

# CDS Auctions and Recovery Rates: An Appraisal

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30 January 2013

In 2005, the International Swaps and Derivatives Association (ISDA), introduced an auction mechanism to facilitate settlement following a credit event in the multi-trillion dollar credit-default swap (CDS) market. The auction identifies a price for the defaulted instrument and this price is then used to *cash-settle* CDS contracts with protection sellers paying protection buyers the instrument's par value minus the auction-identified price. Today, almost 8 years and a hundred auctions since its introduction, an appraisal of the auction mechanism and its functioning appears in order.

## The Background

CDSs are today among the most important of all financial instruments. Akin to default insurance, a CDS offers protection against the occurrence of a *credit event* on a specified instrument.<sup>1</sup> The buyer of protection in a CDS contract makes regular periodic “premium” payments to the seller until maturity of the contract or the occurrence of default, and receives, in exchange, a single contingent payment in the event of default.

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<sup>1</sup>A “credit event” includes but is not limited to the event of default. For example, in European and pre-2009 North American corporate CDS contracts, it includes *restructuring*, which is, loosely speaking, any postponement or reduction in principal or interest payable, or any change in seniority of the debt. For simplicity, we use the terms ‘default’ and ‘credit event’ interchangeably in this paper. Neither buyer nor seller of protection need have any exposure to the underlying instrument, i.e., the CDS can be “naked.” This distinguishes CDS protection from traditional insurance which requires the presence of an insurable interest.

The size of this contingent payment and the manner in which it is determined are of evident importance in gauging CDS protection. Until 2005, CDS contracts were mainly *physically settled*, meaning that upon the occurrence of a credit event, protection buyers would deliver the defaulted instrument (or any instrument from the same issuer that ranked *pari passu* with it) to protection sellers and receive the instrument's par value in exchange. Physical settlement obviated the need to identify a fair value for the defaulted instrument prior to settlement, which was a plus. But the explosive growth of the market revealed a serious problem: for many names, the volume of CDS outstanding had far outstripped the volume of deliverable bonds. Particularly egregious was the case of Delphi in 2005; a study by ISDA (Summe and Mengle, 2006) indicated that against \$28 billion in CDS contracts were a mere \$2 billion in deliverable bonds.

Introduced in 2005 against this backdrop, the CDS auction aimed to resolve this problem by moving to a cash-settlement system in which, as mentioned above, the protection seller pays the protection buyer the par value minus the auction-identified price. The original auction form was modified in 2006 and it is that modified form that is the subject of the rest of this article. Counting both CDS and Loan CDS (LCDS) auctions and including the 9 auctions in 2005 and 2006, there have been, as of end-2012, a total of 126 auctions with the largest number (51) occurring in 2009, and the smallest number—just a single auction—in 2007. The number of “names” (i.e., the entities that issued these bonds) involved in these auctions is smaller since some names had auctions for both senior and subordinated bonds, and a small number had even more (e.g., there were 7 separate auctions held on 28 July 2011 for different categories of bonds issued by The Governor and Company of the Bank of Ireland, and 6 separate auctions held on 29 July 2011 for different categories of bonds issued by Irish Life and Permanent.).

## The Auction Structure

The CDS auction has a novel and complex structure with sharp points of distinction from other financial (e.g., Treasury) auctions. It is, first of all, a two-stage auction, with Stage 1 determining an indicative price (called the *inside market midpoint* or IMM) for the defaulted instrument, and Stage 2 determining the final price. All bids in either stage of the auction must go through dealers (the 12-14 large banks who participate in the auctions). A brief description of the auction follows.

In Stage 1, dealers make price and quantity submissions. The price submissions are called *inside-market* submissions and are required to be two-way prices (i.e., bids and offers) with a specified maximum bid-offer spread, typically 2% of the par value, and for a pre-specified quantity called the *quotation amount* (e.g., \$2 million in face value of the defaulted instrument). All participating dealers are required to make these submissions. These price submissions serve three purposes:

- First they are used to calculate the IMM. For this purpose, all crossing and touching bids and offers (i.e., all bids  $b$  and offers  $o$  such that  $b \geq o$ ) are first eliminated from the

Figure 1: The CIT Auction: Price Submissions and the IMM

The left-hand panel of this figure describes the bids and offers made by participating dealers in the first round of the CIT auction. The right-hand panel presents the bids and offers in ordered form (decreasing bids, increasing offers). The IMM is calculated using these ordered bids and offers in the manner described in the text.

