Asymmetric Information in the Supply Chain of Mortgages

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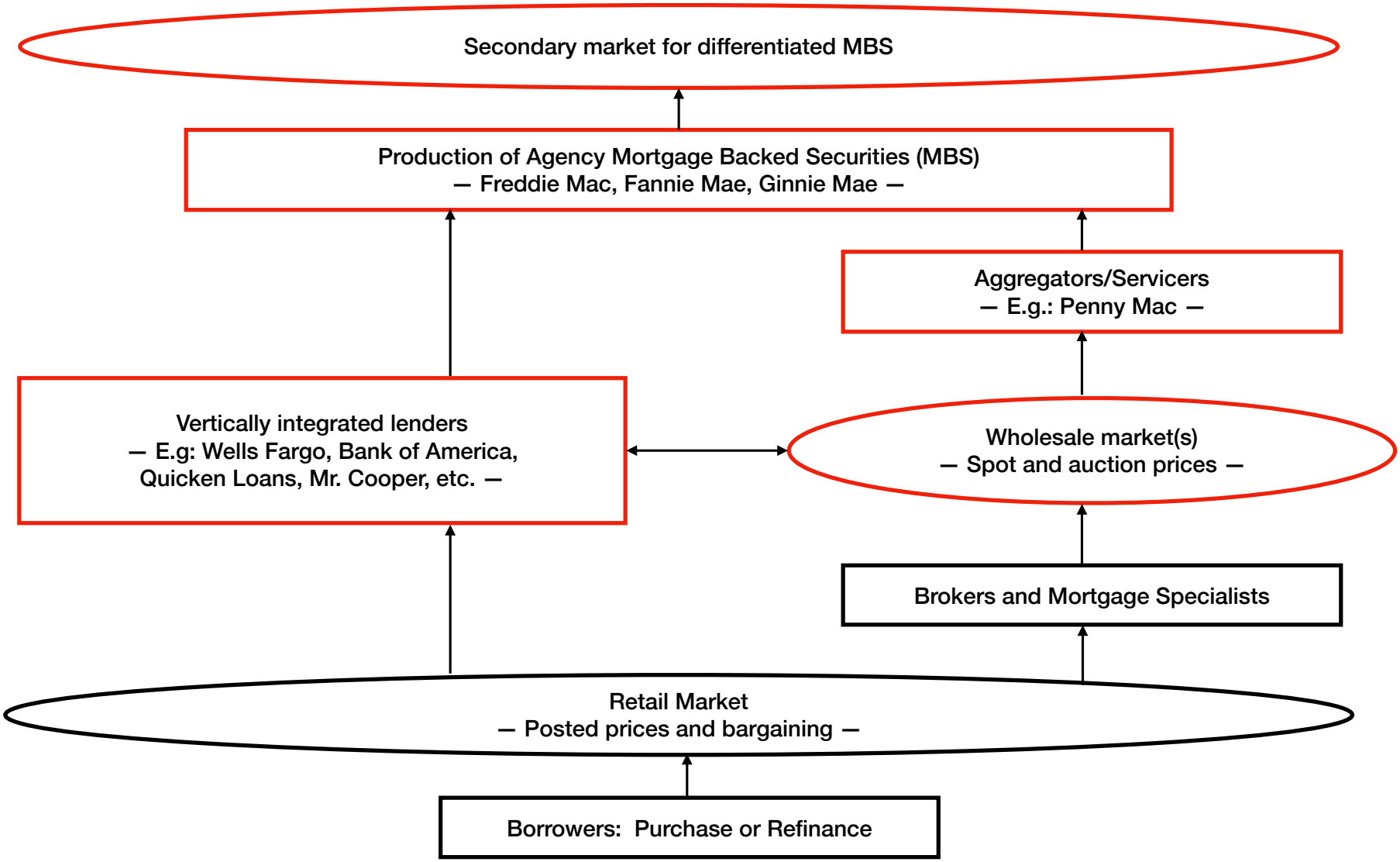
Originate-to-Distribution (OTD) Supply Chain of Mortgages



Loan Values to Servicers

- Sellers in MBS market sell loans, but typically retain servicing rights
  - Collect monthly interest payment from borrower at note rate r
  - Pays the agency for insuring loan against default at rate g
  - Pays the MBS coupon c to investors
  - Keeps the difference: $r - g - c$ (measured in p.p.)

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  - Service income depends upon (random) duration of the loan.
- Main source of risk: early prepayment (e.g., default, refinancing)
- **Key decisions by banks:**
  - Security customization: (i) coupon, (ii) custom/multi-issuer pool
  - Acquisition price/bid: (i) wholesale price, (ii) upfront fee

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- Why?
  - Private signals about *pre-payment risk* leads to a *Winner's Curse* in the wholesale market, and *Lemon's problem* in the MBS market
    - ★ Asymmetric information: Lower loan acquisition **and** MBS prices
    - ★ Borrowing costs are inversely proportional to loan value
  - IO/Bank competition literature:
    - ★ Banks have common beliefs about loan duration
    - ★ Price dispersion is due to idiosyncratic origination/servicing costs

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1. Adverse selection in the MBS market:
   - Variation: Limited ability to customize securities
   - Chiappori and Salanié's correlation test:
     - ★ Do sellers place higher duration loans in low coupon (high service-income) securities?
     - ★ Do they sell higher-duration loans in a custom pool security?
   - Moral Hazard vs Adverse-selection

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   - Moral Hazard vs Adverse-selection
2. Common-value test:
   - Auctions for loans *without* a coupon-choice option
   - Correlation between (residual) bids and loan duration (as in Hendricks, Pinkse and Porter)
   - Sources of asymmetric information: (i) private signal about loan quality, and (ii) accuracy of pricing model

Summary of Findings

- Main results:
  1. Wholesale auctions have a significant common value component
  2. Bidders differ in the quality of their pricing models
  3. Asymmetric information leads to adverse selection in the MBS market
  4. Ability to customize securities increases market power in auctions

Summary of Findings

- Main results:
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  3. Asymmetric information leads to adverse selection in the MBS market
  4. Ability to customize securities increases market power in auctions

- Implications:
  1. Auctions improve information available to upstream lenders, and lower securitization cost
  2. Market unraveling?
     - ★ Ability to customize MBS lower the value of "multi-issuer" pools
     - ★ Wholesale market design determines the size of the wholesale market

  $\Rightarrow$ Information frictions *upstream* affect competition *downstream*

Outline

Secondary (MBS) market

- To-Be-Announced (TBA) forward market: Multi-issuers
  - Bank agrees to delivery a pool of agency-insured loans to a buyer at a specified price, par value, coupon, maturity, and delivery date.
  - Identity of loans unknown to buyer at trade date.
- Custom pool market: Single-issuer.
  - Identities of the loans are known to buyer at the trade date.
  - Roughly 25% in our sample (up from less than 10% in 2010)
- Customization decisions:
  - *Coupon:* Service income $(r - c)$
  - *Pool:* Custom or Multi-issuer

Wholesale Market

- Two market segments:
  - *Posted prices:* Wholesale rate-sheets or *Lock* prices
    - ★ Lock price = Base $(r, \text{lock period})$ + Loan-level adjustments (LLPA)
    - ★ Base prices are updated daily
    - ★ LLPA are based on *coarse* information
  - *Online auctions:* Flexible real-time pricing
    - ★ Information: Originator, Note-rate, Zip-code, Agency, Income, DTI, Size, FICO, Purchase/Refi

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  - Active in both segments: $\approx$ 35% market-share (prior to 2021)
  - 75% of loan exchanges done via auctions

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  - Active in both segments: $\approx$ 35% market-share (prior to 2021)
  - 75% of loan exchanges done via auctions
- Auction design (since 2018):
  - Loan-level first-price sealed bid auction ($\approx$ 1-2 hrs)
  - Sellers invite buyers form their network (fixed)
  - Buyer-specific reserve price: Bid = max$\{$Bulk, Lock$\}$

Data Sources

- **eMBS:** Provides detailed information on all agency MBSs and their component loans from January 2013 to present.
  - Loan performance: Monthly payment history until loan is prepaid.
  - Security information: (i) coupon choice, and (ii) multi-issuer or single-issuer pool
- **Optimal Blue:** Auction data from Jan 2018 to present.
  - Loan-level first-price sealed bid auction ($\approx$ 1-2 hrs)
  - Buyer-specific reserve price: Bid $=$ max$\{$Bulk, Lock$\}$
  - Information: Originator, Note-rate, Zip-code, Agency, Income, DTI, Size, FICO, Purchase/Refi

