The Cost of Servicing Debt Pools

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Debt Servicers' Incentives

Pools of loans are assigned to servicers with misaligned incentives

- Servicers collect payments and pass them through to investors
- Borrowers facing default turn to servicer for relief first
- **Incentive for leniency**: earn *servicing fees* as fraction of outstanding principal if loan survives
- **Incentive for strictness**: *advance payments* on behalf of defaulted borrower that cannot be recovered til foreclosure, prepayment or cure

Key determinant of borrower and investor welfare → **cost of advances net of servicing fee**

This paper: What is the net cost of servicing and its impact on borrowers and investors?

Novel institutional fact: Servicing fees are largely constant within pools of loans

- All servicers in the same pool of debt are paid the same fraction of the principal balance monthly
  - Consistent with average cost pricing
- Individual loan's marginal cost may differ from pooled price, creating variation in net cost with pool

Identify real impacts: Borrowers and investors impacted by servicers' net costs

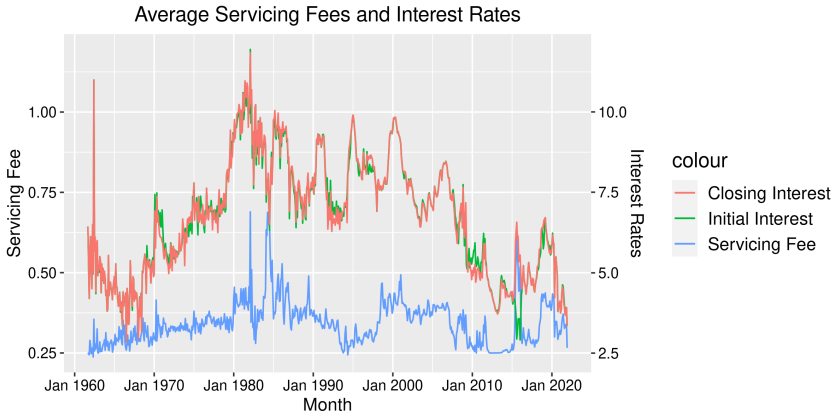
- High net cost loans are foreclosed on more aggressively by servicers
- High net cost pools experience larger losses and lower returns to investors

Data

Data

- Non-Agency Residential MBS loan level data
  - Origination and performance data
  - Covers 95% of the non-agency market
  - Unique features of the data
    - Loan-level characteristics, with servicer identified
    - Include deal and pool ID, which can be connected to CUSIP
  - Cover originations between 2001-2007
  - Very few NARMBS post-financial crisis
- Bloomberg data on NARMBS
  - Gathered price, coupon, maturity, and other characteristics on CUSIPs associated with NARMBS sample
  - Calculated Yield to Maturity as a measure of investor return

Data



- Servicing fee is a fraction of total outstanding principal, around .25% to .5%
- Investor gets about 20x the compensation of servicers

How Pools Set Servicing Fees

Hypothesis: Servicing Fees Set at Average Cost

- Decompose servicing fee by regressing on fixed effects - R^2 table to follow
  - 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

- Each pool must break even in expectation, so assume pricing as follows

$$P_{dp} = AC_{dp} + \epsilon = loss'_{dp}\beta_{loss} + \epsilon \tag{1}$$

  - P_{dp} is the servicing fee for an individual deal-pool
  - AC_{dp} is the cost of servicing that deal-pool
  - $loss_{dp}$ is a vector of variables that determine servicers' costs, including risk of default or prepayment
  - β_{loss} are linear coefficients on losses, assuming that cost varies linearly with loss
  - Error ϵ has mean 0 and is uncorrelated with P_{dp}

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

Table 1: Decompose servicing fee dispersion, v2.

Estimating the Cost of Servicing

1. Limit data to fixed price deals for simplicity
2. *(Average Cost Pricing Function:)* Set relevant loss variables to default and prepayment

$$P_{dp} = K + \beta_1 Default_{dp} + \beta_2 Prepay_{dp} + \beta_3 Default_{dp} \times Prepay_{dp} + \epsilon_{dp}$$

   - Under assumptions, measures cost of servicing at the deal pool (dp) level – meaning the relationship between default/prepayment risk and fee – plus markup K

3. Calculate loan level $\widehat{Default}_i$ and $\widehat{Prepay}_i$ by regressing actual default and prepayment on loan characteristics

$$loss_i = \gamma_j X_{ij} + \epsilon_i \tag{2}$$

4. Solve for marginal cost of servicing loan as

$$\widehat{MC}_i = K + \beta_1 \widehat{Default}_i + \beta_2 \widehat{Prepay}_i + \beta_3 \widehat{Default}_i \times \widehat{Prepay}_i + \epsilon_i$$