Dealer	Bid	Offer
Banc of America Securities LLC	69.25	71.25
Barclays Bank PLC	67	69
BNP Paribas	69	71
Citigroup Global Markets Inc.	68.75	70.75
Credit Suisse International	70	72
Deutsche Bank AG	70.25	72.25
Goldman Sachs & Co.	66.5	68.5
HSBC Bank USA, National Association	69	71
J.P. Morgan Securities, Inc.	69.75	71.75
Morgan Stanley & Co. Incorporated	68	70
Nomura International PLC	70	72
The Royal Bank of Scotland PLC	69	71
UBS Securities LLC	70	72

Bid	Offer	Crossing or Touching?
70.25	68.5	Y
70	69	Y
70	70	Y
70	70.75	N
69.75	71	N
69.25	71	N
69	71	N
69	71.25	N
69	71.75	N
68.75	72	N
68	72	N
67	72	N
66.5	72.25	N

Used to compute IMM

Inside Market Midpoint: 70.25

submissions. From the remaining bids and offers, the “best halves” are averaged to obtain the IMM. Thus, if there are  $n$  bids and offers remaining, the arithmetic average of the  $n/2$  highest bids and the  $n/2$  lowest offers constitutes the IMM. Figure 1, taken from Gupta and Sundaram (2012) illustrates using the CIT auction.

- Second, the price submissions are transferred as limit orders (for the specified quantities) to the second stage of the auction.
- Third, penalties (euphemistically called *adjustment amounts*) are levied on dealers whose submissions are on the “wrong” side of the market, that is, for bids that are higher than the IMM when the NOI is to sell, or for offers that are lower than the IMM when the NOI is to buy. (This penalty is *not* levied if the bid or offer in question did not cross with another offer or bid.) The adjustment amount is computed by applying the difference (expressed as a percentage of the par value of 100) between the submitted price and the IMM to the quotation amount. For example, suppose an auction has an NOI to sell and the IMM is 50.00. Suppose the quotation amount is \$2 million. Then, a dealer who submitted a bid of (say) 52.00 pays an adjustment amount of  $\$(0.02 \times 2,000,000) = \$40,000$ . The adjustment amounts are not large in dollar terms but they presumably carry a reputational impact.

The first stage quantity submissions are called *physical settlement requests* or PSRs, PSRs represent commitments to buy or sell the specified quantities at the auction determined final prices. (Buy-PSRs are commitments to buy and sell-PSRs are commitments to sell.) PSRs

Figure 2: The CIT Auction: PSR Submissions and the NOI

This figure describes the physical settlement requests (PSRs) in the CIT auction and the resulting net open interest NOI. The NOI is obtained from the PSRs by aggregating the buy and sell orders separately and then netting them.

Dealer	Bid/Offer	Size
Banc of America Securities LLC	Offer	391.54
Barclays Bank PLC	Offer	74.618
Citigroup Global Markets Inc.	Offer	170
Credit Suisse International	Offer	152.352
Deutsche Bank AG	Offer	539
Goldman Sachs & Co.	Offer	80
HSBC Bank USA, National Association	Offer	3.018
Morgan Stanley & Co. Incorporated	Offer	0
The Royal Bank of Scotland PLC	Offer	104.195
BNP Paribas	Bid	107.096
J.P. Morgan Securities, Inc.	Bid	299
Nomura International PLC	Bid	141.603
UBS Securities LLC	Bid	238.044
<b>Net Open Interest: \$728.98 million to sell</b>		
Sum of Buy Physical Requests		\$785.743m
Sum of Sell Physical Requests		\$1,514.723m

enable investors to replicate the outcome of a physically-settled CDS. For example, an investor who is long protection and long the underlying bond and who submits a sell-PSR receives a cash flow of  $(\text{Par} - \text{Final Price})$  from cash settlement of the CDS, and the Final Price for the bond sold through the auction, for a net amount of exactly par.