Sample

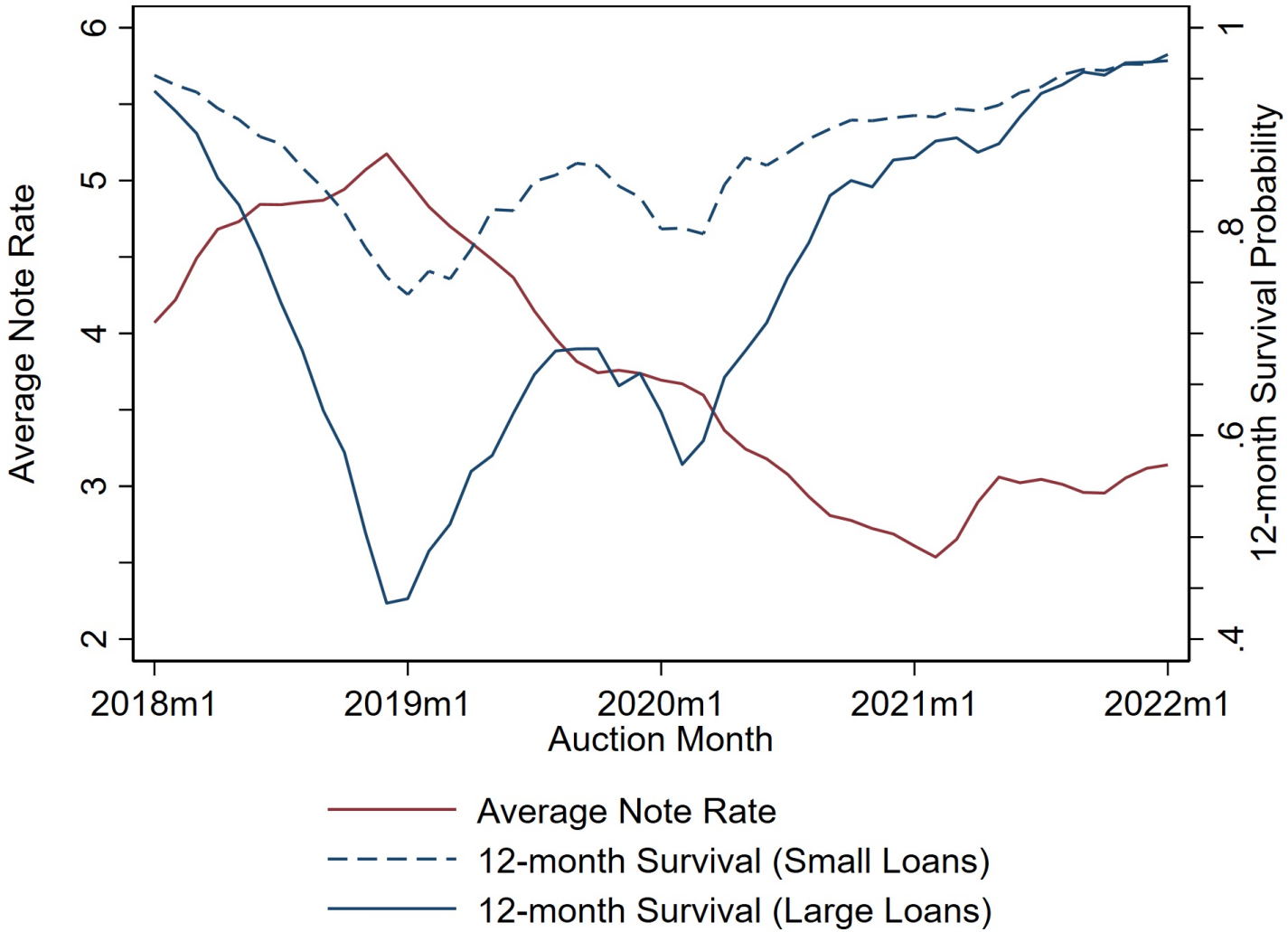
- 30 year fixed-rate mortgages that benefit from Federal housing subsidies (FHA and VA) and insured by Ginnie Mae
  - FHA: high LTV (max 96%); VA: zero down-payment
  - Ginnie does not securitize loans; banks deliver loan packages and incur the securitization costs.
- Why Ginnie?
  - No competition, loans not eligible for Fannie Mae, Freddie Mac
  - Riskier loans, higher default rates
  - Restrictions on coupon choice
  - Guarantee fee is fixed at 6 basis points for all lenders
- Ginne Mae $\simeq$ 25% of agency loan origination.

Summary statistics

Source: eMBS + OB

	MBS Sample		MBS Sample		OB+MBS Sample	
	mean	sd	mean	sd	mean	sd
Interest Rate	4.1	0.56	4.4	0.65	4.4	0.66
Loan Amount (100k)	2.2	1.1	2.4	1.1	2.4	1.1
Loan-to-Value	94.9	8.9	94.8	8.9	95.2	8.5
Credit Score (Min)	688	55	683	56	684	54
Debt-to-Income	36.4	15.9	39.4	14.4	40.2	13.9
1(DTI $>$ 42)	0.44	0.50	0.52	0.50	0.54	0.50
1(VA-Backed)	0.36	0.48	0.38	0.49	0.35	0.48
1(Retail)	0.40	0.49	0.40	0.49	0.11	0.31
1(Correspondent)	0.47	0.50	0.47	0.50	0.85	0.36
Survival: 12-month	85.8	34.9	80.6	39.6	80.9	39.3
Survival: 36-month	0.51	0.50	0.25	0.43	0.17	0.38
Observations	8,517,991		2,821,131		112,510	
Period	2013-2019		2018-2019		2018-2019	

Prepayment risk between 2018 and 2022



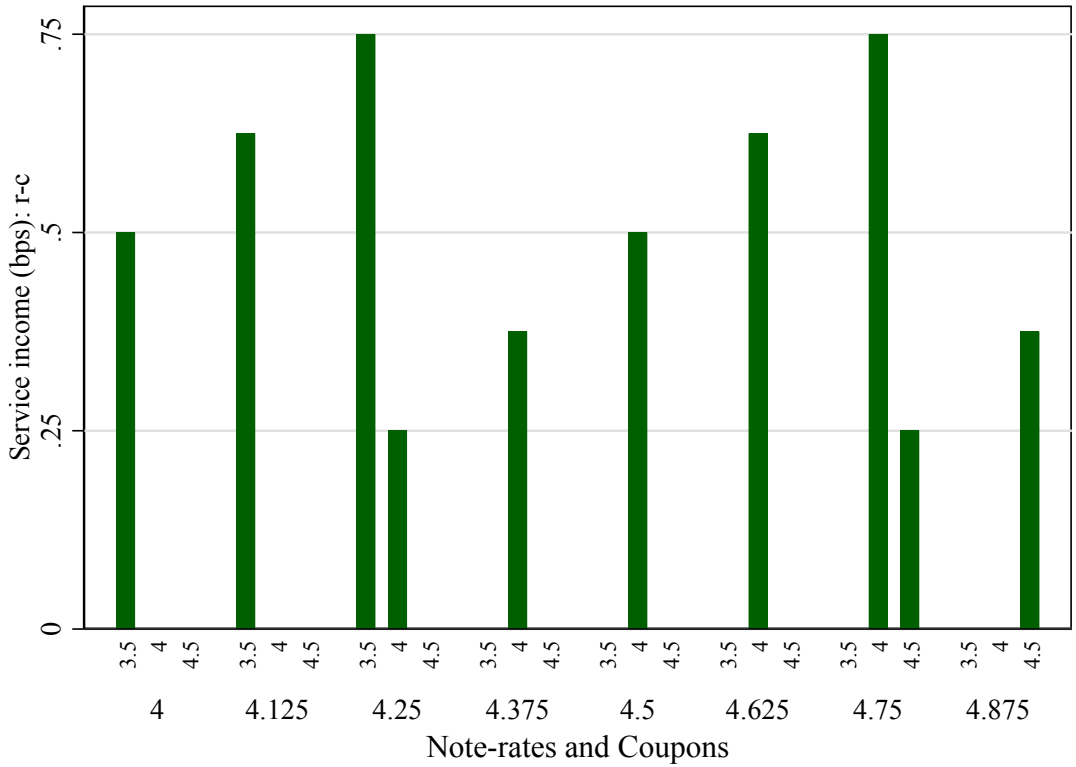
Summary statistics: Wholesale auctions

Bids are for $100 loan; resale price = TBA price

	(1)		
	mean	sd	count
Client network size	17	4.7	63,464
Fraction network invited	.66	.2	63,464
TBA Price ($)	103	1	693,310
Bid ($)	104	1.3	693,310
Bulk - TBA ($)	1.6	.83	493,008
Lock price - TBA ($)	1.2	.97	200,302
Fraction bulk bids	.69	.22	63,464
Winning bid: Bid - TBA ($)	2.1	.73	63,464
1(Bulk winning bid)	.9	.31	63,464
Winning margin: 1st - 2nd bid ($)	.23	.25	63,464
Gain: Winning bid - Highest lock ($)	.72	.85	57,387
Observations	693310		

Stylized fact 1: Security customization

- r is quoted in 1/8 increments, c in 0.5 increments.
- Regulation: $(r - c) \in \{0.25, 0.375, 0.5, 0.625, 0.75\}$
- Natural experiment: Loans with note rates ending in 0.25 and 0.75 can be pooled in a low or a high coupon with margins of .75 or .25.



