

# Study of Auction Bidding Dynamics



UNITED STATES  
**DEPARTMENT OF  
THE TREASURY**



Office of Debt Management  
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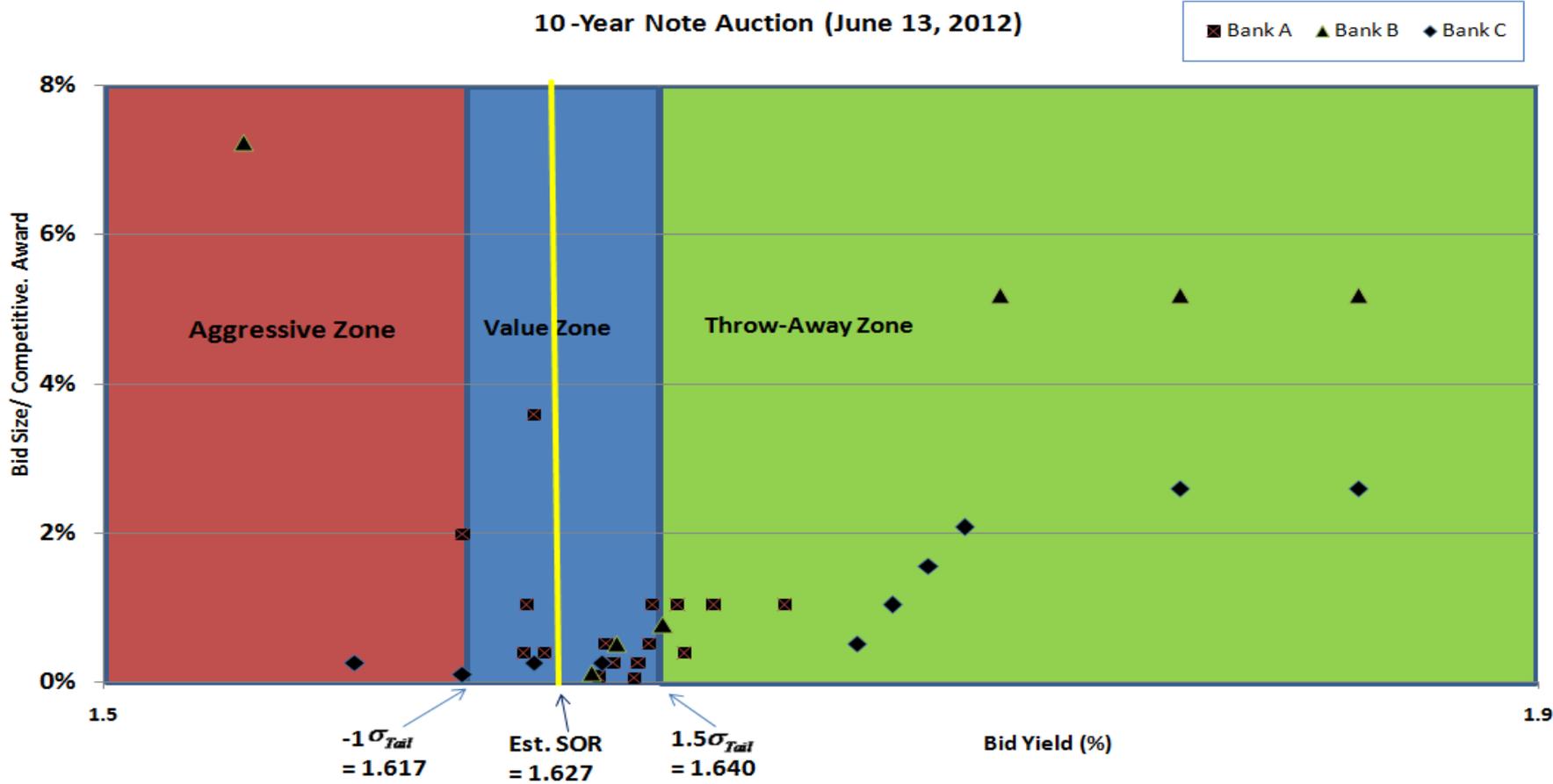


# Theoretical Framework

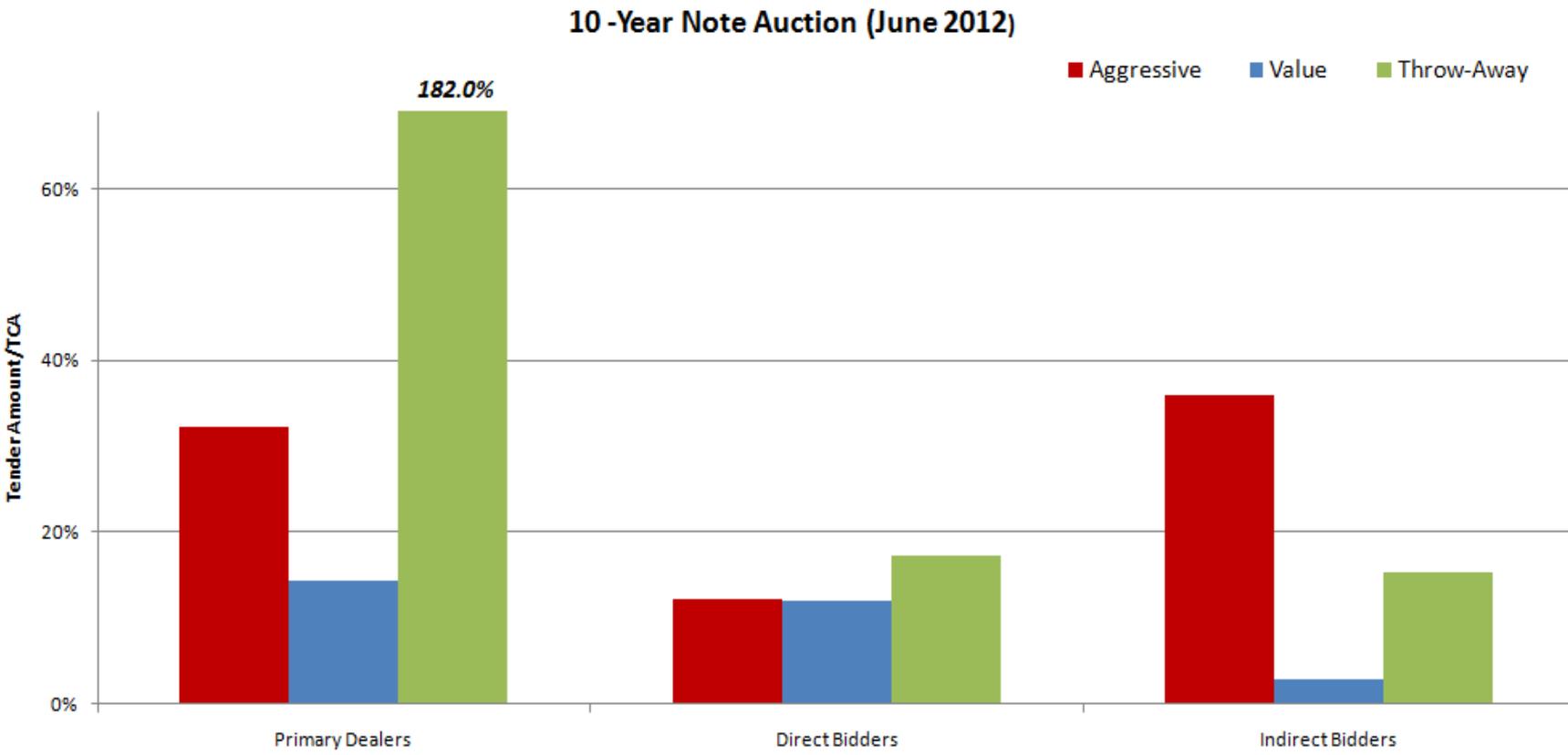
- ◆ Definitions:
  - Auction tail (market definition) = Stop-out-rate (SOR) – 1pm When Issue yield.
  - $m_{Tail}$  : moving average of auction tail over last six auctions.
  - $\sigma_{Tail}$  : moving standard deviation (or sigma) of tail levels over last six auctions.
  - Estimated SOR = 1pm When Issue +  $m_{Tail}$
  - Auction tail in this study = SOR – Estimated SOR.
  