Only investors with existing net CDS positions are allowed to make quantity submissions; sell-PSRs may only come from those who are net long protection, and buy-PSRs from those who are net short protection. Moreover, the PSR submissions may be at most as large as the net CDS position. All PSRs must be routed through a dealer. Dealers aggregate their customers' PSRs with their own and submit the net amount.

Buy- and sell-PSRs from the dealers are aggregated to determine the auction's *net open interest* or NOI. The NOI is the quantity actually auctioned in the second stage of the auction. If the sell-PSRs exceed the buy-PSRs, the NOI represents a net amount to be sold through the auction; the second-stage auction is now a standard auction for the sale of this quantity. If buy-PSRs exceed sell-PSRs, then the NOI represents an amount to be bought through the auction; the second-stage auction is now a reverse auction for the purchase of this quantity. Figure 2 illustrates using the CIT auction.

Observe the unusual and important aspect that both the *magnitude* of the second stage auction (how much is auctioned), as well as whether the second-stage will be a standard auction

or a reverse auction are endogenously determined by the first-stage submissions. This feature alone distinguishes the CDS auction from most auctions used in practice.

Once the NOI is determined, the second-stage auction is a standard uniform-price auction. If a standard auction, dealers and customers submit demand curves specifying the amounts they are willing to buy at different prices; if a reverse auction, dealers and customers submit supply curves indicating the amounts they are willing to sell at different prices. In addition, bids or offers on the relevant sides of the dealers' first stage inside-market submissions are transferred to the second stage as limit orders. (One again, all orders are routed through dealers who submit the aggregate of their customers' submissions and their own.) There are no restrictions on participation in this stage.

The auction's final price is determined in the obvious way from these submissions, but with one caveat: in a standard auction, the final price cannot exceed the IMM plus a pre-specified *cap amount* (typically 1% of par value), while in a reverse auction, it must be at least equal to the IMM minus the cap amount.

## **The Performance of the Auction**

The novelty and complexity of the auction format raise several questions of interest: How well has the auction done to date? What are its main positive features? Its shortcomings? In what directions could it be improved? The sheer size and importance of the CDS market lend urgency to these questions, but defaults are rare events and it was only the advent of the financial crisis that provided researchers with sufficient data to begin investigations.

The bad news first. CDS auctions have sometimes produced results that contradict intuition and common sense. A particular case in point concerns the auctions of senior and subordinated bonds of Fannie Mae and Freddie Mac, all four of which were held on October 6, 2008. Fannie's *senior* bonds had an auction final price of 91.51, while the *subordinated* bonds had a significantly higher auction final price of 99.9. Freddie had similar outcomes with its senior and subordinated bonds fetching, respectively, auction final prices of 94 and 98. A "cheapest-to-deliver" effect may have had a role in generating these inverted outcomes: the two senior auctions included zero-coupon bonds among those that were deliverable but the two subordinated auctions did not. Liquidity too may have mattered: The two senior auctions had relatively small NOIs (\$12 million and \$79 million, respectively), the two subordinated auctions were substantially larger (\$608 million and \$542 million, respectively). Nonetheless, whatever the "explanations," that subordinated bonds could fetch a higher recovery rate than their simultaneously-auctioned senior bonds seems sufficiently anomalous as to constitute an indictment of the auction format.

More generally, Gupta and Sundaram (2012) look at those auctions in which the deliverable bonds were traded actively both before and after the auction, and compared bond prices pre- and post-auction to those bond prices that resulted from the auction. For "sell" auctions (those with a second-stage NOI to sell), which constitute the vast majority of auctions in the data, they find

that the auction systematically *underprices* the bonds relative to the market.<sup>2</sup> On average over their sample, the underpricing is of the order of 20%; the upper panel of Figure 3 describes this price behavior. There are relatively few buy auctions on which pre- and post-auction bond prices are also available, but broadly they appear to exhibit the opposite pattern of auction *overpricing*: the lower panel of Figure 3 illustrates with the case of General Motors.

As an aside, it should be noted that there is no simple way to exploit the potential mispricing suggested by Figure 3. Ahead of time, it is not known if the auction is going to be a standard auction with a sell-NOI or a reverse auction with a buy-NOI (the former account for about 70% of the auctions in Gupta and Sundaram's study, the latter for about 30%), so it is not clear in which direction the realized mispricing will manifest itself. Too, of course, an investor who (for example) sells ahead of the auction hoping to buy back at a cheaper price in the auction cannot guarantee getting his order filled in the auction; that depends on the realized NOI and the bids submitted by others.