Stylized fact 2: Pricing of prepayment risk

$\Pr(Survival|Z_i) = \Phi(Z_i\beta + \text{Auction month} + \text{State})$

$\text{Net bid}_i = \lambda \Pr(Survival|Z_i) + \text{Date} \times \text{Rate} + \epsilon_i$

	(1) Bulk Bid	(2) Lock Price	(3) Winning Bid
Predicted Survival Prob. (/SD)	0.183*	0.136*	0.230*
	(0.0013)	(0.0023)	(0.0030)
Observations	445,484	184,733	56,896
R-squared	0.245	0.278	0.389
Across-Auction Dispersion (std-dev)	0.60	0.60	0.60
Survival Prob. std-dev	0.16	0.16	0.16

Takeaway

- *Bulk bids price pre-payment risk more accurately than lock*
- *Cost of 12-month survival risk:* 16% *increase in survival probability* = \$0.23 *(38% of across auctions bid dispersion).*

Hedonic bid regression

Stylized fact 3: Bid dispersion

Sample: Loans with no coupon choice

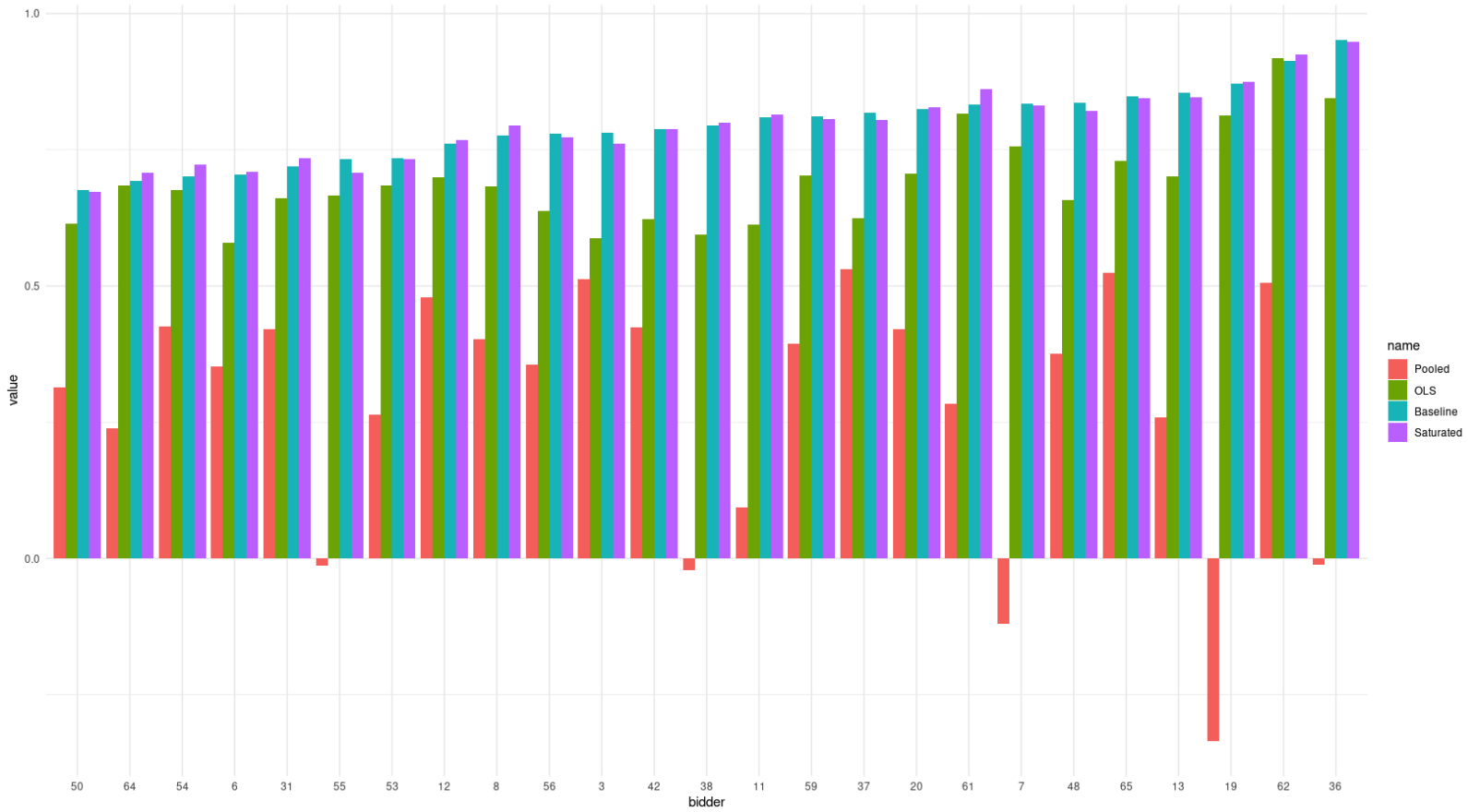
	(1)	(2)	(3)	(4)
Baseline	✓	✓	✓	✓
Buyer FE		✓	✓	✓
Buyer-specific slopes			✓	✓
Buyer-seller FE				✓
R-squared	0.33	0.43	0.65	0.67
Standard-deviation residual	0.75	0.69	0.55	0.53

- Baseline: Loan size, FICO, DTI, Income, Purchase, FHA, Fixed-effects (Sellers, date x rate, county)
- Bidder asymmetries:
  - 30-point increase from bidder-specific intercepts and slopes
  - 4-point increase from seller-specific relationships

Within vs across bid dispersion | Illustration

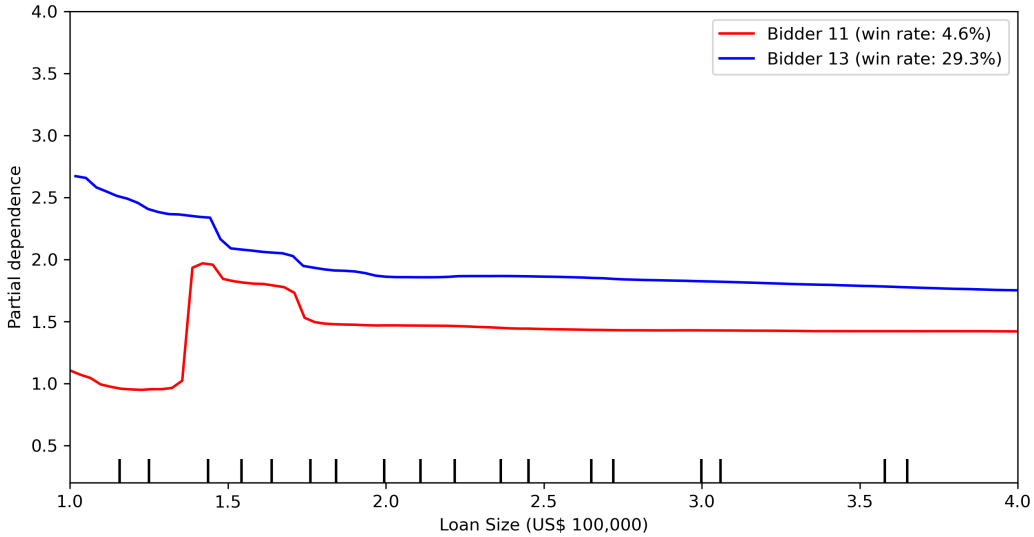
Stylized fact 4: Banks use different pricing models

