action, there is asymmetric information (moral hazard) between the servicer and the investor
- Behavioral responses to pricing (Moral Hazard) $\Rightarrow$ constant pricing distorts incentives

- To test for the existence of Moral Hazard
  - Posit that servicers respond to cost relevant observables
  - Create *Pricing Algorithm* to calculate the fair market value of servicing fees at the loan level using all cost relevant observables in our dataset
  - Calculate "Fee Difference" - the difference between the fair market value and the actual servicing fee
  - "Fee Difference" $\rightarrow$ rank loans by the difference between actual price and cost measure (winners and losers)
  - Test correlation between "Fee Difference" & servicer action (i.e. loan performance) (a la Chiappori Salanie (2000))

Algorithm to Calculate the Fair Market Value of Servicing Fee

1. Estimates predictive power of loan level characteristics ($\boldsymbol{X_i}$) on default & prepayment

$$RealizedDefault(Prepayment)_i = \boldsymbol{\gamma_i X_i} + \epsilon_i$$

2. *(Pricing Function:)* Model servicing fee as a function of default/prepayment risk

$$\begin{aligned} ServicingFee_{dp} &= \beta_1 RealizedDefault_{dp} + \beta_2 RealizedPrepayment_{dp} \\ &+ \beta_3 RealizedDefault_{dp} \times RealizedPrepayment_{dp} + \epsilon_{dp} \end{aligned}$$

   - This is a measure of cost of servicing at the deal pool (dp) level – meaning the relationship between default/prepayment risk and fee – plus additional markups
   - Use no fee dispersion deals are meant to capture an "as close to cost as possible" measure for the servicer

3. Calculate loan level $PredictedDefault(Prepayment)_i$ using $\boldsymbol{\gamma_i}$ & loan characteristic

4. Feed $PredictedDefault(Prepayment)_i$ into the *Pricing Function* to estimate the fair market value of servicing fee at the loan level

Explaining the Fair Market Value Servicing Fee

- According to our *Pricing Function*:
  - Servicing fees should not be uniform
  - Should vary across loans with higher prepayment & default risks
  - Use the deal-pool level servicing fee (the avg. DP level servicing fee across deals) and see how servicing fee varies with realized default across deal pools
  - Then plug predicted prepayment/default at loan level into *Pricing Function* $\Rightarrow$ $PredictedFee_i$ at the loan

Dependent Variable:	fee			
Model:	(1)	(2)	(3)	(4)
Variables				
Constant	0.2863***	0.2302***	0.1315***	0.1320***
	(0.0027)	(0.0068)	(0.0078)	(0.0080)
frac_default60	0.2698***		0.2474***	0.3403***
	(0.0080)		(0.0245)	(0.0413)
frac_prepaid		0.1837***	0.2234***	0.2236***
		(0.0098)	(0.0105)	(0.0105)
frac_prepaidxdefault60			0.0903**	0.0691
			(0.0391)	(0.0431)
frac_foreclosed				-0.1562***
				(0.0299)
frac_mod				0.0939**
				(0.0395)
Fit statistics				
Observations	5,650	5,650	5,650	5,650
R^2	0.16650	0.05813	0.26130	0.26566
Adjusted R^2	0.16636	0.05796	0.26091	0.26501

IID standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Calculating $FeeDifference_i$

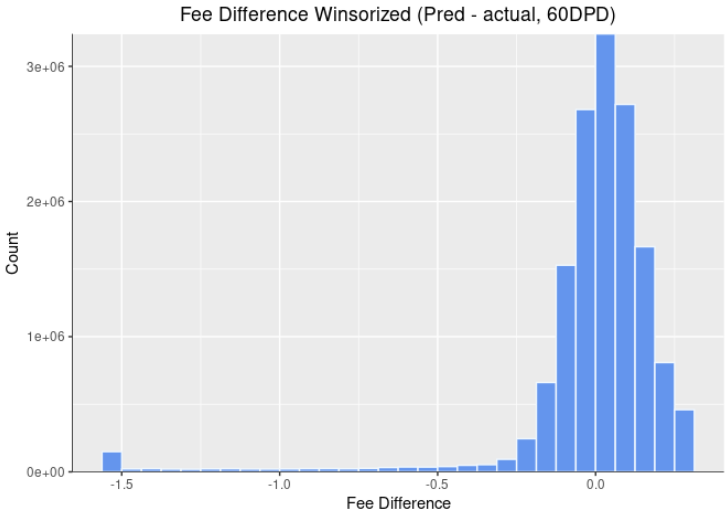
- Once we have the fair market value of servicing fee at loan level, calculate:

$$FeeDifference_i = PredictedFee_i - ActualFee_i$$

  - This is an indicator for mispricing – how much the observed fee varies from the fair market value fee?
    - Positive difference - servicing fee under priced
    - Negative different - serving fee over priced