- ◆ For each treasury auction, we partition the bid levels into three zones:
  - Aggressive Zone: bids 1  $\sigma_{Tail}$  below estimated SOR; bids reflect the bidders' real demand of treasuries and they are expected to be fully awarded.
  - Value Zone: bids within 1  $\sigma_{Tail}$  below estimated SOR and 1.5  $\sigma_{Tail}$  above; bids are placed by price-sensitive bidders and are not expected to be awarded completely unless the auction tails above Value Zone.
  - Throw-Away Zone: bids 1.5  $\sigma_{Tail}$  above estimated SOR; bids are not expected to be awarded unless the auction tails dramatically above Value Zone.
  
- ◆ We measure the strength of each bid via its bid amount, as a percentage of total competitive award (**TCA**), in Aggressive Zone and Value Zone.
  - Throw-Away bids contain little information about bidder' real appetite for treasuries. They are mostly submitted by primary dealers to fulfill their pro-rata bidding requirement, and thus contain lots of noise that distort our statistical analysis. Thus, we do not use Throw-Away bids for our analysis.

# An Example: Three Bidders' Bids for a 10-Year Note (June, 2012)

- ◆ SOR = 1.622%, 1pm WI = 1.635%
- ◆  $m_{Tail} = -0.85\text{bps}$ ,  $\sigma_{Tail} = 0.91\text{ bps}$
- ◆ Estimated SOR = 1.627%
- ◆ Auction Tail = SOR – Est. SOR = -0.45 bps (through) =  $-0.49\sigma_{Tail}$

