THE IMPACT OF VIRTUAL SPREAD PRODUCT ON MULTI-SETTLEMENT WHOLESALE ELECTRICITY MARKET

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Overview
In the interest of improving the performance of wholesale electricity markets, financial products have been introduced. Virtual bids are purely financial instruments that may be used to speculate on the differences between prices in the forward and spot markets in a two-settlement electricity market. Virtual spread bids, or up-to-congestion transactions (UTCs), are bids on the difference between prices from one node to another within the network. In other words, it is a virtual transaction focused on the value of the congestion price spread between two particular points. PJM (2015) claimed that as the profitability of UTCs is based on the congestion price differences between DA and RT markets the transaction of UTCs induces congestion price to converge while not necessarily influencing the nodal price. However, few empirical studies exist to support the expected price impact of UTCs and their irrelevancy to the nodal price. This paper studies the impact of virtual spread product on electricity market prices, especially the price changes in forward and spot markets and the price convergence. Answering the question of the effect of virtual spread bids (UTCs) on the market prices is not simple. It cannot be assessed by looking at the relationship between the market price and the transaction volume because a larger price gap will attract more virtual bidders. Examining a natural experiment in PJM delivers an empirical advantage in this case as we can address this endogeneity problem using regulatory change for exogenous variation in the virtual transaction volume as instrumental variables. Typically, past studies on the financial product in the electricity market emphasize the virtual energy product and its impact on price convergence. To the best of our knowledge, this is the first study to specifically address virtual spread product and its impact on price changes in forward and spot markets as well as price convergence.

This paper is structured as follows. In Section 2, we briefly present background on the multi-settlement wholesale electricity market and virtual transactions. In Section 3, we address the empirical strategy using regulatory change as an instrumental variable to analyze the impact of virtual spread bids. In Section 4, we present the results of the estimated price changes in the electricity market by virtual spread products and summarize the important results. In Section 5, we discuss conclusions, implications, and future work.

Methods
Instrumental variable regression

Results
First, the regulatory change for virtual spread products (UTCs) in the PJM market is used as an instrumental variable to estimate UTCs impact on market prices.

Second, instrumental variable regression analysis of virtual spread products does not show the statistically significant impact on convergences in prices between forward and spot electricity markets.

Third, the results suggest that virtual spread products may increase the prices in both forward and spot wholesale electricity markets.

Conclusions
The expected role of UTCs is that the impact on price convergences is not statistically significant. However, the results of the empirical analysis suggest that the increase in bidding volume of UTCs tends to increase the prices in forward and spot markets. The coefficient suggests that it may even diverge the price gap, not converge. While virtual spread product may bring benefits of liquidity and information seeking, it may affect the market prices and decrease consumer welfare.

References