Fee Difference Distribution

Fee Difference Histogram



- A long tail of overpriced loans is subsidizing a large mass of underpriced loans

Investor Level Results

Fee Difference as Predictor of Servicer Behavior

- *Fee_Diff* measures cost that is not priced into a loan's servicing fee
- Utilize *Fee_Diff* to measure how under or over priced loans' MSRs are
- Test how this measure of unpriced cost predicts servicer behavior (proxied for using loan performance)

Investor Level Empirical Specification

At the Deal Pool (DP) level d

$$Y_d = \beta Fee\_Diff_d + \mu_d + \epsilon_d$$

- Y_d = DP level outcome conditional on 30 DPD within 1 year
  - Foreclosure
  - Modification
  - Prepayment
- Fee_Diff_d = Deal-pool level average predicted - actual servicing fee
- μ_d = DP origination year fixed effect
- ϵ_d = error term
- Include FICO, LTV, DTI, Closing Balance in robustness tests, robust standard errors

Describe Investor Level Results

- Utilize Foreclosure, Prepayment, & Modification conditional on 30 days paid delinquent (DPD)
  - Pricing algorithm predicts default and prepayment
  - Since our *Fee_Diff* variable is structured to predict default and prepayment, there may be a bias if we use unconditional outcome variables
  - *Fee_Diff* measure thus measures additional variation in foreclosure beyond what is explained by default

Deal Pool Level Regression Results

Table 2: DP Avg. Outcomes (60DPD, Pred - Actual), No Fee Dispersion

Dependent Variables:	mod_1yr_30dpd	fc_1yr_30dpd	prepay_1yr_30dpd
Model:	(1)	(2)	(3)
Variables			
dp_fee_diff60	-0.0425***	0.1251***	-0.1169***
	(0.0118)	(0.0211)	(0.0249)
Fixed-effects			
orig_year_dp	Yes	Yes	Yes
Fit statistics			
Observations	5,619	5,619	5,619
R^2	0.29090	0.47471	0.30778
Within R^2	0.00763	0.00841	0.00677

Heteroskedasticity-robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Deal Pool Level Regression Result Discussion

Servicing behavior impacts mortgages' payoffs to investors. Conditional on loans entering 30 DPD, we find that a unit increase in *Fee_Diff* leads to:

- -4.25 pp ↓ in Modifications
  - Consistent with servicers reducing loan modifications
- 12.5 pp ↑ in Foreclosure
  - Consistent with servicers foreclosing fast on a defaulted loan to reduce exposure to advance payments
- -11.69 pp ↓ in Prepayment
  - Consistent with servicers not communicating well with borrowers so they are not able to sell their home before it enters foreclosure

Borrower Level Results

Individual Level Empirical Specification

At the individual borrower level i

$$Y_i = \beta Fee\_Diff_i + \delta \boldsymbol{X_i} + \mu_i + \nu_i + \gamma_i + \epsilon_i$$

- Y_i = Individual level outcome conditional on 30 DPD within 1 year
  - Foreclosure
  - Modification
- Fee_Diff_i Individual level predicted - actual servicing fee

- $\mu_i,\ \nu_i,\ \gamma_i$ are State, Servicer-Originator, Deal-Pool fixed effects
- $\boldsymbol{X_i}$ Includes FICO, LTV, DTI, Closing Balance, and indicators for Orig_year and Product_type
- ϵ_i = error term