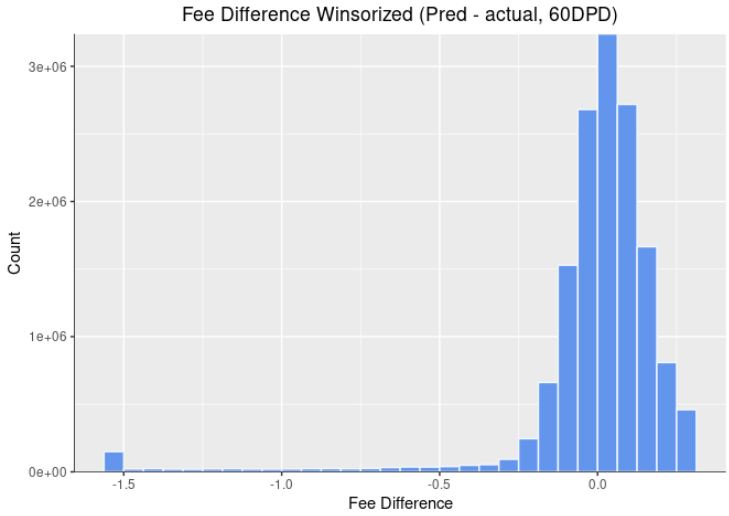
Estimating the Cost of Servicing

- According to our *Pricing Function*:
  - Servicing fees should not be uniform
  - Should vary across loans with higher prepayment & default risks
  - Decompose average servicing cost into loss variables, default and prepayment, then calculate marginal cost from loan characteristic prediction
  - Difference between $\widehat{MC}_i$ and P_i determines the net cost of servicing a particular loan within a deal-pool

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*

Distribution of Net Cost



- A long tail of low net cost loans is subsidizing a large mass of high cost loans

Borrower Level Results

Individual Level Empirical Specification

At the individual borrower level i

$$Y_i = \beta Net\_Cost_i + \delta \boldsymbol{X_i} + \mu_i + \nu_i + \gamma_i + \epsilon_i$$

- Y_i = Individual level outcome conditional on 30 DPD within 1 year
  - Foreclosure
  - Modification
- Net_Cost_i Individual level MC - 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

Table 2: Foreclosure on Fee Diff (60DPD, Pred - Actual) - No Fee Disp. (2yr fee diff)

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				$2.42 \times 10^{-7***}$				$1.09 \times 10^{-7***}$
				(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

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 Net_Cost leads to:
  - 62.17 pp $\uparrow$ in foreclosure
  - 35.89 pp $\downarrow$ in modification

Investor Level Results

Investor Level Empirical Specification

At the Deal Pool (DP) level d

$$Y_d = \beta Net\_Cost_d + \mu_d + \epsilon_d$$

- Y_d = DP level outcome conditional on 30 DPD within 1 year
  - Foreclosure
  - Modification
- Net_Cost_d = Deal-pool level MC - 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

Investor Level Results

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

Deal Pool Level Regression Results

Table 3: 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*

- -4.25 pp ↓ in Modifications
  - Consistent with servicers reducing loan modifications
- 12.5 pp ↑ in Foreclosure

Bloomberg Yield to Maturity Results

- Deals with higher servicing costs have lower yields
- Controls include loan characteristics, types, locations
- Suggests that investors are worse off when deal level servicing fees are set too low
  - Tradeoff between getting a good deal and powering incentives

Table 4: Deal-level monthly YTM regressions

Dependent Variable:	ytm			
Model:	(1)	(2)	(3)	(4)
Variables				
Constant	9.934***	-80.20***	-102.5***	-96.96***
	(0.1015)	(30.60)	(31.62)	(28.91)
fee_diff60	-8.002***	-6.902***	-3.046**	-3.103**
	(0.8675)	(1.064)	(1.428)	(1.506)
coupon		-0.2695***	-0.2629***	-0.2602***
		(0.0568)	(0.0561)	(0.0556)
mstr_INIT_RATE		0.0617	-0.2656***	-0.2335**
		(0.0683)	(0.0757)	(0.1157)
california_fraction		2.605***	1.709**	1.827**
		(0.7394)	(0.8215)	(0.8066)
florida_fraction		2.931	4.562**	4.286**
		(1.787)	(2.014)	(2.093)
non_alt_a_fixed_rate_fraction		92.12***	116.3***	95.89***
		(30.56)	(31.07)	(27.00)
fixed_rate_fraction		-3.617***	-3.764***	-4.388***
		(0.4528)	(0.4846)	(0.5099)
alt_a_fraction		90.62***	114.4***	93.34***
		(30.58)	(31.10)	(27.02)
non_alt_a_arm_fraction		89.66***	113.5***	92.22***
		(30.56)	(31.06)	(27.01)
owner_occupied_fraction			1.579	-1.598
			(2.198)	(2.355)
second_home_fraction			-8.751**	-17.85***
			(4.085)	(4.837)
non_owner_fraction			-3.680	-6.529**