Nonetheless, there is considerable good news too. Contrary to the first impression provided by Figure 3, econometric tests in Gupta and Sundaram (2012) find that information generated in the auction—in particular, the auction final price—is critical for post-auction price formation; indeed, once auction-generated information is included, pre-auction information plays virtually no role at all. Auctions may be biased but they are significantly informative.

This finding in turn raises two further questions. What is the source of the bias in auction outcomes? And is there a “superior” alternative auction design that would avoid this bias?

Concerning the first question, several possibilities suggest themselves. The first is liquidity. On average, auction NOIs are about 10-12 times the daily traded market volumes in the deliverable bonds, so the sheer size of the auction may itself be having an impact on prices. Second, as in all common value auctions, there is the possibility of a “winner's curse” effect,<sup>3</sup> that may induce conservative bidding by participants. Thirdly, there is the possibility of strategic behavior. As an example, consider an investor who has bought \$100 million of protection but is long only \$50 million of the underlying bonds. Underpricing in the auction hurts the investor on the bonds but benefits him on a much larger volume of CDS, so creates a net incentive to lower the price. Gupta and Sundaram (2012) find strong econometric evidence in support of all three hypotheses; each factor is not only strongly statistically significant, it is also economically significant with large implied economic effects.

So is there an alternative auction format that would reduce these effects (e.g., the incentive for strategic behavior) even while preserving its informativeness? This is a tough question to analyze theoretically in part because of the complexity of the auction structure. Under the simplified assumption that the “true” (i.e., post-auction) value of the defaulted bond is common knowledge,

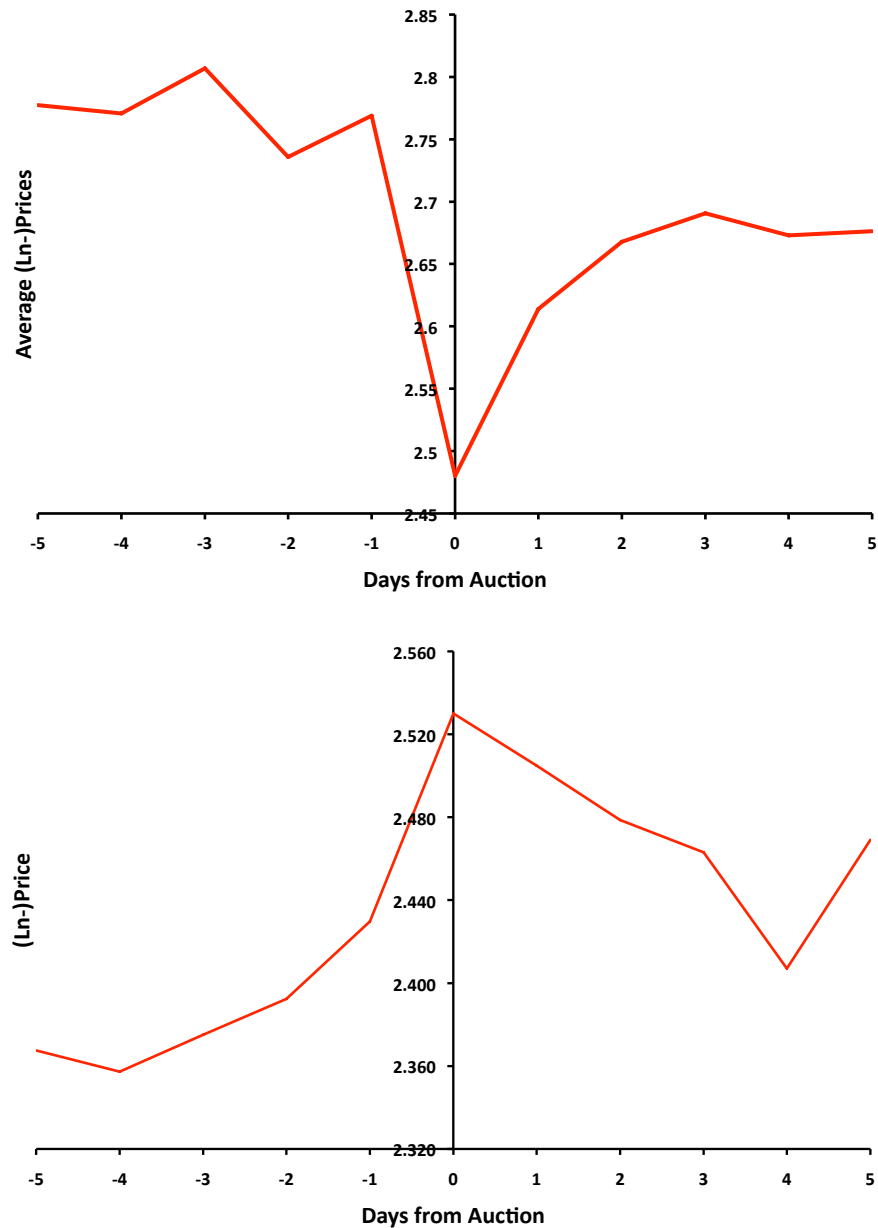
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<sup>2</sup>Chernov, Gorbenco, and Makarov (2011) document a similar finding.

