Liquidity Crisis, Runs, and Security Design

Lessons from the Collapse of the Auction Rate Securities Market

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Federal Reserve Board

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The views presented herein are completely our own and do not necessarily reflect those of the Board of Governors of the Federal Reserve System.

Main Results

ARS design is flawed

- Vulnerability to two runs:
  - Investers' run, partially panic-based
  - Broker-dealers' run
    - ★ Unexpected first mover withdrawal of liquidity support triggered simultaneous withdrawal by all major broker-dealers
  - Two runs interact and amplify each other
- Problems with uniform price auction
  - Strong evidence of underpricing
  - Auction reset rates only weakly related to fundamentals, positively related to maximum rate

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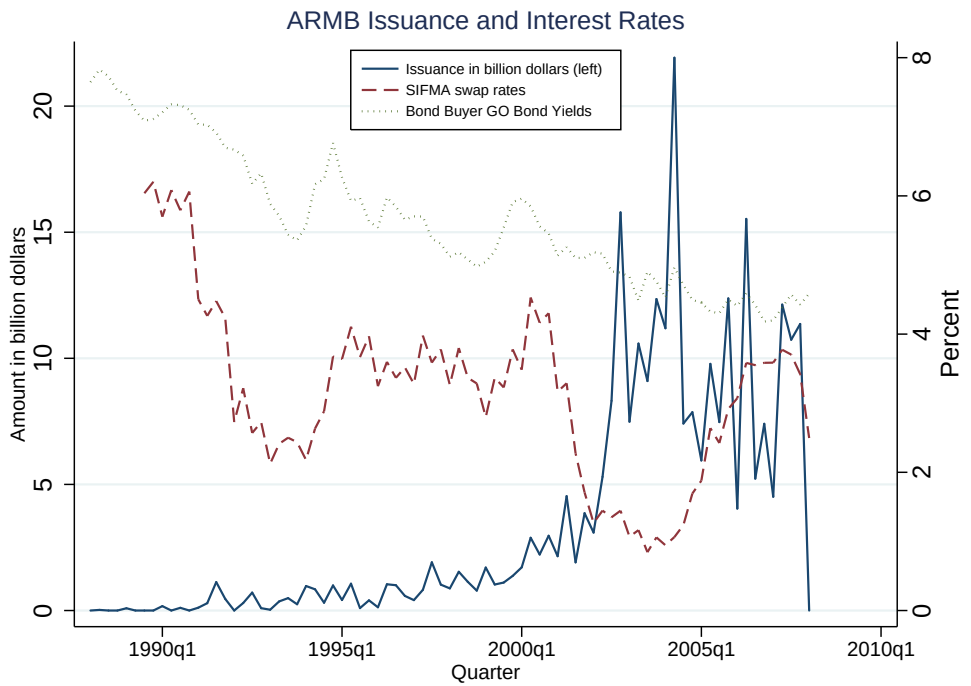
Auction Rate Securities (1984-2008)

- Long-term debt securities with variable interest rates, reset every 7, 28, 35 days etc. through a Uniform-Price Auction Process
- Purpose: ARS allows issuer to fund long term liability with short term debt
- Issuers: municipalities, close-end funds and student loans authorities
- Investors: corporate treasury, high net-wealth individuals
- Market size: $330 billion (end of 2007), half in Muni ARS (MARS)