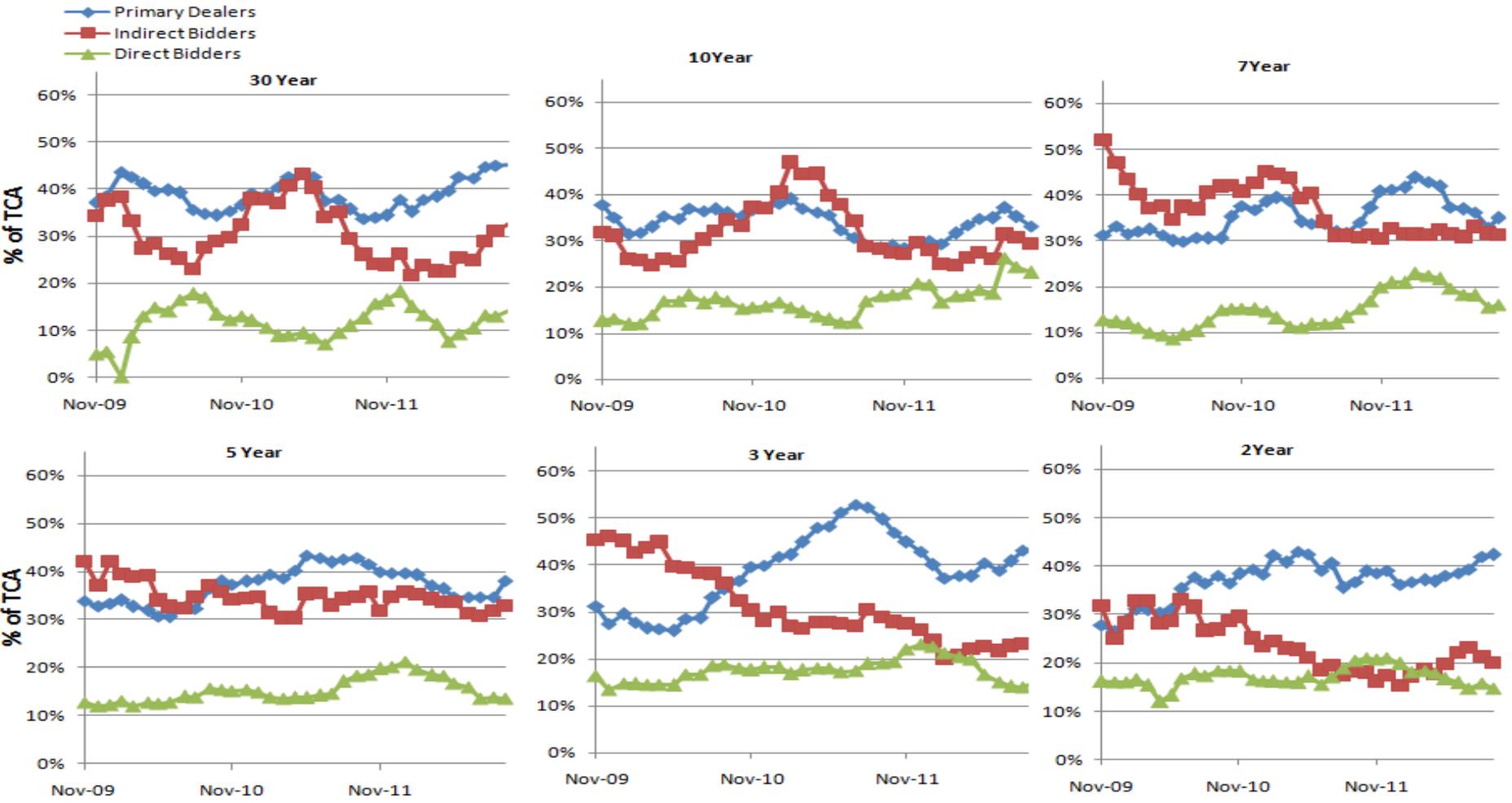


# Example(Cont'd): Aggregate Tender Amount of Three Investor Classes



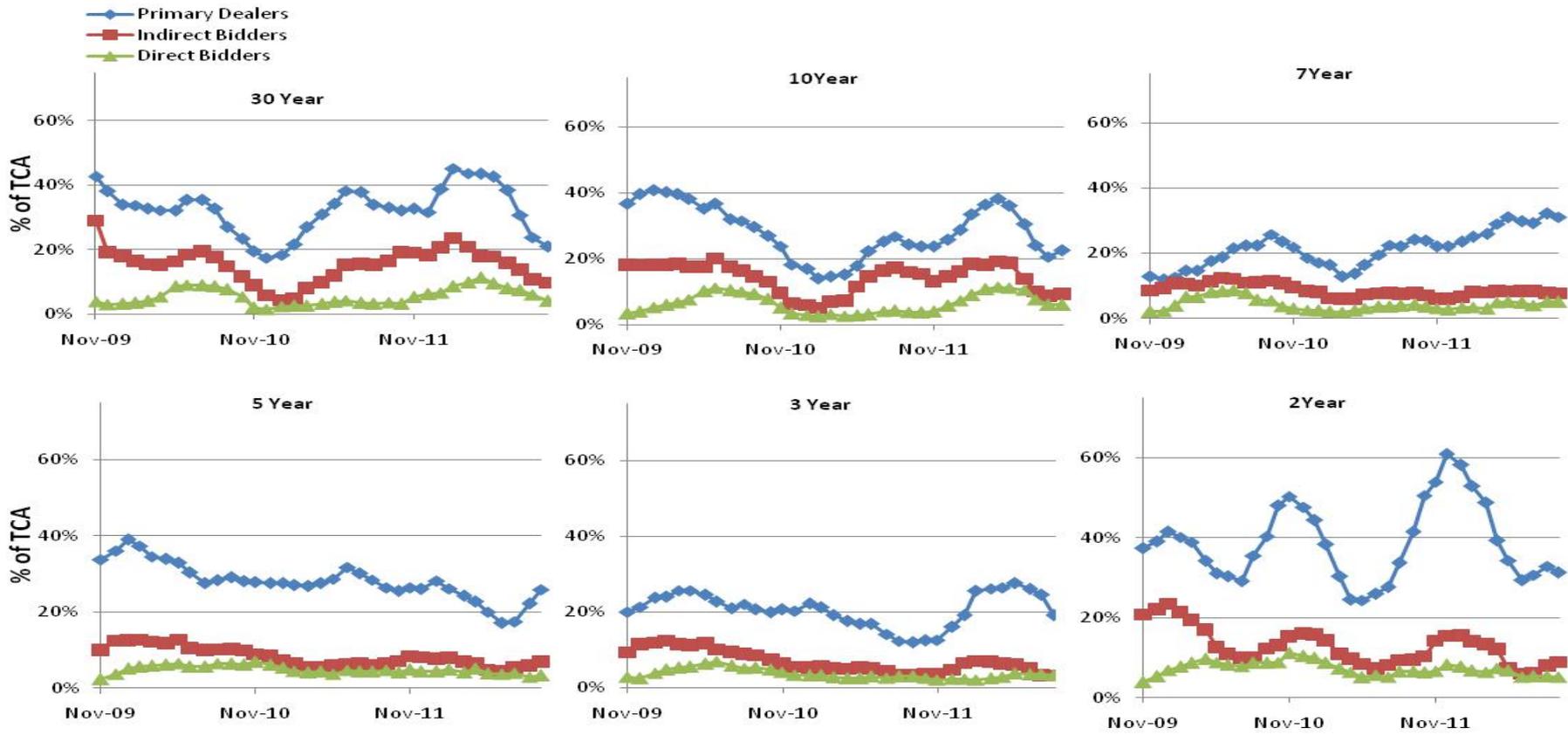
# Aggressive Bidding Amount (6-month Moving Average)

- ◆ Primary Dealers usually place the most aggressive bids among the three investor classes. Their aggressive bidding amount fluctuates over time, but not as much as that of the other two investor classes.