<sup>3</sup>Loosely put, the winner's curse in a common value auction is the observation that, by definition, the winning bid is the most optimistic of the submitted bids, so the expected valuation of the item conditional on winner's information is less than the expected valuation conditional on the combined information of all bidders.

Figure 3: Underpricing in “Sell” CDS Auctions

This figure describes the behavior of the average (log-)price of the deliverable instruments in the CDS credit-event auctions with a sell-NOI 5 trading days before and after the auction date. The lower panel describes the behavior of the average (log-)price of the deliverable instruments in the General Motors CDS auction which was a buy-NOI auction, Day-0 is the date of the auction and the day-0 price is the auction-determined final price. The figures are taken from Gupta and Sundaram (2012); we refer to their paper for details of the data and the calculations.



two recent papers—Du and Zhu (2011) and Chernov, Gorbenko, and Makarov (2012)—have examined CDS auctions from a theoretical standpoint. Each of them has concluded that there are equilibria that result in substantial mispricing, and Du and Zhu suggest that a double auction format may do better. These papers lay an excellent foundation for further analysis, but much work remains to be done here, in particular extending the analysis to a more realistic and interesting setting where the post-auction value of the bond is *not* common knowledge, i.e., where the auction actually plays a price-discovery role (which is presumably its principal purpose).

## Conclusions

The CDS auction is aimed at identifying a fair recovery rate for the defaulted instrument in question so as to facilitate cash-settlement of the contracts. Analysis of auction performance on this dimension reveals two conflicting findings. On the one hand, auctions sometimes produce anomalous findings, as illustrated by the cases of Fannie Mae and Freddie Mac. More generally, compared to the traded prices of bonds pre- and post-auction, auction final prices appear to have systematic biases, with sell-NOI auctions exhibiting auction underpricing and buy-NOI auctions exhibiting auction overpricing. Set against this, there is strong econometric evidence that auction-generated information is of significant value for post-auction price formation.

While liquidity issues and strategic behavior may “explain” the mispricing, the challenge remains of finding an auction format that preserves the information-generating properties but mitigates the mispricing. This is theoretically a hard problem towards which some progress has been made, but the availability of more and better data is also key to this effort. Currently, detailed data on the bidding and outcomes in CDS auctions is publicly and freely available at [www.creditfixings.com](http://www.creditfixings.com), a commendable situation. Unfortunately, details on the CDS (and bond) holdings of the individual players entering the auction, holdings whose sizes one would expect would non-trivially affect auction outcomes, are not available, forcing one to resort to proxies.

Nor is it only in this context that the holdings data is relevant. The discussion in this paper has focussed on what happens in the auction, i.e., *after* a credit event has occurred. But even the occurrence of a credit event may be non-trivially affected by these holdings. Under ISDA rules, a Determinations Committee makes binding and effectively non-appealable decisions on whether or not a credit event has occurred. The Determinations Committee is made up of 10 large banks and five large “buy-side” institutions, all of whom are major participants in the CDS markets. While ISDA has recently decided to make their individual votes on the committee public, their holdings at the time of the vote remain unknown, creating at least an appearance of potential conflict-of-interest.



## References

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