Efficiency Impact of Convergence Bidding on the California Electricity Market

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Abstract The California Independent System Operator (CAISO) has implemented Convergence Bidding (CB) on February 1, 2011 under Federal Energy Regulatory Commission's (FERC) September 21, 2006 Market Redesign and Technology Upgrade (MRTU) Order. CB is a financial mechanism that allows market participants, including electricity suppliers, consumers and virtual traders, to arbitrage price differences between the day-ahead (DA) market and the real-time (RT) market without physically consuming or producing energy. In this paper, market efficiency is defined in terms of trading profitability, where a zero-profit competitive equilibrium implies market efficiency [Jensen, 1978]. We analyze market data in the CAISO electric power markets, and empirically test for market efficiency by assessing the performance of trading strategies from the perspective of virtual traders. By viewing DA-RT spreads as payoffs from a basket of correlated assets, we can formulate a chance constrained portfolio selection problem, where the chance constraint takes two different forms as a value-at-risk (VaR) constraint and a conditional value-at-risk (CVaR) constraint, to find the optimal trading strategy. A hidden Markov model (HMM) is further proposed to capture the presence of the time-varying forward premium. This is meant to be a contribution to the modeling of regime shifts in the electricity forward premium with unobservable states. Our backtesting results cast doubt on the efficiency of the CAISO electric power markets, as the trading strategy generates consistent profits

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