Individual Level Regression Results

Dependent Variable:			fc_1yr_30dpd				mod_1yr_30dpd	
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
fee_diff60	0.6942***	0.6360***	0.6778***	0.6217***	-0.0824***	0.0191	-0.3336***	-0.3589***
	(0.0179)	(0.0419)	(0.0421)	(0.0463)	(0.0098)	(0.0366)	(0.0454)	(0.0459)
FICO			0.0003***	0.0003***			-0.0006***	-0.0006***
			(2.66×10^{-5})	(2.69×10^{-5})			(3.32×10^{-5})	(3.39×10^{-5})
LTV			-0.0004***	-0.0001			-0.0006**	-0.0005*
			(0.0001)	(0.0001)			(0.0003)	(0.0003)
DTI			0.0003***	0.0002***			0.0006***	0.0005***
			(5.58×10^{-5})	(5.97×10^{-5})			(5.48×10^{-5})	(5.09×10^{-5})
CLOSE_BAL				2.42×10^{-7}***				1.09×10^{-7}***
				(1.72×10^{-8})				(1.48×10^{-8})
Orig_year Indicators								
Product_type Indicators								
Fixed-effects								
STATE		Yes	Yes	Yes		Yes	Yes	Yes
SVC_CODE-ORIG_CODE		Yes	Yes	Yes		Yes	Yes	Yes
DEAL_NO-POOL_ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	2,271,696	2,271,696	2,271,696	2,271,696	2,271,696	2,271,696	2,271,696	2,271,696
R^2	0.08901	0.09822	0.10952	0.11423	0.09893	0.11158	0.11948	0.12069
Within R^2	0.00745	0.00564	0.01809	0.02330	0.00013	6.51×10^{-6}	0.00889	0.01025

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Individual Level Results Discussion

- Results hold at the borrower level
- Borrowers with more under-pricing experience more foreclosures and fewer modifications
- Conditional on loans entering 30 DPD, a 1 unit increase in Fee_Diff leads to:
  - 62.17 pp $\uparrow$ in foreclosure
  - 35.89 pp $\downarrow$ in modification

Conclusion and Next Steps

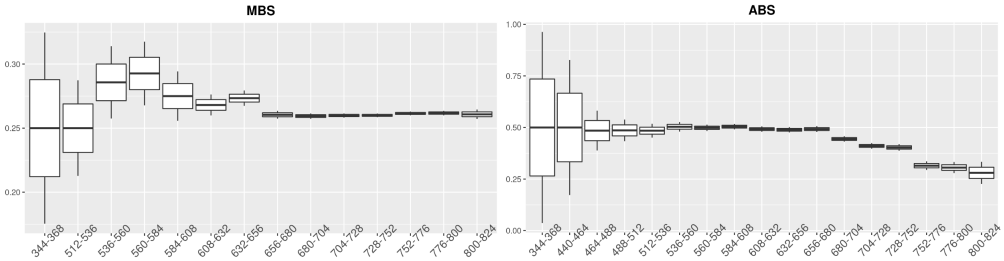
Conclusion:

- Servicing revenue depends on prepayment and default
- Servicer pricing does not take into consideration relative risk of prepayment and default
- Thus servicers have incentive to de-prioritize under-priced loans when liquidity is required
  - Conditional on default loans with higher difference between predicted minus actual fee experience:
    - More foreclosures
    - Fewer modifications
    - Fewer prepayments
  - We find evidence that this matters at the deal-pool level, suggesting that mispricing servicer fees affects returns for investors
  - We find evidence that this matters at the individual level, suggesting that underpriced borrowers receive less liquidity in default states

Appendix

Downward Trend in Fee by FICO Across Groups

Consistent with high credit score borrowers being easier to service



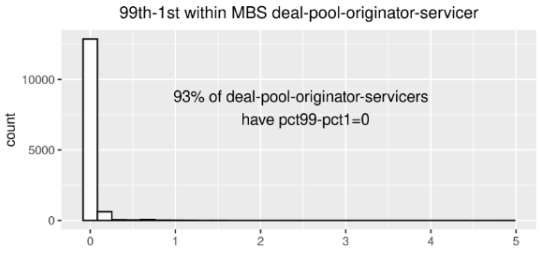
(a) MBS (Prime)

(b) ABS (Subprime & Alt-A)

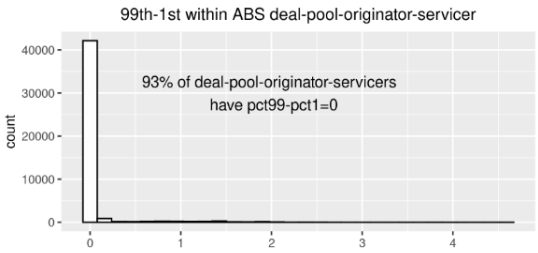
Nearly Zero Fee Dispersion Within Groups of Loans