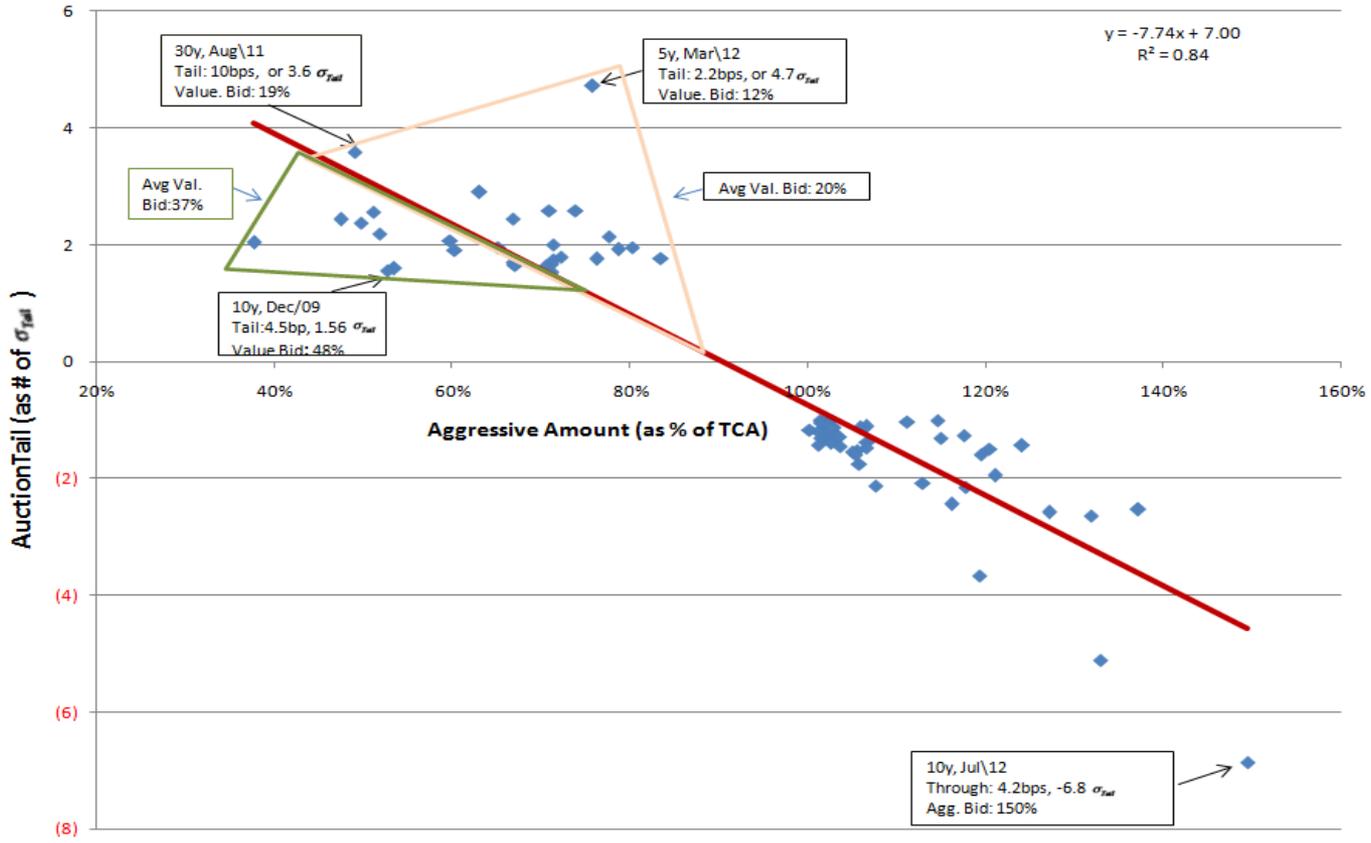
# Value Bidding Dynamics (6-month moving average)

- ◆ Primary dealers almost always submit the most amount of value bids of all three investor classes.
- ◆ Value bidding dynamics look similar across all nominal coupons. Two possible explanations:
  - PDs construct their value bids based on the their clients' value bids. But this high correlation is not found on the individual primary dealer level.
  - Aggregately, these three investor classes have similar valuation of nominal coupons and use similar bidding strategy.



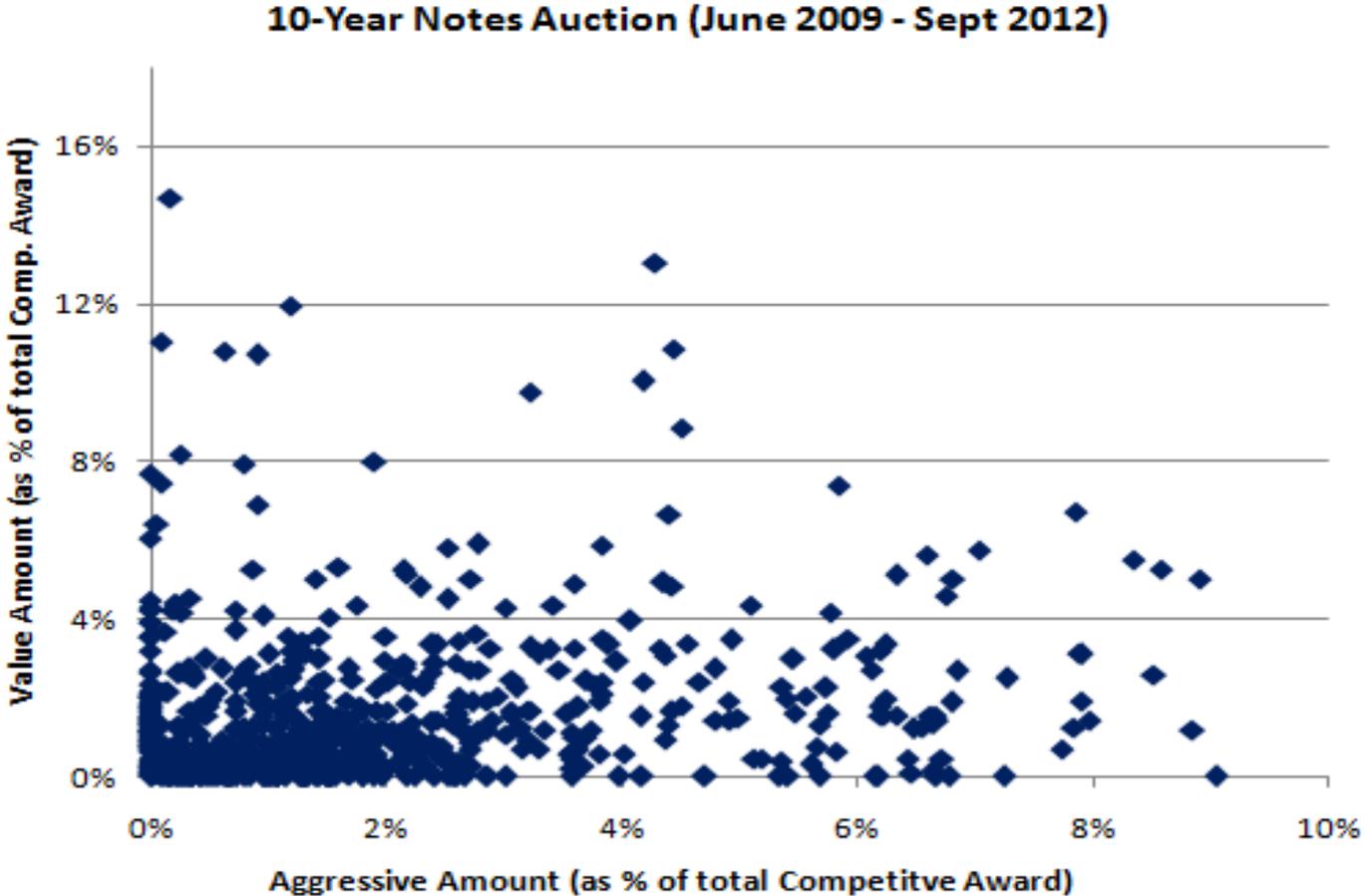
# Aggressive Bids Largely Drive Auction Tail Levels

- ◆ Auctions that tail 1 standard deviation below (through) or 1.5 standard deviation above the estimated SOR are considered “unexpected”.
- ◆ Regress the “unexpected” auction tail levels against the aggressive bid amount:
  - More aggressive bids, more negative the auction tail (or better auction results to Treasury).
  - Less aggressive bids, more positive the auction tail (or worse auction results to Treasury).
- ◆ When aggressive bids are not sufficient, value bids serve to prevent auction results from tailing too much.