Auction Process & Dealer's Role

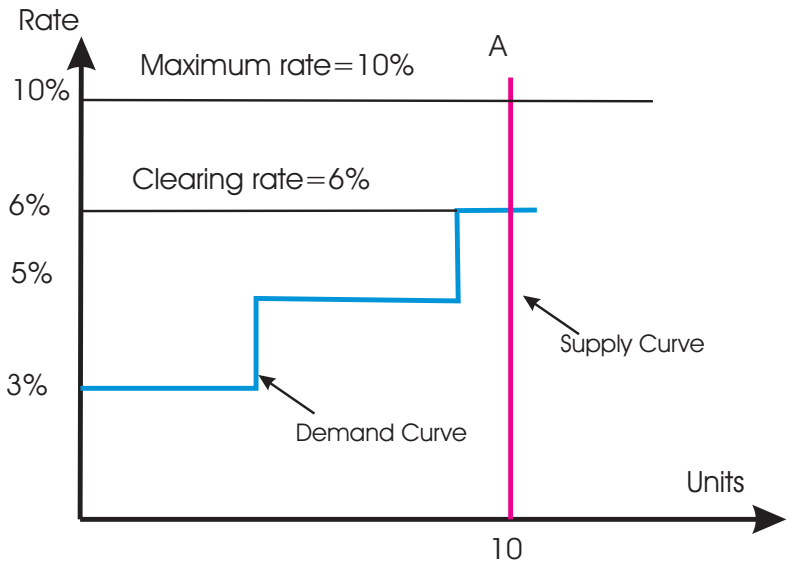
Purpose

- Price discovery: Setting interest rates
- Source of liquidity: transfer ownership

Order Types

- Existing Owner : Sell, Hold, Hold at rate
- Potential Buyer : Buy at rate

- Clearing Rate: the lowest rate at which bids are sufficient to cover all sells
- In the example, the clearing rate is 6%



- If sells $>$ buys, auction fails. Transfer prorated. Reset rates set at maximum rate
- Dealer can participate after seeing the demand curve to support auctions, but not required to do so.

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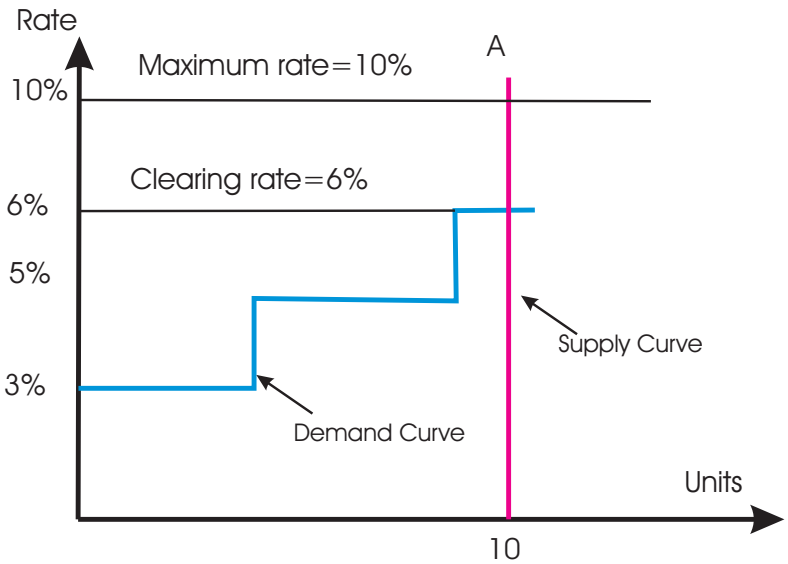