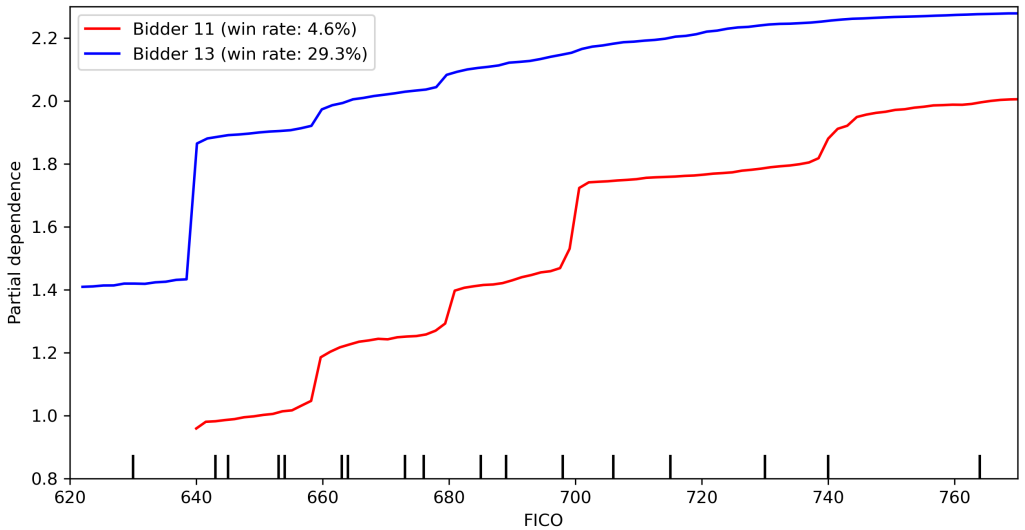
Bar heights = R^2 from Random-forest regression



- Sample: 25 bidders who won at least 100 auctions + No coupon choice
- Banks put different weights on observed attributes
- AND do not use all information available. E.g. location, income, seller.

Stylized fact 4: Banks use different pricing models





Loan Valuations: Ex-post

- *Realized cash flows* for \$100 loan i (omitting time period):

$$R_i(c) = P_i(c) + \underbrace{\sum_{\tau=1}^{\tilde{T}_i} \left(\frac{1}{1+\rho_\tau}\right)^\tau L_{\tau,i}}_{\text{service multiple } (M_i)} \times \underbrace{\frac{r_i - g - c}{1200}}_{\text{service fee}} + \text{Match value}$$

  - $P_i(c)$ is the MBS security price
  - $L_{\tau,i}$ is unpaid balance at end of month τ.
  - $\tilde{T}_i \leq 360$ is the (random) duration of the loan.
- Security price:
  - *Multi-issuer pool:* TBA price depends on c, but not on (z, r).
  - *Single-issuer pool:* Pool price depends on c AND pool composition

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- Two-stage decision:
  1. Bidding
  2. Security customization choice

Two Models of Loan Valuation

- PV model:
  - Bidders have common beliefs about duration, $\overline{M}_{ij} = E[M_i|Z_i]$ for all j
  - Plus additive, idiosyncratic cost/value shock S_{ij} over match value

$$\text{Match value} = Z_i\gamma + S_{ij}$$

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- CV model:
  - Each bidder j receives an informative private signal S_{ij} about M_i

$$\Rightarrow \overline{M}_{ij} = E[M_i|Z_i, S_{ij}]$$

  - *Implication:* Dispersion in bids and securitization choices reflect heterogeneity in expectations of loan duration

Security choice: Testable implications

- **Customization options:**
  1. *Service income:* High vs Low coupon
  2. *Pool:* Custom vs Multi-issuer

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  2. *Pool:* Custom vs Multi-issuer
- **Testable implication 1:** Markup vs Upfront TBA price

$$c_i = c_H \text{ if } \overline{M}_{ij} \leq \frac{P_H^{tba} - P_L^{tba}}{(c_H - c_L)/1200}$$

  - Under CV, loans placed in High-coupon securities (*low service income*) are more likely to be pre-paid early

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- **Testable implication 2:** Security price vs Securitization cost/diversification

$$P_c^{custom} = c \times E[M_i|\text{Bank } j\text{' pool}] > P_c^{tba} = c \times E[M_i|\text{Multi pool}]$$

  - Rank loans in portfolio for coupon c:

$$\overline{M}_1 > \overline{M}_2 > \cdots > \overline{M}_n$$

  - Under CV, loans with $\overline{M}_{ij} > m_j^*(c)$ are placed in custom-pool

Bidding stage: Willingness to pay

- Bidder willingness to pay conditional on selecting coupon c:

$$WTP_j(c|Z,S) = \begin{cases} P_{j,c}^{custom} + \overline{M}_{ij}\frac{r-c-g}{1200} & \text{If } \overline{M}_{ij} \geq m_j^*(c) \\ P_c^{tba} + \overline{M}_{ij}\frac{r-c-g}{1200} & \text{If } \overline{M}_{ij} < m_j^*(c) \end{cases}$$

- Bidder valuation:

$$WTP_j(Z,S) = \max_{c \in \{c_H, c_L\}} WTP_j(c|Z,S) + \text{Match value}$$

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- **Special case:** Note rates with digits $d \in \{0, 1/8, 3/8, 4/8, 5/8, 7/8\}$ do not have a coupon choice.

$$\Rightarrow WTP_j(Z_i, S_{ij}) = P_j^*(c|Z_i, S_{ij}) + \overline{M}_j(Z_i, S_{ij})\frac{r-c-g}{1200}$$

Bidding stage: Strategies

- In practice, bids are additive in a reference price:

$$\begin{aligned} \text{Bulk Price}_{ij} &= \text{Base price} + \text{Loan-level adj.} = \overline{B}_j(Z_i) + B_{ij} \\ \text{Lock Price}_{ij} &= \text{Base price} = \overline{B}_j(Z_i) \end{aligned}$$

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- **Assumption:** Existence of an equilibrium in monotone increasing strategies,

$$B_{ij} \equiv \beta_j(Z_i, S_{ij}) \text{ is increasing in } S_{ij}.$$

- Bidding strategy:

$$\text{Bid}_{ij} = \overline{B}_j(Z_i) + \begin{cases} B_{ij} & \text{If } B_{ij} \geq 0) \\ 0 & \text{If } B_{ij} < 0) \end{cases}$$

- Cutoff: Bulk bid if $S_{ij} > s_j^*(Z_i) = \beta_j^{-1}(Z_i, 0)$

Bidding stage: Testable implications

- **Participation:**
  - *Positive selection*: Under CV,

$$E[M_i|1\{B_{ij} > 0\}, Z_i] > E[M_i|Z_i]$$

  - *Rival selection:* Under CV,

$$E[M_i|1\{B_{ij} > 0\}, \sum_{j' \neq j} 1\{B_{ij'} > 0\}, Z_i]$$

    is increasing in second argument (invariant under PV).

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    is increasing in second argument (invariant under PV).
- **Bid levels:** For any $S_{ij} > s_j^*(Z_i)$
  - *Monotonicity*: $E[M_i|B_{ij} = b, Z_i]$ in increasing wrt to b if CV, invariant if PV
  - *Winner's curse*: $E[M_i|B_{ij} = b, \max\{B_{i,-j}\} = b', Z_i]$ is increasing wrt to max rival bid if CV

Empirical question: *Are banks' actions informative about prepayment risk?*

- Survival regression:

$$100 \times 1(\tilde{T}_i > 12) = \lambda\,[\text{Banks actions}] + FE_i + \gamma Z_i + \epsilon_i$$

- Adverse selection in the MBS market:
  - Variation: Limited ability to customize securities
  - Chiappori and Salanié's correlation test:
    - ★ Do sellers place higher-duration loans in low coupon securities?
    - ★ Do they sell higher-duration loans in a custom pool security?
- Common-value test:
  - Auctions for loans *without* a coupon-choice option
  - Correlation between (residual) bids/participation and loan duration (as in Hendricks, Pinkse and Porter)
- What is the impact of bank asymmetries on loan allocation?

