This week, the Emmett Center released a new paper on the potential legal constraints on revenue generated from California’s upcoming greenhouse gas (GHG) cap-and-trade auction. In that paper, we provide a general overview of the cap-and-trade auction mechanism and discuss the potential revenue raised. I would like to expand on that discussion in a series of posts, starting here with auction pricing.

California cap-and-trade auctions: price floor and ceiling

After a trial run in August, CARB will begin auctioning some allowances in November of this year, and quarterly thereafter. Although different categories of allowances will be auctioned separately, the basic auction mechanics remain the same for all.

Anyone can register to bid for allowances at auction. Each auction will be single-price, sealed bid in multiples of 1000 allowances. Multiple bids are allowed. A bid is a price plus a quantity of allowances to purchase at that price. Single-price means that bids are filled from the highest-priced bid and moving downwards, until all allowances have been sold. The price paid by all winning bidders is set to the price of the lowest winning bid, which the regulations refer to as the “settlement price.” For a more in-depth discussion on the benefits of an auction for the cap-and-trade market, see this paper I co-authored last summer.)

One basic bidding strategy in this type of auction is to submit multiple bids, starting with an offer for only a few allowances at a high price and offering to purchase more allowances at increasingly lower prices. In other words, you might be willing to buy 1000 allowances at $20, an additional 5000 allowances at $15 and an additional 5000 allowances at $11. If the settlement price is $14, you would receive 6000 allowances at $14; if the settlement price was $10 you would receive 11,000 allowances at $10.

The auction regulations establish a hard price floor on bidding. For 2012 and 2013, the price floor (“Auction Reserve Price”) is $10. It then increases by 5% plus inflation (as measured by a specific CPI index) each year. In the chart above I have graphed the price floor in red, assuming a range between 0% and 4% inflation each year. If not all allowances are sold at a given auction, the allowances are withheld until after the settlement price exceeds the price floor for two consecutive auctions.

Notice how this withholding can automatically constrain the supply of allowances. If CARB has issued too many allowances—*i.e.*, set the cap too high—then allowances will gradually be taken off the market due to lack of bidding interest at the quarterly auctions.

Beginning in 2013, CARB will also offer a Reserve Sale six weeks after each quarterly auction. The Reserve Sale is only open to entities with compliance obligations: those businesses that must obtain allowances to account for their GHG emissions. At these reserve sales, a defined pool of "reserve" allowances are offered at fixed price tiers. In 2013, those price tiers will be $40, $45 and $50. Just like the Auction Reserve Price, these price tiers increase annually by 5% plus inflation. I have graphed those price tiers with a range of inflation above.

Because of these reserve allowance, it would not make much sense for an auction participant to bid higher than $40 at the auction, because the ultimate buyers of these allowances—compliance entities—could get them later at the Reserve Sale for $40. Of course, that is only true so long as the reserve pool has not been depleted. So the Reserve Pool acts as a soft ceiling on auction prices. The reserve sales could moderate sharp price spikes but would not prevent an extended increase in allowance price.

While I have heard various numbers tossed around as estimates of the initial auction price, such as $15, I have not seen much recent economic modeling of the likely range of auction prices for the cap-and-trade program. Given the limited reductions needed in the early years of the program and the potential for industries to implement cheap measures, such as energy efficiency improvements and other "low-hanging fruit" early in the program, I would expect to see auction prices stay close to the Auction Reserve Price for the near future.

Code and data are available at Github. Figure created using the ggplot2 package in R.