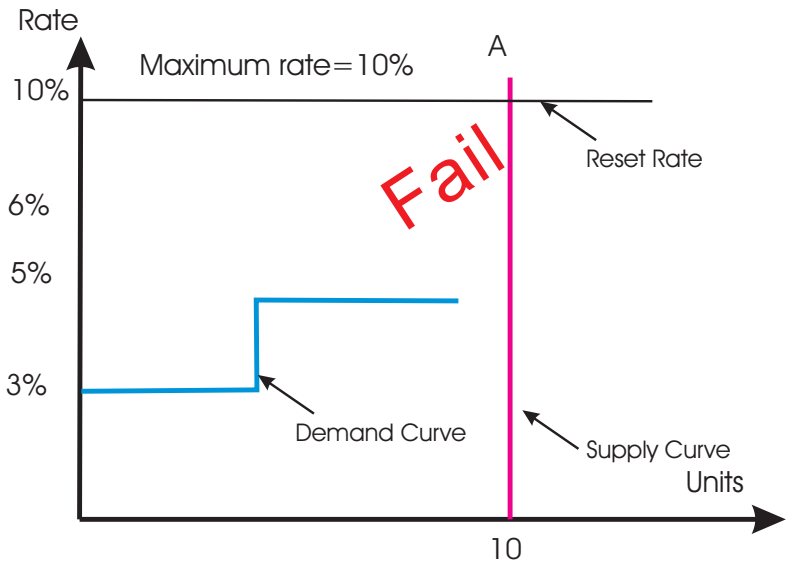

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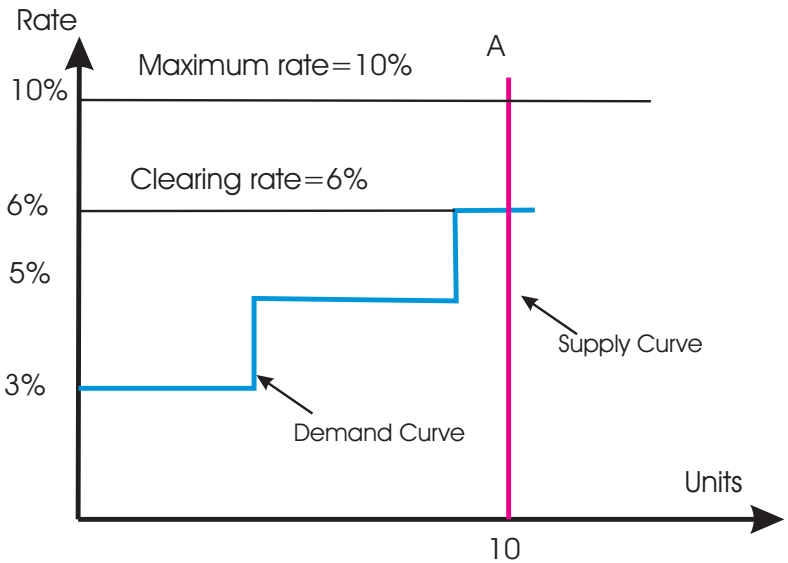

