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Default supply auctions in electricity markets: Challenges and proposals

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ABSTRACT

This paper studies premiums got by winning bidders in default supply auctions, and speculation and hedging activities in power derivatives markets in dates near auctions. Data includes fifty-six auction prices from 2007 to 2013, those of CESUR in the Spanish OMEL electricity market, and those of Basic Generation Service auctions (PJM-BGS) in New Jersey's PJM market. Winning bidders got an average ex-post yearly forward premium of 7% (CESUR) and 38% (PJM-BGS). The premium using an index of futures prices is 1.08% (CESUR) and 24% (PJM-BGS). Ex-post forward premium is negatively related to the number of bidders and spot price volatility. In CESUR, hedging-driven trading in power derivatives markets predominates around auction dates, but in PJM-BGS, speculation-driven trading prevails. The policy recommendation to market regulators and administrators is that they should gauge consumers' price risk aversion before introducing alternative methods to default supply auctions for the computation of the part of cost of energy of the electricity bill of customers whose contracted capacity is small and are not served by other suppliers.

1. Introduction

Liberalization processes of electricity markets around the world face many challenges, such as how to supply electricity to different customers at prices consistent with market circumstances. Auction mechanisms have played a salient role in many countries in the effort to match supply and demand as an alternative to other pricing systems, although the theoretical conclusions and empirical evidence are ambiguous, Newbery and McDaniel (2003). In deregulated markets, auctions are a mechanism applied in many countries to supply electricity to customers whose contracted capacity is small and are not served by other suppliers. Providers of last resort (POLR), designated by the corresponding public utility commission, must get electricity from somewhere and must sell energy to those customers. Default Supply Auction (DSA) is a method to supply electricity to POLR, Loxley and Salant (2004). In these auctions, POLRs buy electricity forward contracts from winning bidders (WB) at prices determined by the specific auction mechanisms (e.g. sealed bid, ascending auctions, descending clock auction (DCA)[1]). Market regulators use DSA-based prices for computing the variable factor of the cost of energy part. When choosing DSA to give electricity to the POLRs, market administrators assume at least two hypotheses: (1) DSA provides efficient generation resources at competitive prices,[2] and (2) DSA gives agents incentives to engage in hedging activities, using power derivatives.[3] This paper studies the

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[1] In ascending auctions, the auctioneer begins with a low asking price for the product being acquired, which is increased by bids from participants. Price and allocation are determined in an open competition among the bidders. The bidders willing to pay the most win. In DCAs, in each round the Auctioneer announces a price for the product being acquired. Bidders bid for the right to provide the quantity of the product they wish to supply at the price announced by the Auctioneer. Bidders decide what quantity of the product they wish to offer to provide in a particular round of the auction. Following the end of a round, the Auctioneer adds up all bids received at the price for that round. If the total quantity of the product bid is greater than the quantity to be acquired, the Auctioneer announces a lower price for the following round. Bidders then decide how much to offer to supply at the new, lower price. The quantity of the product that a bidder offers to supply in the next round can be the same as or smaller, but not larger, than it offered in a previous round. A bidder must submit bids in every round, and cannot re-enter the auction once it abstains from bidding in a round. When the total quantity bid by all bidders matches the total quantity sought by the Auctioneer, the auction closes. The winners are the bidders in the last successful round of the auction.

[2] According to New Jersey Board of Public Utilities (BPU), the auction is designed to procure supply for PJM-BGS customers "at a cost consistent with market conditions". More details of PJM-BGS auctions can be found at http://www.BGS-auction.com/BGS.auction.overview.asp. The Royal Decree 1634/2006 regulating CESUR auction states: "the goal is to adapt tariffs (auction prices) to market prices". CESUR auctions, (see Order ITC/400/2007) help in the pricing of the energy component included in tariffs charged to final consumer. They also intend to prevent further tariff deficits.

[3] According to New Jersey Board of Public Utilities (BPU), auctions provide an opportunity for energy trading and marketing companies to provide PJM-BGS supply. One key goal of CESUR auctions is "encourage forward contracting", CNE (2008).

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extent to which these two hypotheses are consistent with empirical evidence from actual DSA experiences in Spain (CESUR auction) and in the State of New Jersey (PJM-BGS auction) in 2007–2013. Retail electricity prices contain two elements: (i) the cost of supplying electricity and (ii) the "government wedge" (taxes, levies, and other charges to finance public policies). In this paper, we focus on (i), "the cost of energy", composed of two factors: a fixed factor related to contracted capacity and a variable factor related to electricity prices. We analyze DSA-based prices that regulators use when setting the amount to be charged to consumer corresponding to the variable factor.

We present an empirical framework showing that auction-related factors (e.g. number of bidders) and market factors (e.g. spot price volatility) help in explaining the ex-post forward premium in CESUR and PJM-BGS. Besides that, we show that hedging and speculative activity in power derivatives markets increases in dates near the auctions. An empirical simulation in the period 2007–2013 suggest that consumer's aversion to price volatility plays a key role when choosing between alternative methods for the computation of the variable factor of the cost of energy.