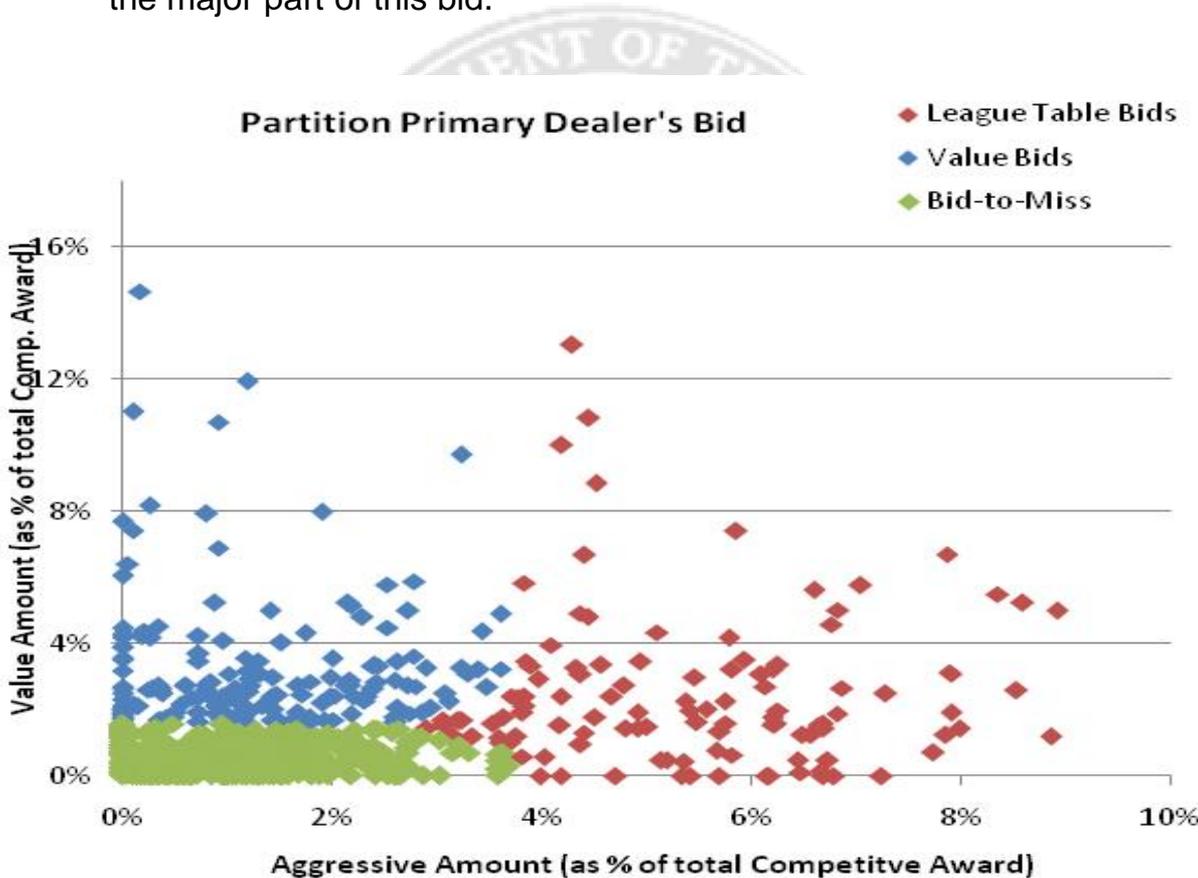
# 10-Year Note Auctions (June 2009 – September 2012)

- ◆ Each point represents one primary dealer's bid, measured by its amount in Aggressive Zone and Value Zone, for all 10-Year Note auction between Sept 2009 and September 2012.