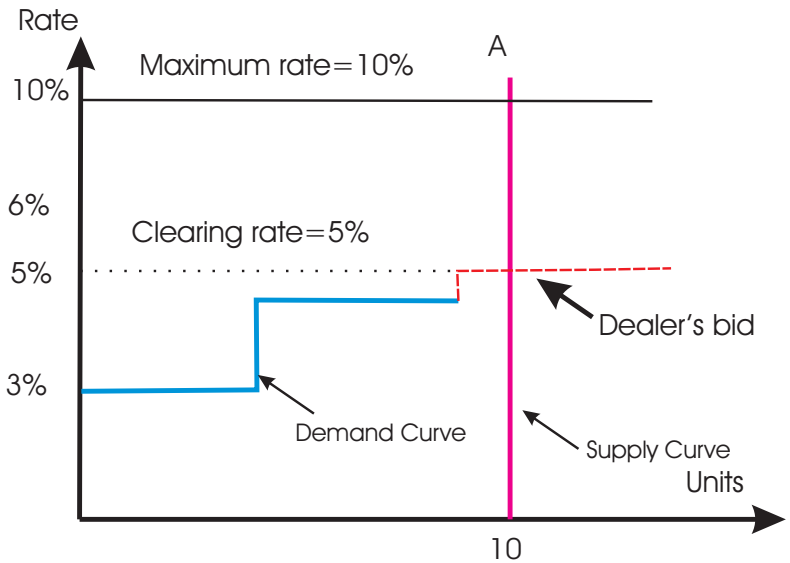

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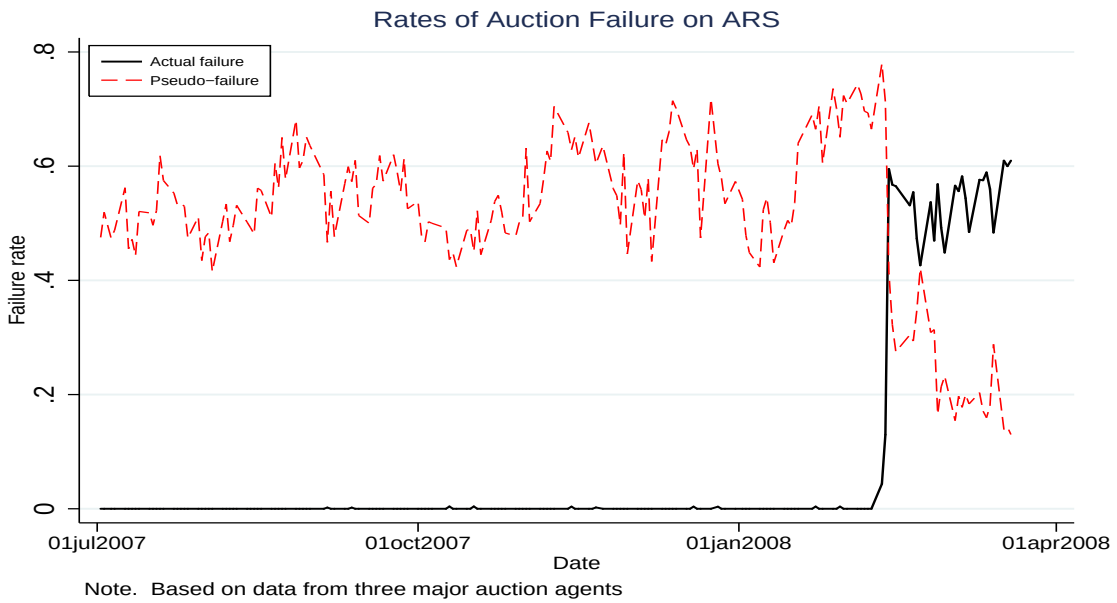
Before Week of Feb 12: Managed Bidding

Dealer's impact in:

- Pricing: Price talk and Actual bids
- Liquidity: net Buyer in auctions, net Seller in non-auction secondary market

False Sense of Safety

- Many investors are unaware of auction dealer's role in auctions



Note. Based on data from three major auction agents

- Many insiders expect the "implicit support" to be binding

Data in MARS

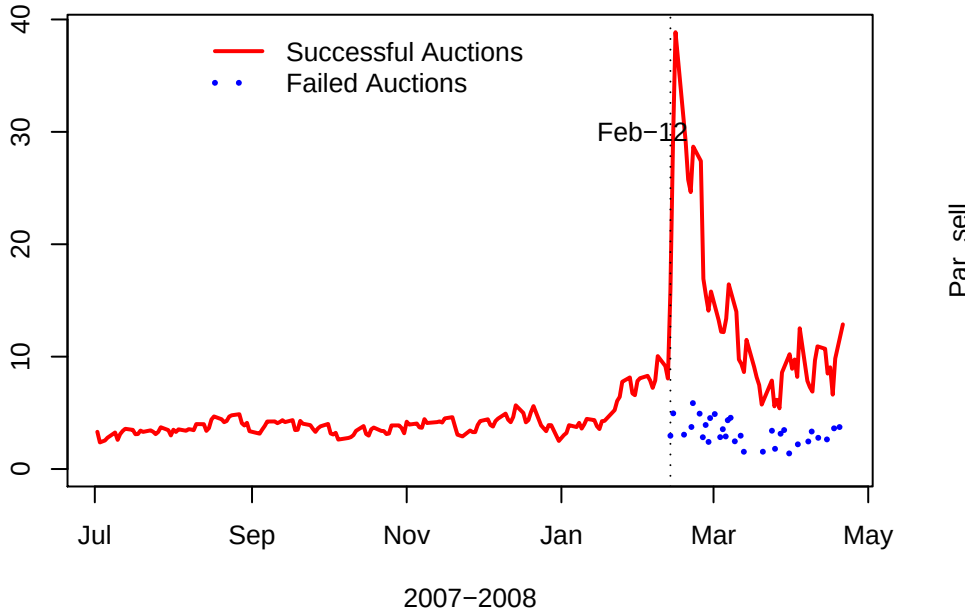
- Auction results from three main auction agents
  - Auction status, reset rates, benchmark index rate
- Muni transactions data from MSRB
  - Trade size, price, direction of trade
- Bond characteristics from Bloomberg
- Identify maximum rates through "rule matching"