Empirical implementation: Adverse selection

- Sample: All Ginnie-Mae loans securitized between 2013 and 2019
- Two tests:
  - *Coupon choice:* Loans with a coupon option securitized in multi-issuer securities (i.e. TBA-eligible)
  - *Mutli vs custom pool:* Loans without a coupon choice option
- Estimating equation:

$$100 \times 1(\tilde{T}_i > 12) = \lambda \left\{ \begin{array}{c} \text{High-coupon} \\ \text{or Multi-issuer MBS} \end{array} \right\} + FE_i + \gamma Z_i + \epsilon_i$$

- We use three sets of controls (in addition to Month x Rate FE):
  - *Selection on observables and unobservables:* Z_i includes only loan size
  - *Selection on unobservables:* Z_i includes full set of loan characteristics
  - *Selection on unobservables within firms:* Issuer FE
- List of controls

Results: Adverse-selection (1)

VARIABLES	(1)	(2)	(3)	(4) Retail	(5) Wholesale
Panel A: Coupon choice					
1(High coupon)	-3.96	-2.63	-1.61	-0.93	-0.90
	(0.35)	(0.33)	(0.26)	(0.31)	(0.28)
Obs.	2,627,016	2,627,016	2,619,080	1,067,970	1,481,475
Loan charact.	loan size	yes	yes	yes	yes
Fixed effects	$r \times t$	$r \times t$	$r \times t \times f$	$r \times t \times f$	$r \times t \times f$
Mean dep. var.	89.2	89.2	89.2	89.1	89.6
% Multi-issuer pool	0.83	0.83	0.83	0.86	0.78
% High Coupon	0.87	0.87	0.87	0.87	0.87

Takeaway

- *Holding fixed r, loans placed in high-coupon (low service income) are $\approx$ 4% more likely to get pre-paid within 12 mo.*
- *Pricing of MBS: 65% of adverse-selection is due to observables*
- **Firm asymmetries:** *Banks who never use low-coupon (i.e. high liquidity needs) supply lower duration loans*

Results: Adverse-selection (2)

VARIABLES	(1)	(2)	(3)	(4) Retail	(5) Wholesale
Panel B: Pool type					
1(Multi-issuer pool)	-10.0	-4.27	-2.87	-3.07	-2.62
	(0.29)	(0.22)	(0.22)	(0.23)	(0.22)
Obs.	8,469,486	8,469,486	8,438,337	3,348,467	3,959,362
Loan charact.	loan size	yes	yes	yes	yes
Fixed effects	$r \times t$	$r \times t$	$r \times t \times f$	$r \times t \times f$	$r \times t \times f$
Mean dep. var.	89.2	89.2	89.2	89.1	89.6
% Multi-issuer pool	0.83	0.83	0.83	0.86	0.78
% High Coupon	0.87	0.87	0.87	0.87	0.87

Takeaway

- **Adverse-selection:** *Loans placed in multi-issuer pools are adverse-selected*
- *About 1/3 of the adverse-selection is due to private signals about loan duration*
- **Firm asymmetries:** *Banks who never use multi-issuer pools (i.e. small lenders) supply lower duration loans*

Moral Hazard or Adverse Selection?

- Do lenders encourage borrowers to refinance their loans early so they can earn higher service income on new loan?
- Test using sample of loans **not** eligible for a coupon choice - i.e., note rates that end in 0.375, 0.5, and 0.625.
- Regression:

$$\begin{aligned} Y_i &= \lambda_1 1\{r_i - c_i = 0.5\} + \lambda_2 1\{r_i - c_i = 0.625\} \\ &\quad + g(r_i) + Z_i\beta + \text{Fixed Effects} + u_i \end{aligned}$$

  - Loans with higher rates get pre-paid early: $g'(r) < 0$
  - Loans with higher spread $r - c$ likely to be pre-paid if hypothesis is true $\Rightarrow \lambda_2 > \lambda_1 > 0$.

Results: Moral Hazard

VARIABLES	(1)	(2)	(3)	(4) Retail	(5) Wholesale
Panel C: Service income					
$r - c = 500$ bbs	0.40	0.046	-0.39	-0.31	-0.45
	(0.15)	(0.15)	(0.11)	(0.12)	(0.13)
$r - c = 625$ bbs	1.05	0.60	-0.065	-0.11	-0.046
	(0.16)	(0.16)	(0.11)	(0.13)	(0.13)
Observations	4,385,138	4,385,138	4,384,537	1,819,522	1,970,036
Loan characteristics	rate+loan	all	all	all	all
Fixed effects	t	t	$t \times f$	$t \times f$	$t \times f$
Mean dep. var.	89.2	89.2	89.2	89.1	89.6

Takeaway

- *Reject Moral Hazard hypothesis:*
  - *More profitable loans are slightly more likely to survive*
  - *Difference is fully explained by observed differences cross loans/banks*

Common value test: Empirical implementation

Sample: Loans without a coupon choice sold between 2018-2019

- Recall that WTP and observed bids are given by:

$$\begin{aligned} WTP_j(Z_i, S_{ij}) &= P_j^*(c|Z_i, S_{ij}) + \overline{M}_j(Z_i, S_{ij})\frac{r-c-g}{1200} \\ \text{Price}_{ij} &= \overline{B}_j(Z_i) + \max\{\beta_j(Z_i, S_{ij}), 0\} \\ 1\{\text{Bulk}_{ij} = 1\} &= 1\{S_{ij} \geq s_j^*(Z_{ij})\} \end{aligned}$$

- *Challenges:*
  1. We do not observe B_{ij} or $\overline{B}_j(Z_i)$ directly
  2. We do not observe counter-factual security choice: $P_j^*(c|Z_i, S_{ij})$

Common value test: Empirical implementation (continued)

Sample: Loans without a coupon choice sold between 2018-2019

- *Solution:* Estimate pricing model separately for each bank j

$$\text{Net price}_{ij} = \text{Price}_{ij} - P_i^{tba}(c) = \mu_j(Z_i, \text{Bulk}_{ij}) + \hat{S}_{ij}$$

- Random Forest pricing model for bidder j, $\hat{\mu}_j(Z_i, \text{Bulk}_{ij})$:
  - *Control variables:* Auction date, Note Rate, Service income, Loan size, FICO, LTV, DTV, Purchase/Refi, VA/FHA

Common value test: Empirical implementation (continued)

Sample: Loans without a coupon choice sold between 2018-2019

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  - *Control variables:* Auction date, Note Rate, Service income, Loan size, FICO, LTV, DTV, Purchase/Refi, VA/FHA
- What is in $\hat{S}_{ij}$?
  - Pricing model error: $\mu_j(Z_i, \text{Bulk}_{ij}) - \left[\overline{B}_j(Z_i) - 1\{\text{Bulk}_{ij} = 0\}\mu_{0j}\right]$
  - Monotonic transformation of signal S_{ij}
- **Importantly:** The event $1\{S_{ij} \geq s_j^*(Z_{ij})\}$ is a "clean" measure of banks' private signal S_{ij}

Results: Common Value Test

VARIABLES	(1)	(2)
1(Bulk bid)	0.523*	0.428*
	(0.141)	(0.111)
Fraction bulk bids (rivals)		3.408*
		(1.019)
Observations	652,601	652,563
R-squared	0.158	0.158
Sample	All Bids	All Bids
Mean dependent variable	80.13	80.13
Fraction bulk bids	0.779	0.779
Fraction rival bulk bids (SD)		0.196

Takeaway

- *Common Value: Participation is positively correlated with duration*
- *Winner's Curse: Rivals' participation is informative about duration*

Bidder Asymmetries: Are bidders differentially informed?

- Three measures of information quality:
  - **Participation signal:** Measure informativeness of signal S_{ij}

$$Y_i = \widehat{\lambda}_j^p 1\{Bulk_{ij} = 1\} + FE_i + \gamma Z_i + \epsilon_i$$

  - **Bid residual:** Informativeness of signal + pricing model error

$$Y_i = \widehat{\lambda}_j^s \hat{S}_{ij} + FE_i + \gamma Z_i + \epsilon_i$$

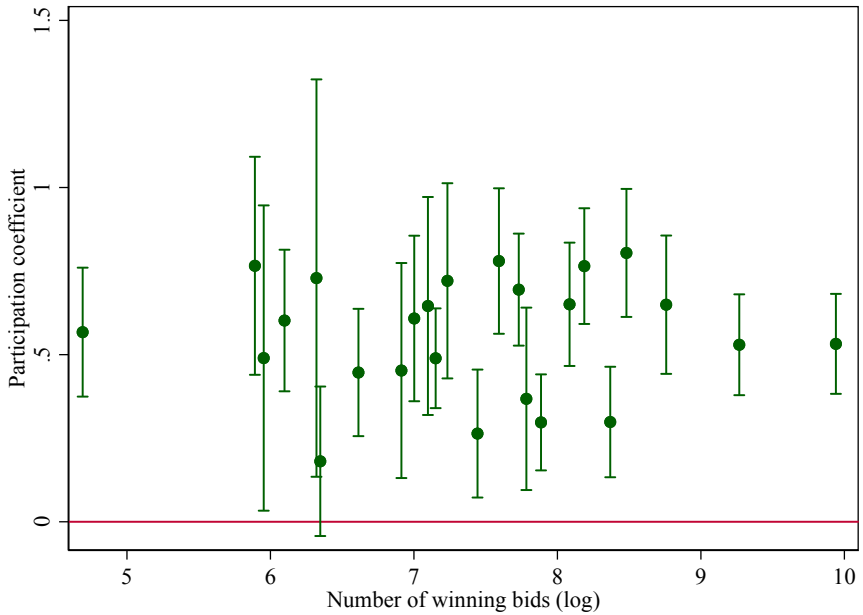
  - **Model quality**: How well does bidder j forecast loan duration based on observables?