Conclusion and Next Steps

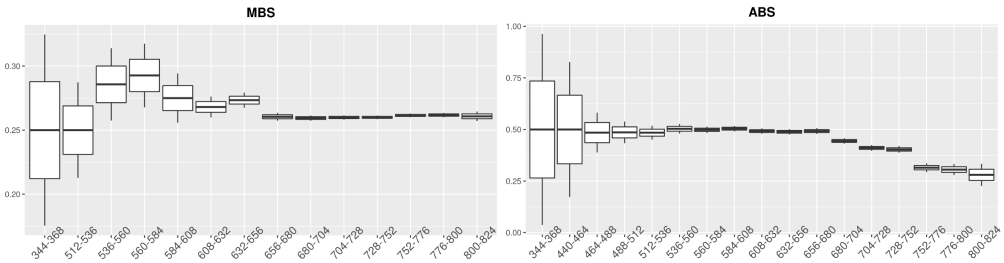
Conclusion:

- 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 marginal cost and servicing 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



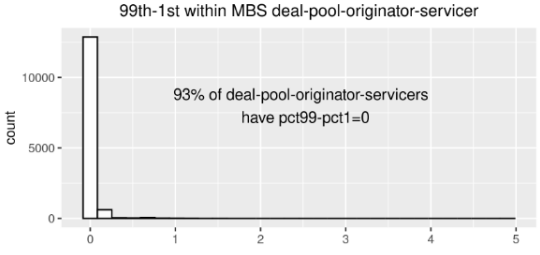
(a) MBS (Prime)

(b) ABS (Subprime & Alt-A)

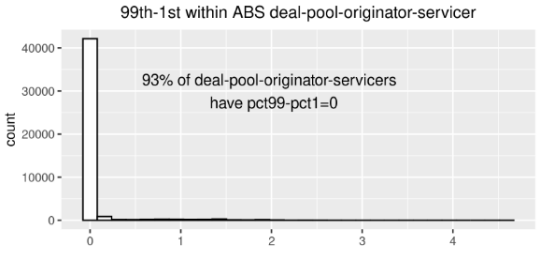
Nearly Zero Fee Dispersion Within Groups of Loans

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)

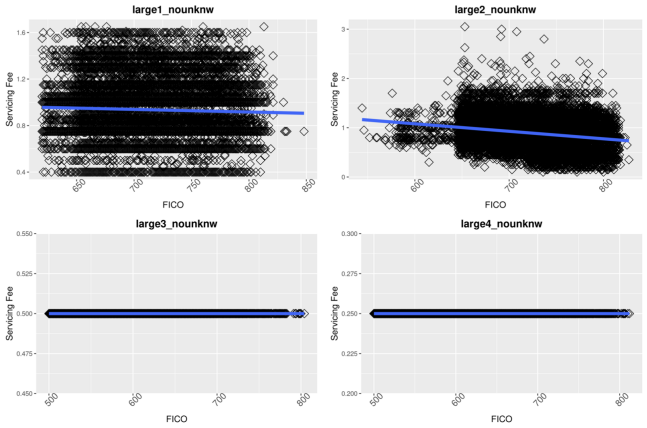


(d) ABS (Subprime & Alt-A)

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

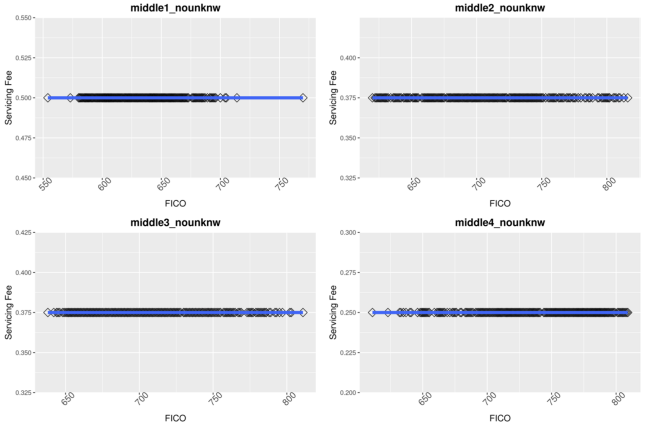


(e) 4 Largest Groups

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

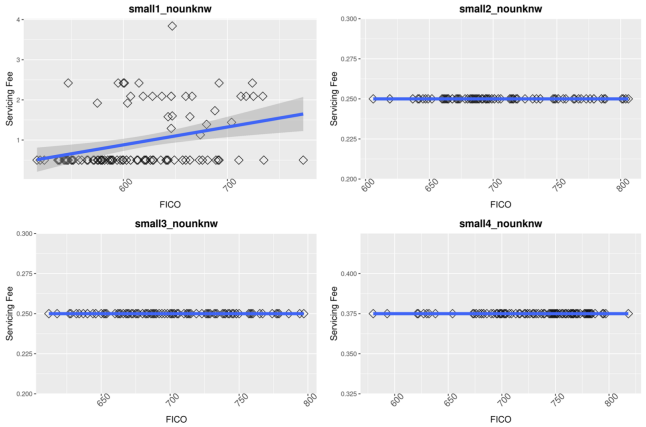


(f) 4 Middle Groups

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