Three sample periods

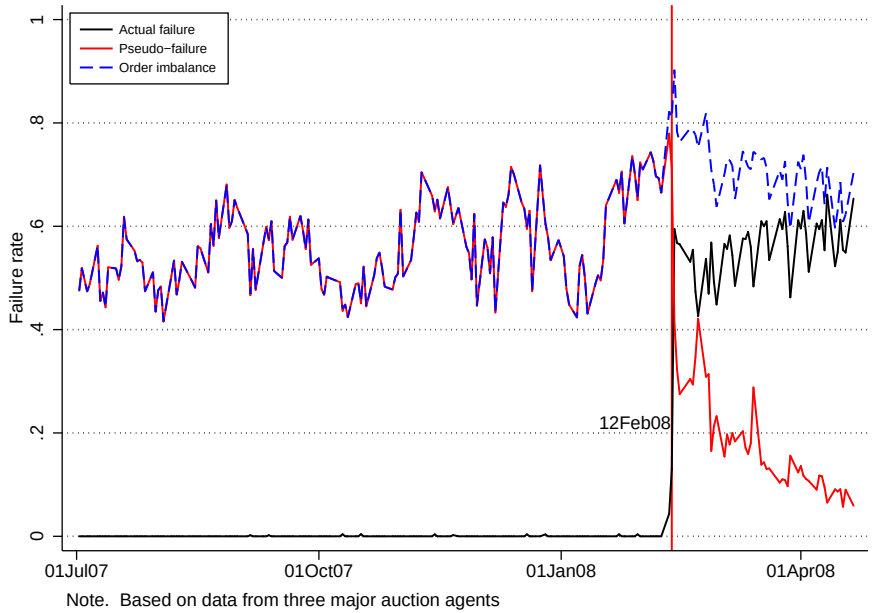
- Pre-crisis period 7/1/2007-12/31/2007
- Crisis period 2/11/2008-2/19/2008
- Post-crisis period 2/20/2008-3/19/2008