Servicing fee on 99^{th} pct loan minus servicing fee on 1^{st} pct loan

- Within Deal-Pool-Originator-Servicer group
- Majority have zero fee dispersion



(c) MBS (Prime)

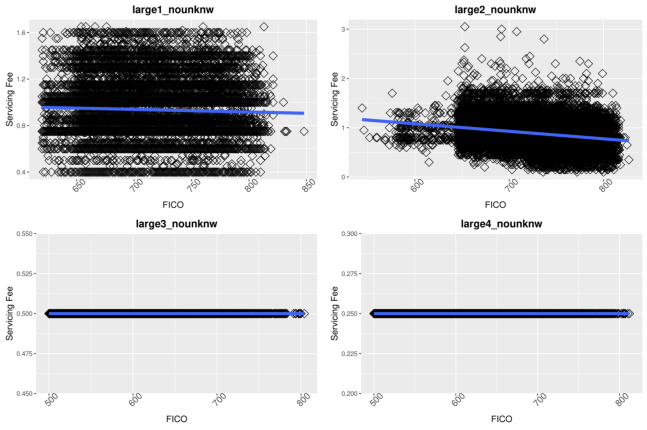


(d) ABS (Subprime & Alt-A)

Explore Whether Large vs. Small Servicers Vary in Fee Dispersion (Large)

Rank DPOS by number of loans select 4 Largest Groups

- Dispersion in Servicing Fee within DPOS Groups Originators or Servicers
- More dispersion for 2 of 4 servicers consistent with a more refined pricing model

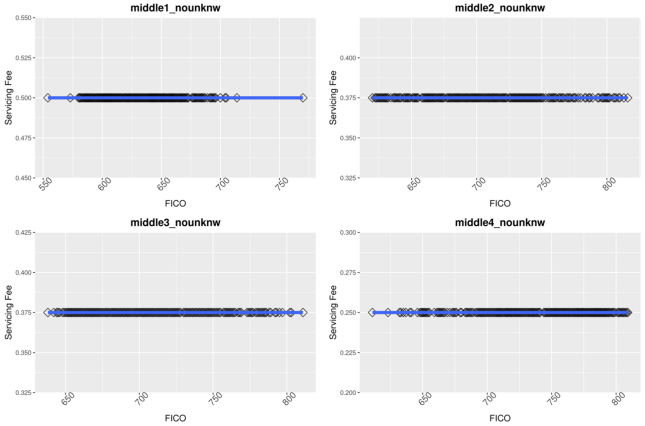


(e) 4 Largest Groups

Explore Whether Large vs. Small Servicers Vary in Fee Dispersion (Middle)

Rank DPOS by number of loans select 4 Middle Groups

- Dispersion in Servicing Fee within DPOS Groups Originators or Servicers

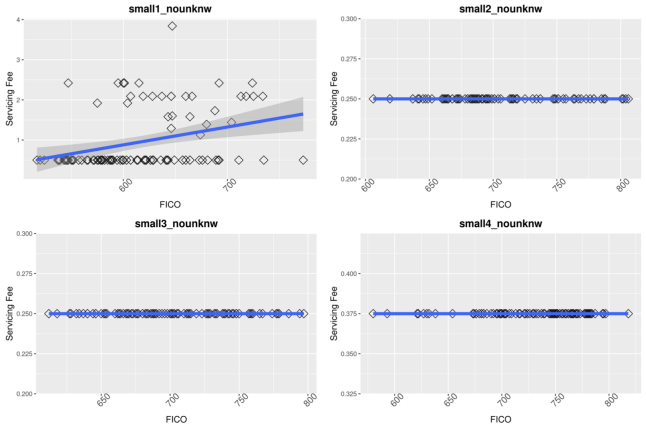


(f) 4 Middle Groups

Explore Whether Large vs. Small Servicers Vary in Fee Dispersion (Small)

Rank DPOS by number of loans select 4 Small Groups

- Dispersion in Servicing Fee within DPOS Groups Originators or Servicers



(g) 4 Small Groups