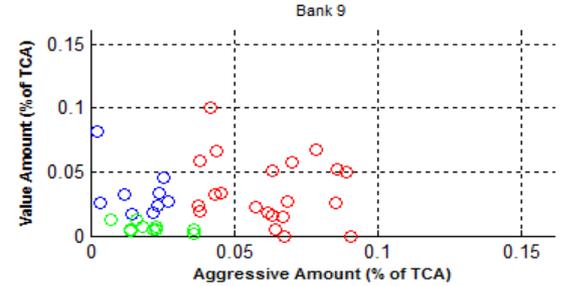
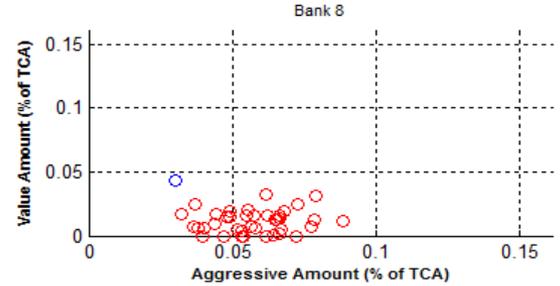
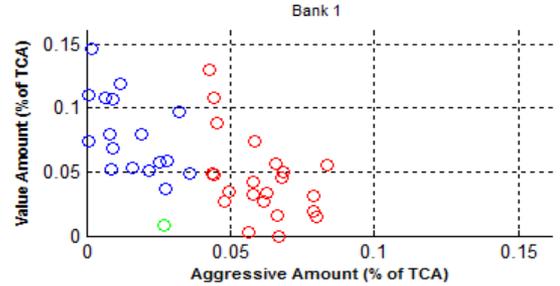
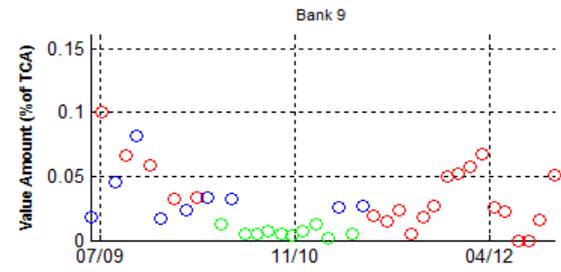
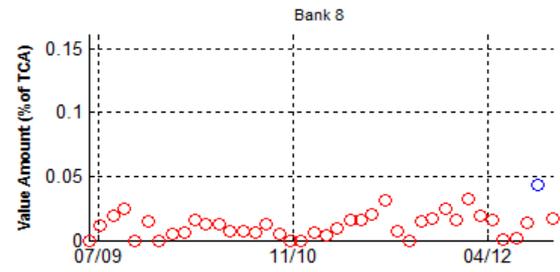
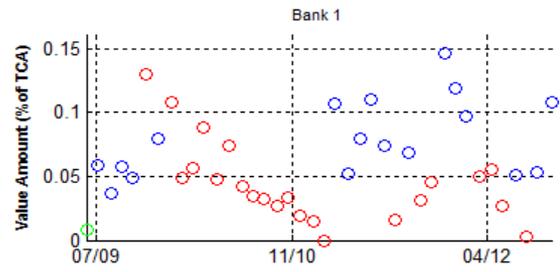
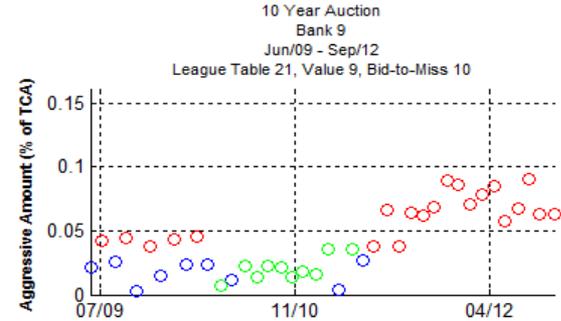
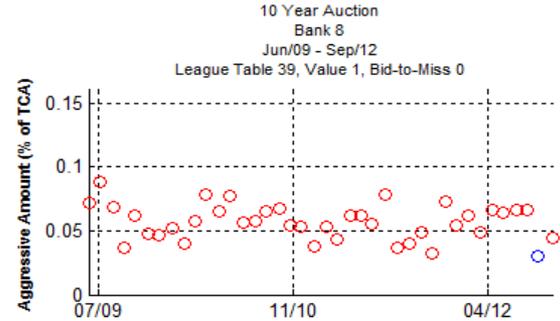
# Partition Primary Dealers' Bids

- ◆ Apply K-Means, a non-parametric regression method, to partition the bids into three categories:
  - League Table Bid: large bidding amount in both Aggressive Zone and Value Zone.
  - Value Bid: large bidding amount in the Value Zone only.
  - Bid-to-Miss Bid: least bidding amount in both Aggressive Zone and Value Zone, which implicitly means the major part of this bid.



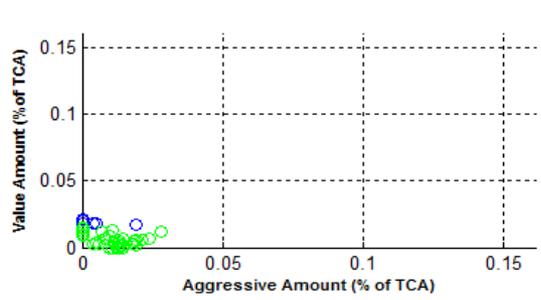
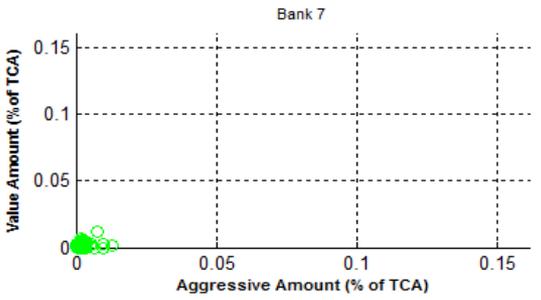
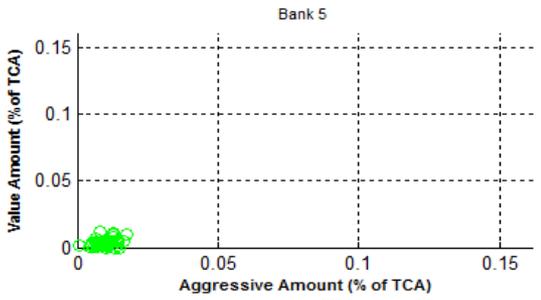
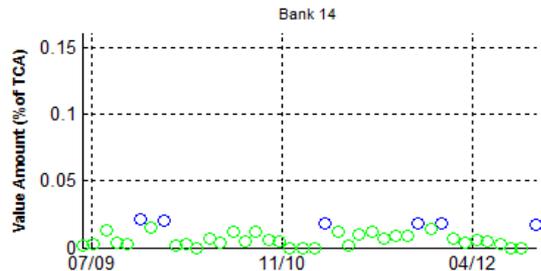
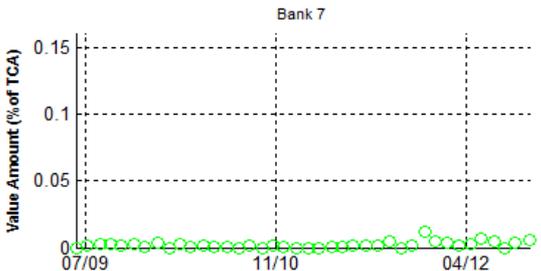
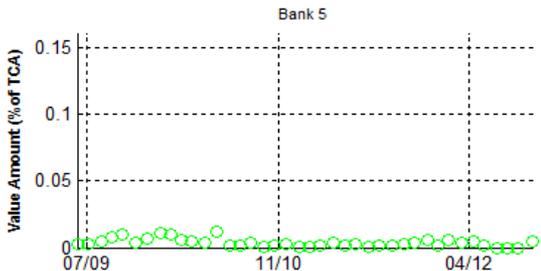
# Active Primary Dealers (10-year Notes)

- ◆ All primary dealers are created equal, but some are more active.
- ◆ Active primary dealers: most of their bids are either league-table bids (red) or value bids (blue).



# Less Active Primary Dealers (10y notes)

- Some other primary dealers seem to be less active or to have less demand for Treasuries for their house book. Most of their bids are Bid-to-miss (green).