Empirical 1: Investors' Run

- Unusually large number of sell orders on Feb 12

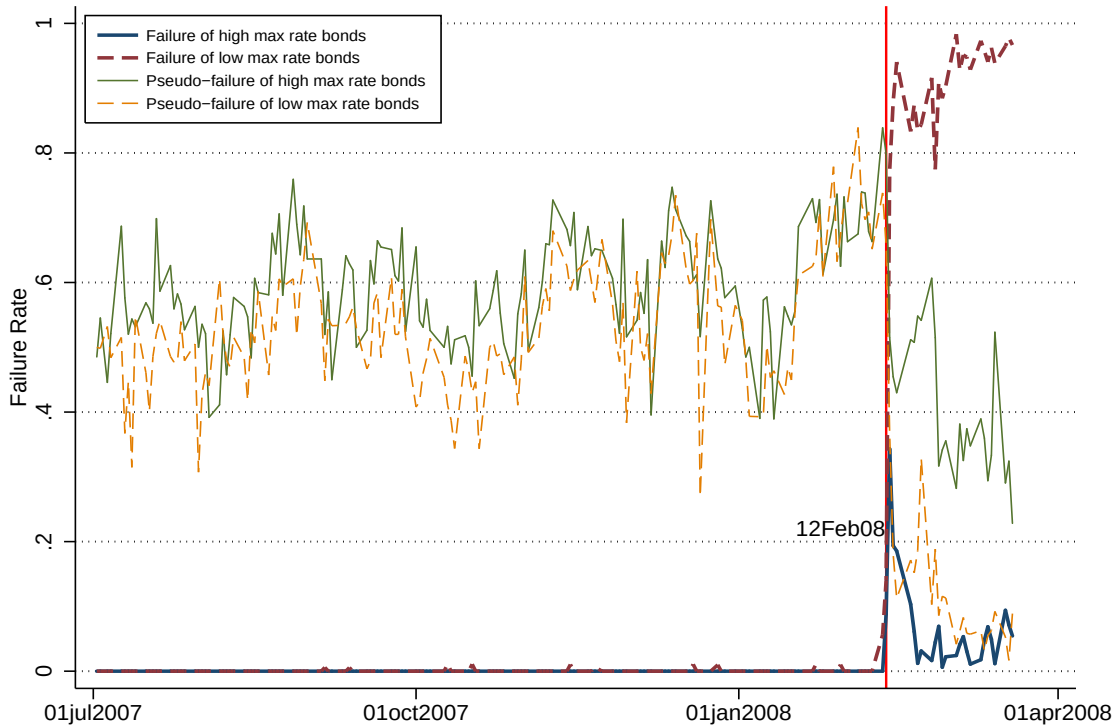


- Sudden surge in the incidence of failures (Pseudo Fail+Actual Fail)



Determinants of Auction Failures

- Fundamental variables: bond characteristics, credit risk, macro factors
- Max rate:
  auction likely to succeed if maxrate $\geq$ upper support of fundamental value



Abnormal Failure Rates

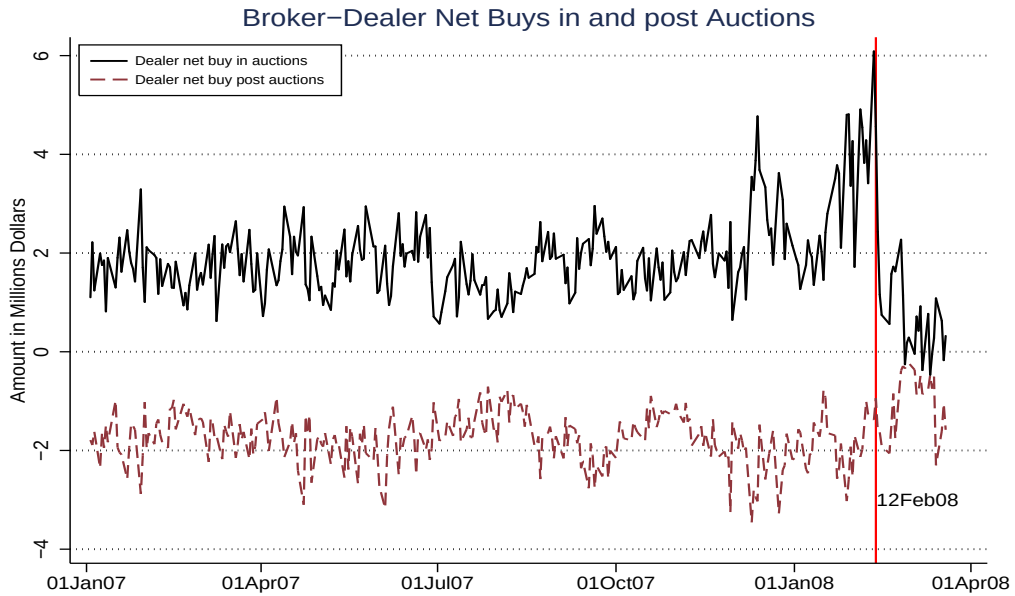
- Panic based (Sunspot) v.s. Informational based?

