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Electronic trading system and returns volatility in the oil futures market ☆

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ABSTRACT

This paper uses daily Brent crude prices to investigate the employment of electronic trading on the returns conditional volatility in the oil futures market. After a suitable GARCH model is established, the conditional volatility series are found. The Bai and Perron model is then used to find two significant structural breaks for these conditional volatility series around two implementation dates of electronic trading. This result indicates that the change in the trading system has significant impacts on the returns volatility since our estimated second break date is very close to the all-electronic trade implementation date. Moreover, the conditional volatility in the all-electronic trading period is found to be more dominated by the temporal persistence rather than the volatility clustering effect. All these evidence can shed some light for explaining the high relationship between more volatile world oil price and the more popular electronic trade.

1. Introduction

The record high crude oil price and its high volatility attract lots of attention in the whole world. Most experts are eager to reveal the reasons behind. These authors wonder that the more pervasive electronic trade may also play an important role for enlarging the crude oil price volatility. The Intercontinental Exchange (ICE) employed partial electronic trading on November 1, 2004. It further shut down its open

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Table 1
Comparison between open outcry system and electronic trading system

	Open outcry system	Electronic trading system
Number of employees	More	Less
Employee training	Costly	Cheaper
Hardware equipment	Cheaper	Costly
Information transition	More	Less
Trading process	Complicated	Simple
Trading area limits	Yes	No
Trading period limits	Yes	No
Change of orders	Simple	Complicated
Order matching process	Human decision	Computer operation
Errors	Human mistakes	Computer failure
Access to trade	Difficult	Easy
Commodity specification	Rough	Well-defined

outcry trading floor and shifted its benchmark ICE Brent crude to an all-electronic format on April 7, 2005[1]. More recent news has pointed out that the NYMEX also plans to give up its traditional open outcry trading system and transit to all-electronic trading. These events show that electronic trading is more popular and may be more suitable for the rapid changing world.

Electronic trading systems are more pervasive today ever since the Commodity Exchange Act was implemented in 1974. Except the all-electronic trading market (Appendix Table 1), most of the financial markets use hybrid system by blending the open outcry and electronic trading system currently such as NYSE and NYMEX. The trading system is adjusted much smoothly due to the controvertible arguments of trade efficiency and larger volatility in the all-electronic trade system. Evans (1998) investigated the effects of an electronic trading system on an open outcry commodity exchange. He contended that the electronic trading system would dominate the market trading in commodities since computers have become more involved with our daily lives. Tsang (1999) tried to compare the open outcry and electronic trading in futures exchanges. He concluded that the electronic trading system is superior in many aspects, although there are still some supporters for the open outcry system. Concerning the support of an open outcry system, Coval and Shumway (2001) argued that this system brings pit traders more market information since various hand signals combined with shouts and body movements could deliver more buy/sell eagerness. Stoll (2006) wrote an excellent survey paper on electronic trading and pinpointed its efficient trade characteristics. Those fully electronic markets (i.e. Electronic Communications Networks, ECNs), have several advantages in the trading process. ECNs are automatic, anonymous, fast, have a lower cost, and can be programmed to offer complex orders. Once an order is submitted using the fully automated trading system, the order routing, execution, and confirmation can be done in seconds without human intervention. We summarize all these studies in the literature and list the comparisons between open outcry and electronic trading systems as shown in Table 1.

The above distinctions between an open outcry system and an electronic trading system bring different impacts for an economy. Generally speaking, efficiency and price volatility are two main issues when comparing this trade system transition. Most of the items in Table 1 are related to the issue of operational and information efficiency. Massib and Phelps (1994) found that the electronic trading system enhances the operational efficiency. Freund et al. (1997) and Freund and Pagano (2000) paid more attention on the information efficiency and found electronic trading system has less support for enhancing the information efficiency. The market volatility is also investigated since the implementation of electronic trade may result in more volatile price due to the larger involvement of uninformed small traders. Battalio et al. (1997) examined the market volatility of the Small Order Execution System (SOES). They found that large SOES trades lead to greater volatility within a one-minute interval, but cause lower volatility in two to five min, suggesting that the existence of SOES concentrates the price discovery process. Daiglar and Wiley (1999) had similar findings for claiming that uninformed traders increase volatility due to less capability at

[1] IPE (International Petroleum Exchange) merged with ICE in June 2001.