# Primary Dealers' Bids Statistics

Jun 09 - Sept 12	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23
# of 3Y Auctions	40	40	40	40	40	40	40	40	40	38	40	40	40	40	1	12	40	40	38	12	9	39	20
League Table Dealer	14	6	3	18	37	8	3	36	16	6	11	29	3	11	0	6	13	0	5	0	8	1	1
Value Dealer	24	11	2	10	0	16	4	4	22	4	9	6	11	2	0	0	9	0	3	4	0	7	0
Bid to Miss Dealer	2	23	35	12	3	16	33	0	2	28	20	5	26	27	1	6	18	40	30	8	1	31	19

Jun 09 - Sept 12	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23
# of 10Y Auctions	40	40	40	40	40	40	40	40	40	38	40	40	40	40	1	12	40	40	39	12	9	39	20
League Table Dealer	22	9	2	16	0	3	0	39	21	0	2	4	0	0	0	0	2	0	0	0	0	0	0
Value Dealer	17	17	7	10	0	26	0	1	9	0	14	18	20	6	0	1	10	1	4	5	0	10	1
Bid to Miss Dealer	1	14	31	14	40	11	40	0	10	38	24	18	20	34	1	11	28	39	35	7	9	29	19

Jun 09 - Sept 12	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23
# of 30Y Auctions	40	40	40	40	40	40	40	40	40	38	40	40	40	40	1	12	40	40	39	12	9	39	20
League Table Dealer	34	10	3	18	0	2	0	35	20	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Value Dealer	6	22	16	15	4	20	0	2	16	3	21	29	4	7	0	3	12	9	7	1	0	13	0
Bid to Miss Dealer	0	8	21	7	36	18	40	3	4	35	17	11	36	33	1	9	28	31	32	11	9	26	20

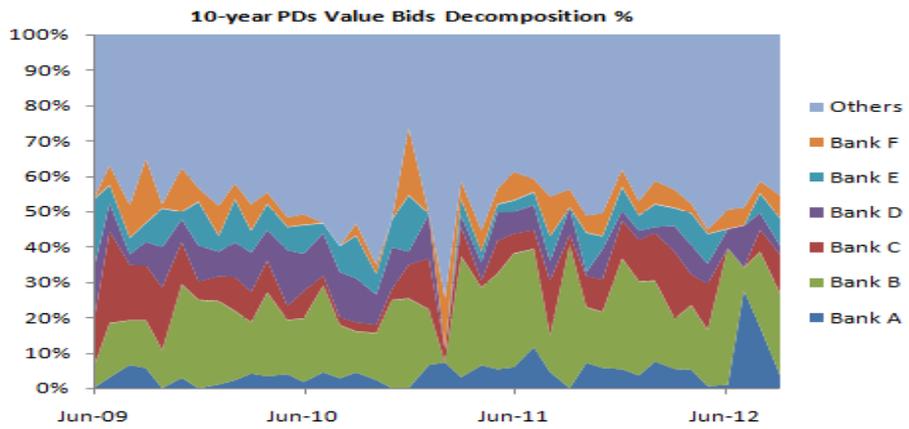
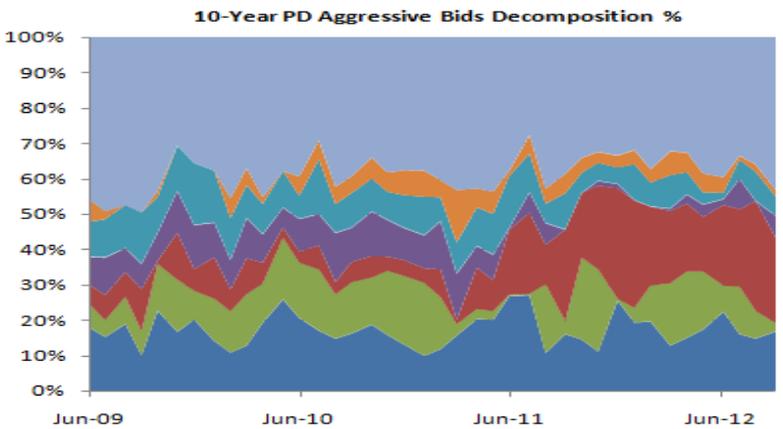
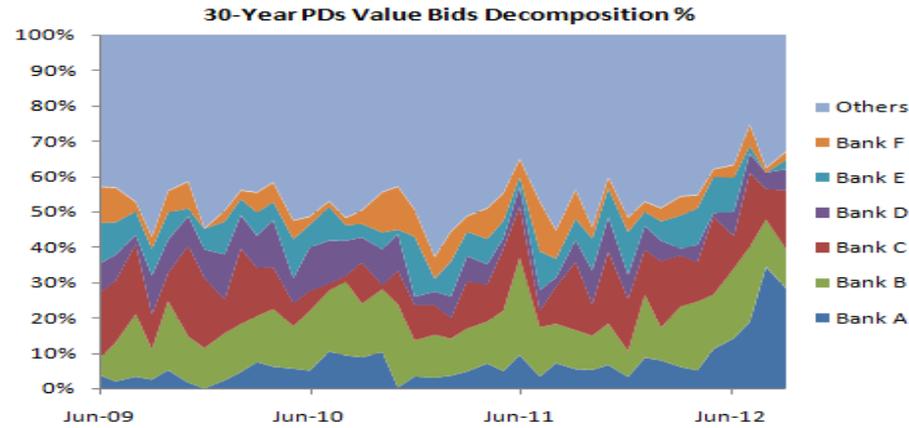
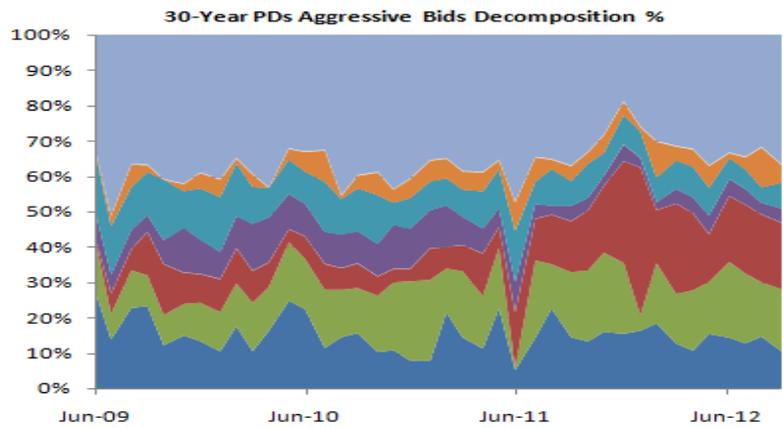
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# of 2Y Auctions	40	40	40	40	40	40	40	40	40	39	40	40	40	40	1	12	40	40	39	12	9	40	20
League Table Dealer	15	7	7	16	39	9	5	19	19	8	15	29	1	19	0	7	14	34	13	0	9	5	0
Value Dealer	25	9	3	6	0	21	7	14	19	2	9	3	11	5	0	0	8	0	2	6	0	3	0
Bid to Miss Dealer	0	24	30	18	1	10	28	7	2	29	16	8	28	16	1	5	18	6	24	6	0	32	20