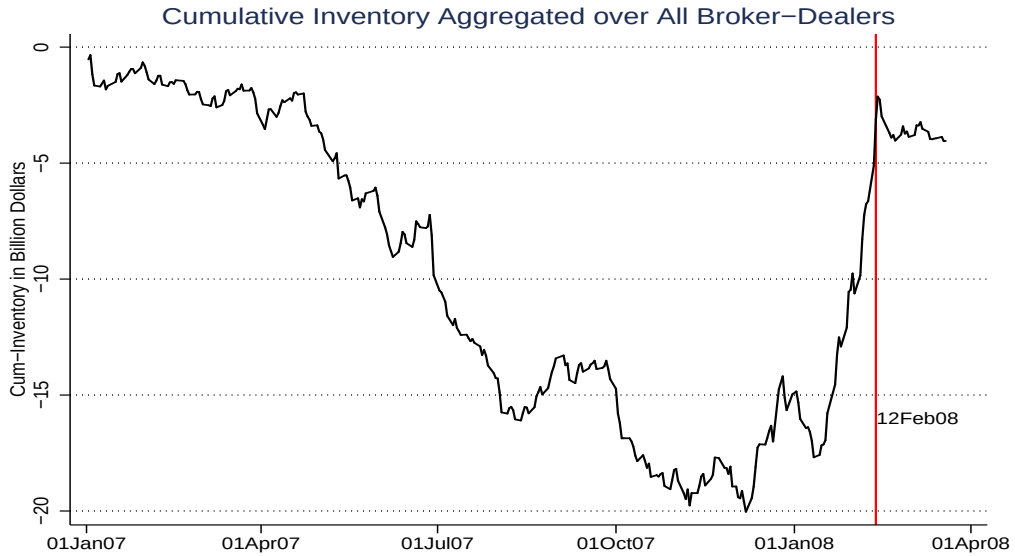
Abnormal Failure Rates in Mid-February

Date	Actual $\overline{p}_t$	Predicted $\overline{\hat{p}}_t$	Abnormal $\overline{p^\star}_t$	Std. Dev. of $p^\star_{it}$	N_t	t-Stat of $\overline{p^\star}_t$
2/11/2008	0.04	0.42	-0.40	0.44	225	-13.64
2/12/2008	0.13	0.39	-0.28	0.51	358	-10.45
2/13/2008	0.60	0.43	**0.11**	0.48	385	4.49
2/14/2008	0.57	0.43	**0.09**	0.37	309	4.04
2/15/2008	0.57	0.38	**0.11**	0.32	359	6.79
2/19/2008	0.53	0.45	0.01	0.32	403	0.83

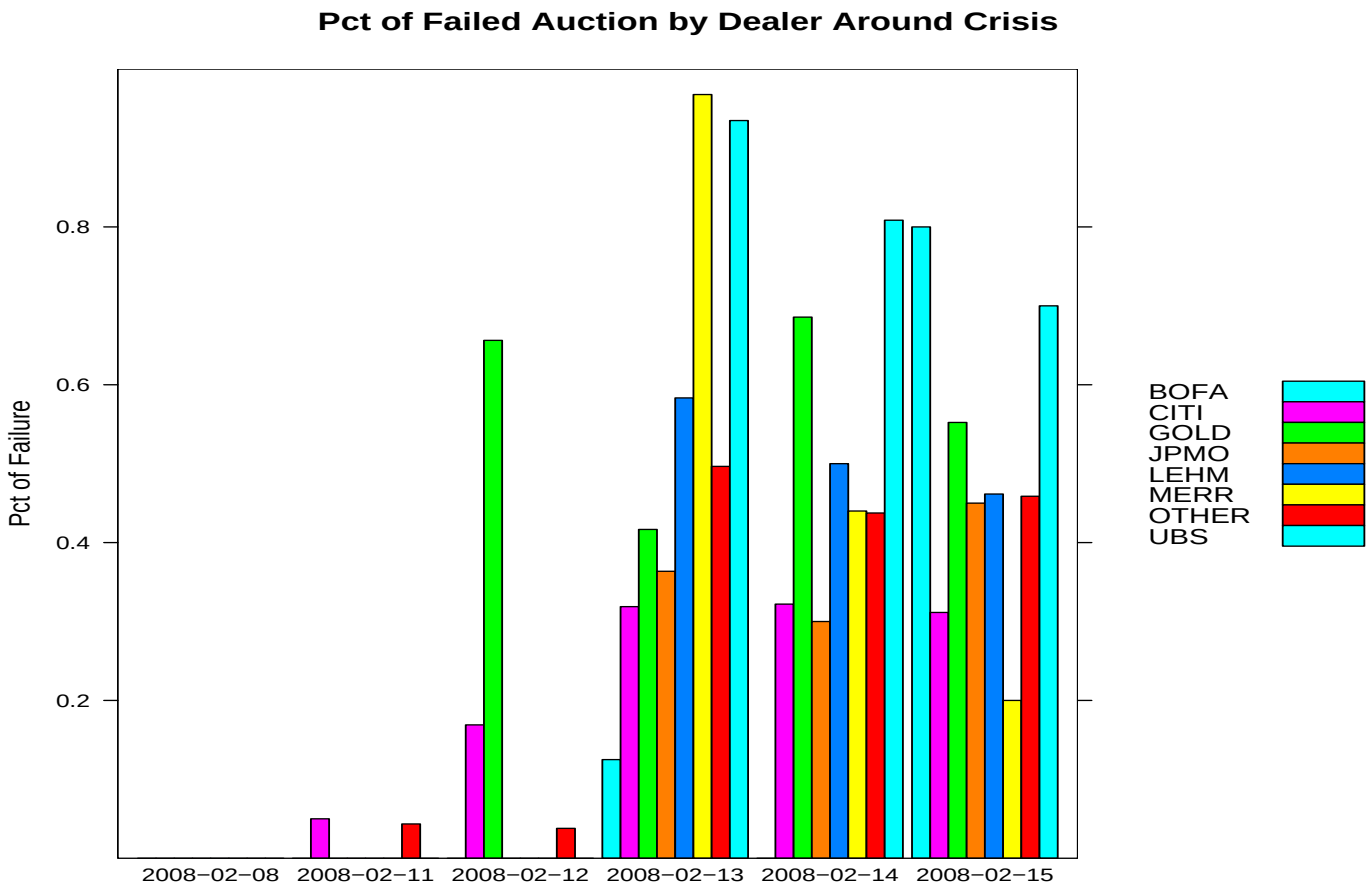
The runs are partially panic driven.

