Auction-Based Transaction Mechanisms for Commodity Trading

The Internet and advances in market designs have paved the way for new, more efficient and transparent ways to trade commodities using auction-based trading platforms.

By Brad Miller & Margarita Sapozhnikov

Transaction Mechanisms For Commodities

Long-established ways to buy and sell commodities include bilateral negotiations, networks of brokers, and traditional commodity exchanges. However, the Internet and advances in market designs have paved the way for new, more efficient and transparent ways to trade commodities using auction-based trading platforms. While modern auction theory and practice have provided us with a variety of auction-based formats, the optimal bidding mechanism for a particular marketplace depends on many factors including:

- Most importantly – what are the goals and requirements of the trading platform? Examples may include improved price discovery and transparency, more reliable and credible market information, greater risk management opportunities, and improved transaction efficiencies for both seller and buyer.
- How many products will be offered at the same time? When multiple products are offered, auctions can be designed to account for the degree of substitutability or complementarity among the products. An effective auction design allows bidders to switch among products in response to changing prices.
- What are the trade-offs between single-shot bidding and multiple-round bidding? Depending on the objectives and the product characteristics, the optimal bidding design may have bidders submit a single, one-shot bid that represents their best and final (i.e., only) offer. Alternatively, winning bidders can be chosen through rounds of bidding where prices gradually change until supply and demand are in equilibrium.
- What is the form of a bid? Depending on what is best for the situation, the bid could specify only the quantity to be transacted at the current auction price (quantity bid), or a price for the product at which the transaction could take place (price bid), or a combination of both (price-quantity bid).
- What price is paid and received? The options generally are: (1) uniform pricing in which there is a single clearing price for each product paid by the buyer to seller, and (2) discriminatory pricing in which the transaction price is tied to the price of the bid. The pricing rule of an auction can significantly affect the strategies of the bidders and what they bid.

ONE OF THE main goals of a trading platform is to establish reliable market prices. In many commodity markets, traditional exchanges set the market price. Open-outcry trading in the pit (where it still exists) essentially involves sequential, bilateral negotiation for single products or lots at a time (or limited sets of products or lots). The same structure was preserved somewhat once commodities trading moved online. This can be effective in some cases, but it may not reveal accurate market prices and signals if trading is thin. Prices for commodities that are thinly traded, or change hands through non publicly-disclosed market deals, or for which prices are set administratively, often are unreliable and inconsistent market indicators. This leads market participants to seek new ways to establish market prices.

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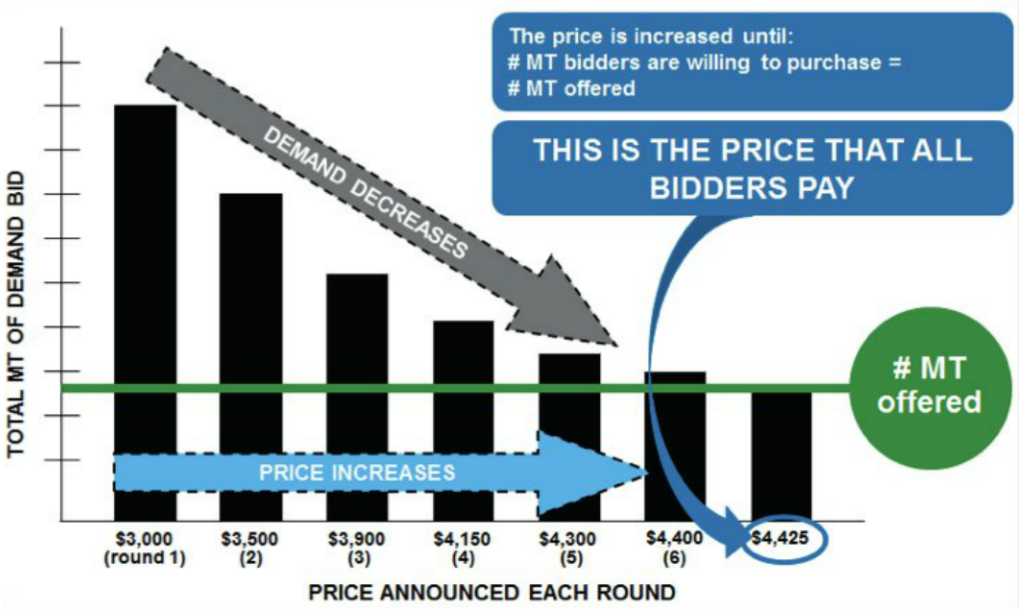
In 2007, Fonterra, the largest dairy exporter in the world, recognized that there was no benchmark price to clearly and quickly signal market conditions in the dairy industry. Moreover, without transparency, dairy farmers could not be sure that they were receiving the full value from providing their milk supply to dairy processors and cooperatives. Fonterra's objectives in creating a trading platform were:

- Effective price discovery process and reliable, credible prices
- Security of supply and better tools for price-risk management
- Information about current and expected future supply and demand conditions
- Lower information and transaction costs of doing business

Figure 1. Illustration of Clock Auction



CRA International was retained to design and implement the GlobalDairyTrade (GDT) trading platform consistent with those objectives. Two auctions on the GDT trading platform are held each month using a version of a multiple-product, ascending-price clock auction format, where the bids are quantity bids and the pricing rule is uniform. This auction format provides for effective price discovery, enables simultaneous bidding on products, and produces credible, reliable clearing prices and quantities that reflect market conditions.

In the multiple-product ascending-price clock auction, bidding takes place in a series of rounds, simultaneously on all products within each round. Prior to each bidding round, there is an announced price for each product. When a round opens, each bidder enters for each product the quantity they are willing to purchase at the announced prices. When the bidding round closes, the aggregate quantity bid for each product is compared to its supply and if it exceeds it, the announced price is increased by some increment for the next bidding round. The process continues round-by-round until demand meets supply for each product.

Figure 1 illustrates the round-by-round bidding process for a single product. The vertical axis shows quantity in metric tons (MT): the intersection of the green horizontal line with the vertical axis indicates the supply quantity offered for sale. The horizontal axis shows the announced price in $/MT for each round. In round 1, the announced price is $3,000. At that price, the height of the black bar indicates the total quantity bid (i.e., demand). It is taller than the horizontal green line (i.e., the supply quantity offered for sale), so the product has excess demand. The announced price for round 2 is $3,500. At that higher price, there is less quantity bid in round 2 than in round 1: the height of the black bar is shorter in round 2 than in round 1. The auction continues until demand and supply meet.

In contrast with many standard commodity exchanges, transactions on the GDT platform are for physical delivery of dairy products and all the

Table 1. Growth of GDT Trading Platform

	July 2008 – June 2009 (TE001 TE012)	May 2013 – April 2014 (TE091 TE114)
Trading Event Frequency	Monthly	Twice per month
# Sellers	1	7
# Qualified Buyers	Approx 150	Approx 800
# Bidders per event	Approx 60	Approx 200
# Product Groups	1	9
# Contract Delivery Periods	3	6
# Products per event	9	Approximately 100
Metric tons Sold	180,000	980,000
Cumulative US$ Transacted	US$ 0.5 billion	US$ 4.7 billion
US$ Transacted Through April 2014		**US$ 14 billion**

products are available for bidding simultaneously at pre-scheduled trading events. The sellers are manufacturers of the dairy products and the buyers (winning bidders) take physical delivery of the products. The sellers establish their own product specifications and contracts.

Today, transactions in dairy markets are widely influenced by GDT, and the results of each GDT trading event are reported and discussed in the industry trade press. The use of the GDT trading platform has increased significantly over time. Table 1 below summarizes some of the indicators suggesting how widely adopted and successful the platform has become.

GDT is an example of a marketplace that was designed at the request of market participants. Another example is the CranberryAuction trading platform used by Ocean Spray Cranberries, Inc. There also are examples of auction-based market mechanisms that are designed and implemented to satisfy the requirements or objectives of government agencies. Examples of these include spectrum auctions and energy sector auctions (including capacity, emissions, and regulated utility procurements).

Other industries have been adopting these approaches or are seriously considering them

Some state regulatory agencies have mandated that the regulated electric utilities in the state hold competitive bidding processes to procure energy from third-party suppliers. The winning bidders supply energy for the utilities' customers and are paid prices determined at the auctions. The auctions often are descending-price clock auctions, where the bids are quantity bids and the pricing rule is uniform.

We have provided only a few examples here of new auction-based commodity trading mechanisms. Other industries have been adopting these approaches or are seriously considering them. They provide a number of advantages and the principles on which they are based fit well with a wide range of objectives and requirements. We believe that inevitably auction-based marketplaces similar to those discussed here will become a new norm in commodities trading. •

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