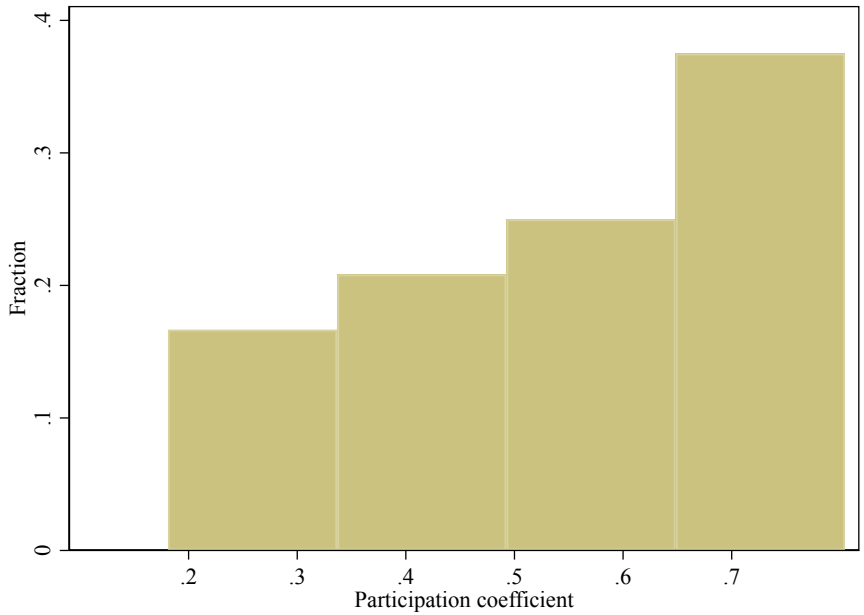
$$\overline{Y}_i = \widehat{\lambda}_j^m \widehat{\mu}_{ij} + \text{Buyer FE} + \text{Seller FE} + \text{Note rate x Month FE} + \epsilon_i$$

where $\overline{Y}_i$ is a predicted survival score: $\overline{Y}_i = \widehat{\gamma} Z_i + FE_i$.

Is participation informative about loan duration?

- **Participation signal:** $Y_i = \lambda_j^p 1\left(\text{Bulk bid}\right)_{ij} + Z_i\beta + \text{Fixed effects} + \epsilon$



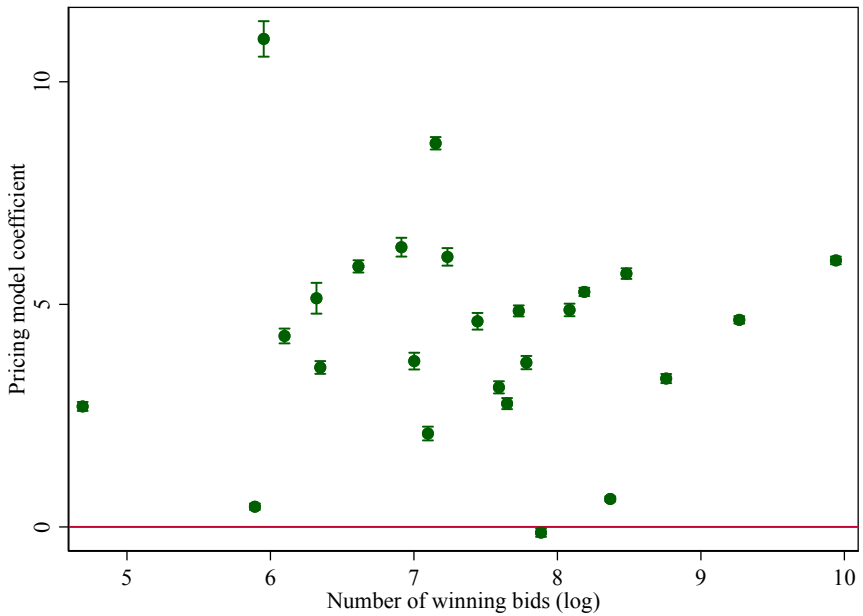


Note: Figures exclude bidders who won less than 100 auctions. Total sample = 25 banks

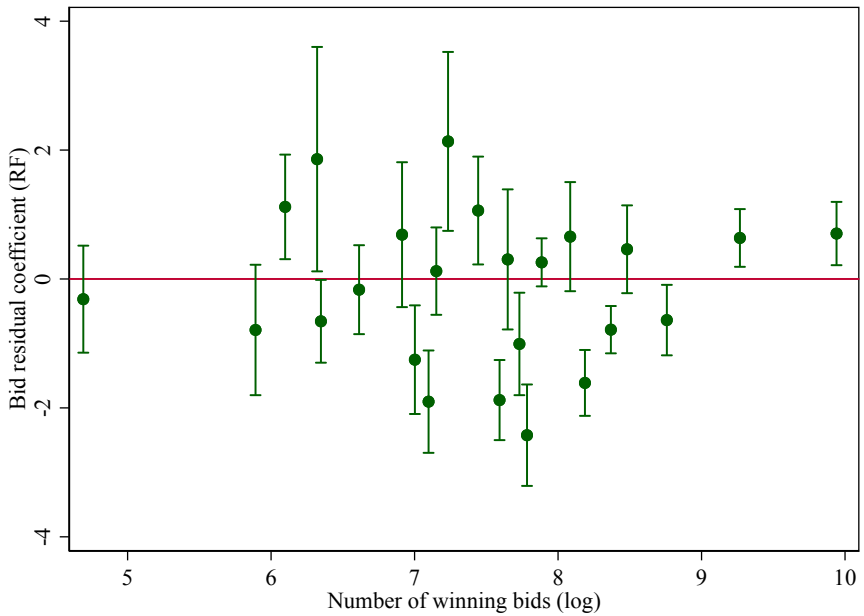
Are bidding strategies informative about loan duration?

- **Model quality:** $\bar{Y}_i = \lambda_j^m \widehat{\mu}_{ij} + \text{Fixed effects} + \epsilon$
- **Signal quality:** $Y_i = \lambda_j^s \text{Bid residual}_{ij} + Z_i\beta + \text{Fixed effects} + \epsilon$