Dealer's Inventory Stress





Dealers' Run – Failure to Coordinate



- One bank let their auctions fail, all others followed the next day

Why Simultaneous Withdrawal of Liquidity Support?

One dealer's decision to Support or Not:

- Cost of support: Inventory cost, balance sheet stress
- Benefit: reputation to both investors and issuers

Multiple Dealers: externality of one dealer's decision on others by letting auctions fail

- Investors run away from all ARS, other dealers forced to take more inventory, more stress to balance sheet
- Relative cost to reputation diminishes for other dealers if they also withdraw

Two Equilibrium outcomes: All support (unstable), or all withdraw (stable)

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Empirical 2: Uniform Price Auction Inefficiencies

- All bidders pay at the clearing rate

Theoretical Predictions, Back & Zender 93 , 01

1. Without dealer support—fixed quantity auction
   - Equilibrium may be unrelated to fundamentals
   - Equilibrium with lowest price (highest interest rate) preferred
2. With dealer support — endogenous quantity auction
   - Difference between worse-case equilibrium and fundamental value converge to zero as number of bidder increases

Results from OLS Regressions of Reset Rates

	7/1/07-12/31/07		2/20/08-3/19/08	
Independent var.	(1)	(5)	(6)	(10)
Maximum rate		0.012**		0.228**
		(0.00)		(0.03)
Lag. cum. inventory		0.050**		0.224**
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Bond, credit, macro	Yes	Yes	Yes	Yes
R^2	0.66	0.66	0.21	0.30
N	34369	34369	3496	3496

- In the pre-crisis equilibrium (endogenous supply model):
  - reset rates reflect strongly fundamentals;
  - auction variables such as the maximum rate are not relevant;
- In the post-crisis equilibrium (fixed supply model):
  - reset rates are weakly related to bonds' fundamentals;
  - reset rates are positively related to maximum rate;
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- ARS crisis caused by two types of runs
- Prices in auctions can deviate from fundamentals, underpricing
- Unexpected impact of secondary market liquidity

Lessons

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- Implicit support should be explicit
- Lack of market transparency creates false sense of safety
- Financial crisis is the ultimate test of financial innovation

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