Jun 09 - Sept 12	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23
# of 5Y Auctions	40	40	40	40	40	40	40	40	40	39	40	40	40	40	1	12	40	40	39	12	9	40	20
League Table Dealer	25	7	1	10	0	3	0	39	20	1	9	2	0	2	0	0	6	0	0	0	0	1	0
Value Dealer	15	21	2	18	3	26	0	1	15	2	15	14	13	3	0	0	13	0	6	7	0	5	1
Bid to Miss Dealer	0	12	37	12	37	11	40	0	5	36	16	24	27	35	1	12	21	40	33	5	9	34	19

Jun 09 - Sept 12	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7	Bank 8	Bank 9	Bank 10	Bank 11	Bank 12	Bank 13	Bank 14	Bank 15	Bank 16	Bank 17	Bank 18	Bank 19	Bank 20	Bank 21	Bank 22	Bank 23
# of 7Y Auctions	40	40	40	40	40	40	40	40	40	39	40	40	40	40	1	12	40	40	39	12	9	40	20
League Table Dealer	20	10	0	10	0	2	0	39	16	1	3	0	0	0	0	0	4	0	0	0	0	0	0
Value Dealer	19	15	9	21	0	28	0	0	11	2	15	10	11	5	0	2	13	0	4	6	0	5	1
Bid to Miss Dealer	1	15	31	9	40	10	40	1	13	36	22	30	29	35	1	10	23	40	35	6	9	35	19

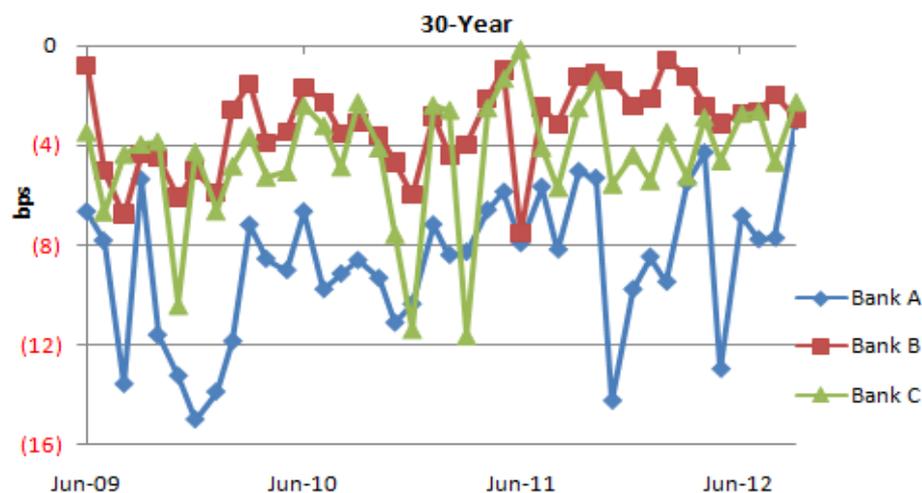
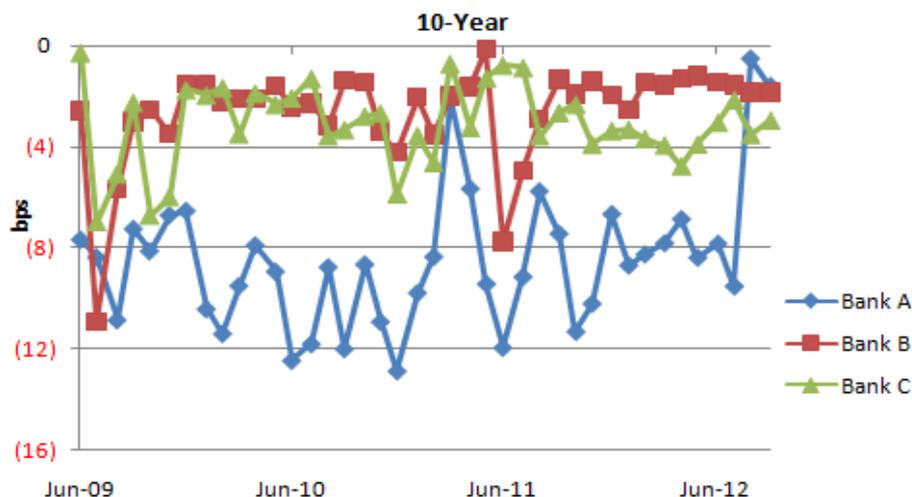
# Decomposition of Primary Dealers' Aggressive Bids and Value Bids

- Bank A, Bank B, and Bank C contribute between 30% and 50% of the total aggressive bidding and value bidding. They are the three most active primary dealers in 10-year and 30-year.
- Bank C has made bigger and bigger contributions in aggressive bids since Sept 2011 in both 10-Year and 30-Year.
- The six most active primary dealers contribute over 50% of the aggressive bidding and value bidding.



# The Aggressiveness of the Aggressive Bids

- ◆ We measure the aggressiveness of the aggressive bids in terms of their tender-amount weighted average level minus the Aggressive Zone boundary ( $= -1 \sigma_{Tail}$  from the Est. SOR).
- ◆ Even among the most active primary dealers, their aggressive bids differ in the level of aggressiveness.
- ◆ The aggressiveness of Bank A' aggressive bids is higher than that of Bank B and Bank C.
  - Bank A' aggressive bids are similar to the noncompetitive awarded-at-any-price bids.
  - Bank B and Bank C often have their aggressive bids awarded, but in the case of the surprisingly large auction through, most of their aggressive bids could be missed.



The more negative the level, the more aggressive the bids; the less negative the level, the more price-cautious the bids.