Pricing Model



Bid Residual

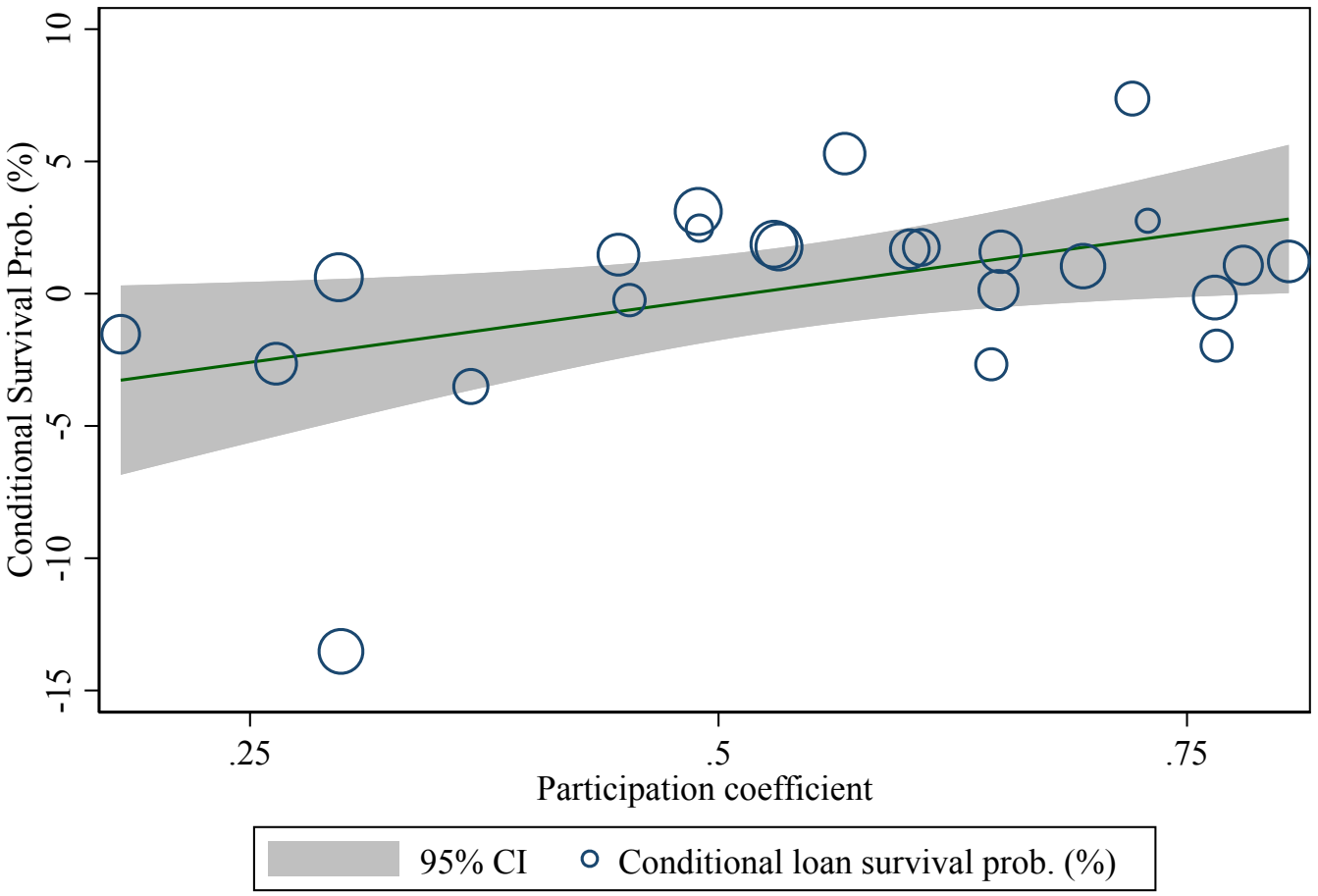


Note: Figures exclude bidders who won less than 100 auctions. Total sample = 25 banks

Do informed bidders win better loans?

- **Conditional survival FE:** Measure of bank "residual productivity" (centered at zero)

$$Y_i = Z_i\beta + \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$

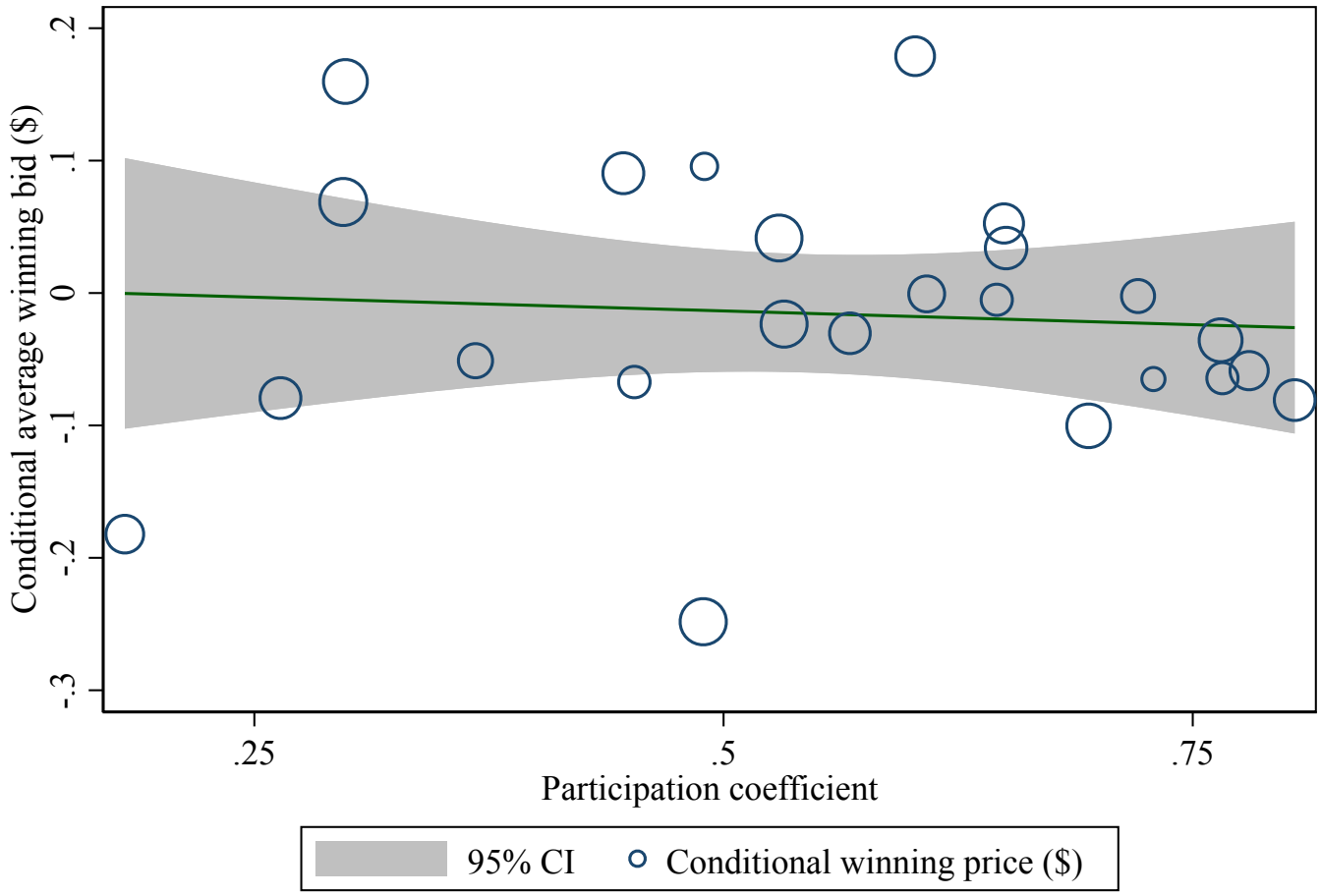


Correlation coefficient = .44

Do informed bidders pay higher prices?

- **Conditional survival FE:** Measure of bank "residual productivity" (centered at zero)

$$Y_i = Z_i\beta + \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$



Correlation coefficient = -.07

What about bidders with "better" pricing models?

- **Unconditional average survival and prices:**

$$\bar{Y}_i = \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$

$$\hat{\mu}_{ij} = \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$

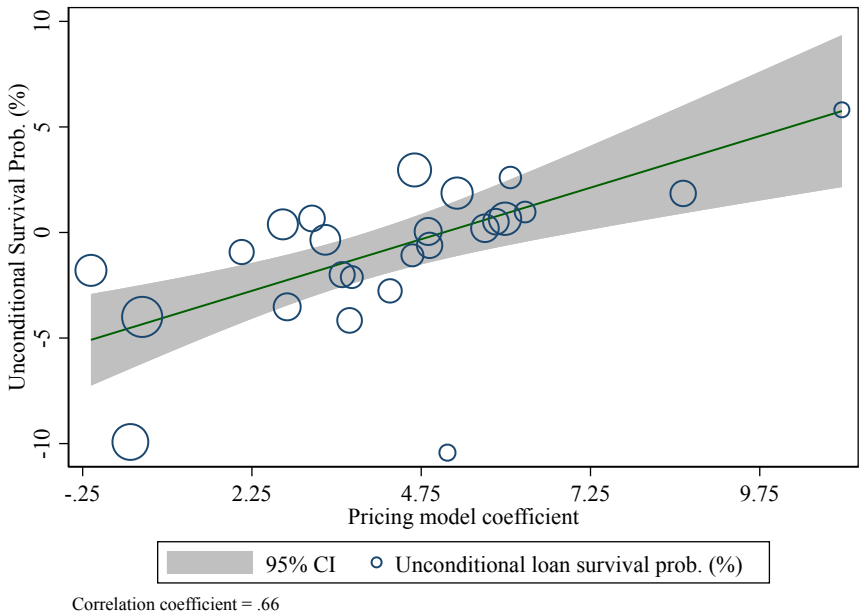
What about bidders with "better" pricing models?