This paper contributes to the literature on the empirical analysis of ex-post forward premium in CESUR auctions by completing partial results in Federico and Vives (2008), Cartea and Villaplana (2012), Fabra and Fabra Utray (2012) and Capitán Herráiz (2014). Ours is the first paper analyzing the full set of auctions and documenting a significant relation between ex-post forward premium and the number of participants in the auction. We also contribute to the study of the results of PJM-BGS auctions, extending results in Loxley and Salant (2004), Lacasse and Wininger (2007) and de Castro et al. (2008). Different from their papers, we present an empirical model explaining ex-post forward premium and trading activity in power derivatives markets. Another novel contribution is that, in both markets, we compute premium during delivery periods, by comparing auction prices against (i) spot (day-ahead) prices and (ii) the Forward Market Price Index (FMPI) containing prices of forward contracts matching the service period. Finally, this paper contributes to the literature on the extent to which default supply auctions in electricity markets obtain electricity prices consistent with market conditions (Maurer and Barroso, 2011). The empirical findings in this paper give suggestions to be considered in the current discussions in energy policy about methods for supplying electricity to customers whose contracted capacity is small and are not served by other suppliers.

The rest of this paper is organized as follows. Section 2 discusses the main characteristics of CESUR and PJM-BGS auctions. Section 3 presents the methodology of measures for hedging and speculation in derivatives markets. We present the data in Section 4. The empirical analysis is in Section 5. Section 6 concludes with policy recommendations.

2. Default supply auctions: CESUR and PJM-BGS

2.1. CESUR

Ministerial Order ITC/400/2007 implemented a quarterly auction (CESUR auctions); to support the calculation of the energy price to be passed through[4] to regulated consumers.[5] The mechanism is as follows. The government (Secretaría General de la Energía, SGE) announces the amount of energy to be auctioned, first price and auction dates. SGE also announces delivery periods. There are five POLR, designated by the government. The government sets their share as buyers in CESUR auctions. The firms (shares) are ENDESA (35%), IBERDROLA (35%), EDP (12%), FENOSA (11%), HIDROCANTÁBRICO (4%) and VIESGO (3%).[6] Winning bidders (WB) sell forward contracts to POLRs. The Government appointed the National Energy Commission as the trustee of the auctions (CNE, Comisión Nacional de Energía, later subsumed into the CNMC, Comisión Nacional de los Mercados y la Competencia, from October 2013). CNE contracted an independent consulting firm to conduct the first five auctions, which started in June 2007. From the sixth auction onward until December 2013, the managing body responsible for organizing and managing the auctions has been OMEL, the electricity market operator. The 25th CESUR auction (December 19, 2013) produced a final price deemed "too high" and the Spanish government annulled the auction on allegations of "manipulations".[7] Since then, they suspended CESUR auctions.[8]

In the 24 CESUR auctions they offered 28 different products. The quantities auctioned are always smaller than the amount needed to fulfill regulated consumers' needs. In most cases, auctions included three-month base-load contracts, amounting to an average of 3500 MW, or less than 30% of expected needs. An average of thirty domestic and international allowed bidders take part in the bidding and contracts are awarded to an average of fifteen WB, including retailers, generators, and marketers. All CESUR auctions are simultaneous descending clock auctions. On average, auctions closed after twenty-three rounds. Cash flows between WB and POLR resulting from CESUR auctions are computed each hour during the delivery period by differences between CESUR prices and spot (wholesale) market prices.

2.2. PJM-BGS

Since 2002 to the present, four designated POLR: Public Service Electric & Gas Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) serve PJM's Basic Generation Service (PJM-BGS) customers through auctions held in February. Each POLR serves a specific geographic area (ACE, PSEG, JCPL, RECO) within the overall PJM system.[9] Each area has its specific spot (day-ahead) price. BGS refers to the service of customers who are not served by a third-party supplier or competitive retailer. Two auctions are held concurrently, one for larger customers (BGS-CIEP) and one for smaller commercial and residential customers (BGS-RSCP, BGS-FP). In this paper, we concentrate on the latter because its final customers are like CESUR's. We call it PJM-BGS. An average of nineteen allowed bidders takes part in the bidding and contracts are awarded to an average of seven (PSEG), six (JCPL), four (ACE) and one (RECO) winning bidders. Considering all

[4] Final consumer electricity prices contain two elements: (i) cost of supplying electricity (including the price of energy based on CESUR prices in 2007–2013 plus the regulated cost of providing network services) and (ii) national "government wedge". This wedge includes taxes, levies, and other charges to finance public policies such as feed-in tariff support to renewables and payments of interests to investors in securitized 'tariff debt' traded in international financial markets. Spain's "government wedge" is the second highest in Europe (after Germany) and is the main reason for the rise in retail electricity prices since 2008; see Robinson (2015). It accounts for approximately 60% of final electricity prices.

[5] Households and small firms connected in low tension (< 1 kV) and contracted load lower or equal than 10 kW. 22 million consumers in 2015.

[6] After the 5th auction, shares changed as follows: ENDESA 29%, IBERDROLA 40%, EDP 12%, FENOSA 6%, HIDROCANTABRICO 12%, VIESGO 1%.

[7] This is a controversial issue. See the extensive report by the market regulator CNMC (2014) which points out to some "atypical" circumstances. For instance, the auction closed after seven rounds. In previous cases, the minimum figure was twelve rounds.

[8] From July 2007 until March 2014, the price of energy part included in retail prices was referenced to CESUR prices. Since April 2014 to the present, the Spanish Government adopted a new system based on PVPC (*Precio Voluntario para el Pequeño Consumidor,* Volunteer prices for small consumers) tariffs in which the price of energy components is calculated using hourly prices of the wholesale electricity market. Therefore, small consumers affiliated to PVPC are exposed to daily fluctuations in prices, that is, to market price risk. Such exposure causes growing concern both to consumers and to government officials. Small consumers also can sign "free-market" contracts with commercial suppliers.

[9] The four utilities decided to sell their generation assets or transfer them to affiliates, thus becoming electric distribution companies (EDC). An EDC is a "wires only" company. This means that the only assets it owns are wires (a "natural monopoly") and the firm is within the ambit of the market regulator.