- **Unconditional average survival and prices:**

$$\bar{Y}_i = \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$

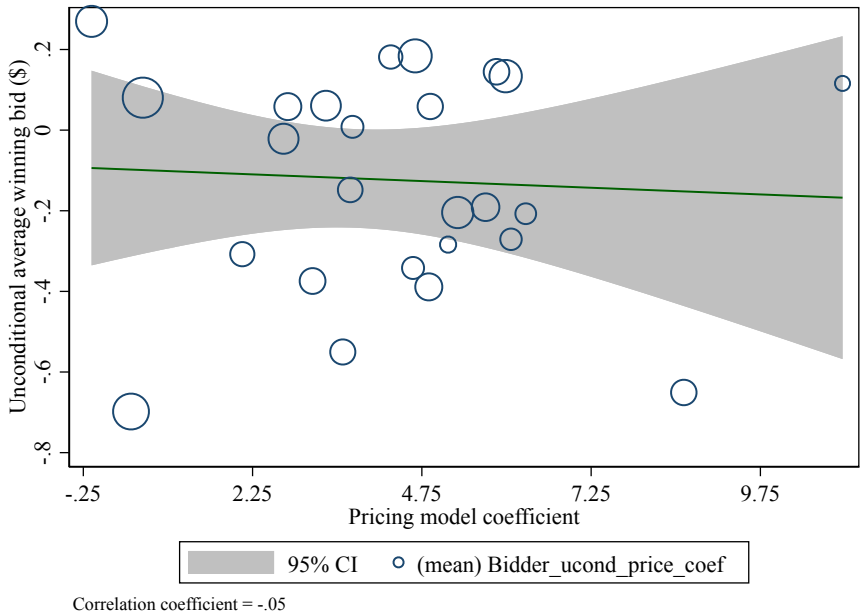
$$\hat{\mu}_{ij} = \text{Fixed effects} + \omega_j 1(\text{Bank } j \text{ wins}) + \epsilon$$

Average survival



Correlation coefficient = .66

Average winning price



Correlation coefficient = -.05

Common-value test results: Takeaways

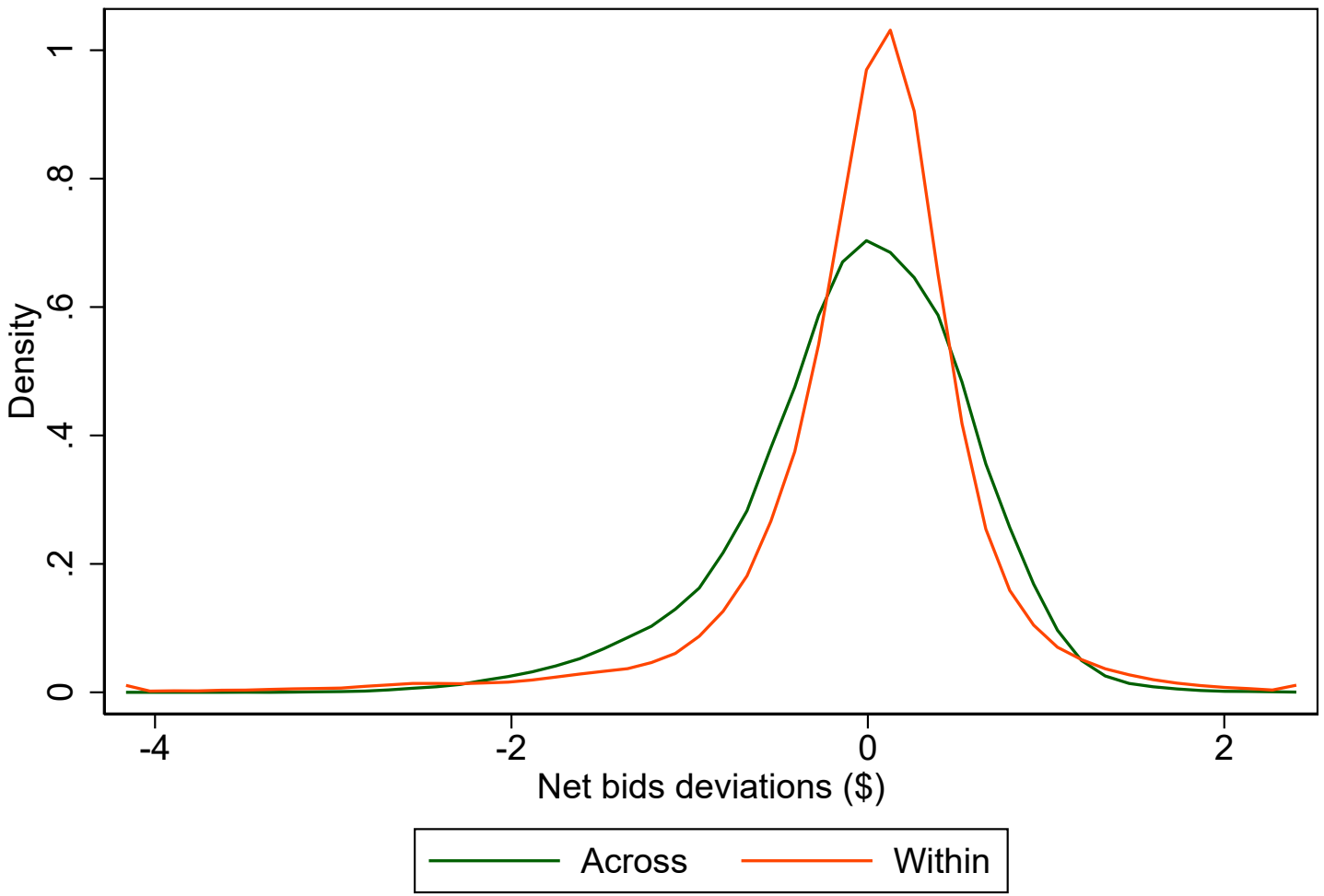
- Evidence of common-value:
  - Participation "signal" is correlated with loan duration
  - Rival participation is informative conditional on *own* participation
- Bank asymmetries:
  - Weak evidence that banks differ in the precision of their signals
  - Strong evidence that asymmetries in pricing model affect allocation
- Winner's Curse?
  - More informed bidders *over pay* for loans
  - Banks with better pricing models *cream skim* the market, and earn higher profit margins

Conclusion

- Main Results
  - Banks value loan duration, and price it more efficiently in the auction than in the posted price market.
  - Auction is a common value auction with differentially informed bidders.
  - Asymmetric information leads to adverse selection in the MBS market.
  - Ability to customize securities increases market-power in the wholesale market
- To Do
  - Source of bank asymmetries: Preference for liquidity or information?
  - Adverse selection in wholesale market: Do originators sell higher duration loans in MBS market, lower duration loans in wholesale market?
  - Impact of the auction on borrowing costs: how much of the gain is passed on to borrower?

APPENDIX

Bid dispersion: Within and across auctions



Across auction std-dev: .6. Within auction std-dev: .65

Return

Pricing of Risk Attributes

Regression: $Y_i = Z_i\beta + \text{Date} \times \text{Rate} + \text{County} + \text{Seller} + \epsilon_i$

	(1) Survival (12mo)	(2) Survival (36mo)	(3) Bulk Bid	(4) Lock Price
LogLoanAmount	-19.3*	-23.4*	-0.41*	-0.10*
	(0.45)	(0.46)	(0.0029)	(0.0052)
1(Purchase Loan)	4.04*	5.40*	0.057*	0.082*
	(0.51)	(0.53)	(0.0033)	(0.0058)
FICO Score (/1000)	-60.8*	-28.6*	5.21*	6.56*
	(3.59)	(3.71)	(0.023)	(0.041)
Loan-to-Value (/100)	20.0*	6.14*	0.0095	0.21*
	(2.62)	(2.72)	(0.017)	(0.029)
1(VA-Backed)	-13.3*	-5.90*	-0.33*	-0.37*
	(0.41)	(0.42)	(0.0026)	(0.0045)
1(Debt-to-Income $\geq$ 50)	-0.79*	-0.28	-0.021*	-0.00086
	(0.37)	(0.38)	(0.0024)	(0.0043)
Observations	65199	65199	502953	203703
R^2	0.160	0.121	0.304	0.338

Standard errors in parentheses
* $p < 0.05$

- Bulk: Hedonic prices match main survival attributes (expt. FICO)
- Lock prices not as well, but fit is better.

Return

Control Variables

- Baseline specifications: Period x Note-rate fixed effects
  - MBS sample: Issuance month
  - Auction sample: Auction date
- Loan attributes:
  - Loan size, FICO, LTV, Refi/Purchase, Income (auction), DTI, Agency (VA/FHA), Zip-code house value
  - Geography: County (Auction), State (MBS)
- Origination channel:
  - Auction: Originator (Seller) fixed-effects
  - MBS: Channel, Issuer fixed-effects

Return (AS)

Return (CV)