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Electronic versus open outcry trading in agricultural commodities futures markets

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ABSTRACT

The Chicago Board of Trade (CBOT) introduced side by side trading of its agricultural futures commodities in August 2006. We analyze and compare market quality conditions in corn, soybeans, and wheat futures when these contracts trade simultaneously on open outcry and electronic trading venues. We find that volume migrates from floor trading to electronic trading and transaction costs are higher for floor than for screen-based trading. Nonetheless, we observe that both trading venues contribute significantly to price discovery. Given the recent surge in volatility in commodities futures markets, we also investigate activity variables such as volume that can help explain volatility in the two different trading platforms. We find that for agricultural commodities, variables that help describe volatility are not characteristic of the type of trading venue.

1. Introduction

On August 1, 2006, the Chicago Board of Trade[1] (CBOT) introduced electronic trading of their agricultural futures contracts. Historically traded on the floor, they began to trade electronically with the objective of capturing greater market share and giving existing customers easy access to the trading of these commodities.

The current study investigates and analyzes market quality and volatility conditions in corn, wheat, and soybeans futures contracts between two different trading mechanisms within one exchange, the CBOT. The purpose is twofold. First, we analyze market quality conditions in the aforementioned contracts before and after the introduction of electronic trading in order to compare and contrast market quality between electronic trading and open outcry. Second, we examine the relationship between volume and volatility. Several studies have examined the impact of liquidity variables like volume and open interest on volatility. Bessembinder and Seguin (1993) show that volume and open interest play an important role in explaining volatility behavior when futures contracts are traded in an open outcry setting. Wang and Yau (2000) argue that the volume and volatility variables are endogenously determined and, hence, the analysis of volume-volatility relationship should account for this endogeneity bias. We employ Wang and Yau's framework to investigate the volume–volatility relationship for floor and electronically traded futures contracts.

For over a decade there has been a trend in market migration from traditional open outcry to electronic trading. In some instances both markets have coexisted while in others, open outcry trading has given way to electronic trading. Many authors have studied this phenomenon by analyzing different aspects of the market for a diverse group of financial and metals futures contracts. Examples of such work include, Martinez, Ning, and Tse (2008); Chung and Chiang (2006); Ates and Wang (2005a); Bloomfield, O'Hara, and Saar (2005); Aitken, Frino, Hill, and Jarnecic (2004); Copeland, Lam, and Jones (2004); Covrig, Ding, and Low (2004); Gwilym and Alibo (2003); Theissen (2002); Tse and Zabotina (2001); Blennerhassett and Bowman (1998); Frino, McInish, and Toner (1998); Martens (1998) and Pirrong (1996).

Although previous work provides evidence in support of both electronic and open outcry markets, in practice, we observe a tendency of movement in trading from open outcry to electronic venues. Glosten's (1994) model suggests a tendency of financial markets to consolidate into a single electronic exchange. Current events indicate these predictions are materializing. In December of 2007, the Intercontinental Futures Exchange announced trading of

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[1] In July 2007, the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT) merged to form the CME group. Nonetheless, since this analysis begins at a point preceding the merger, we will refer to CBOT and not CME group.

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commodities exclusively on its electronic platform heralding the end of floor-trading. By the end of 2008, three well known derivatives exchanges, the Chicago Mercantile Exchange (CME), the CBOT, and the New York Mercantile Exchange (NYMEX), will have merged creating the world's largest derivatives exchange.

The side by side trading of commodities within the same exchange offers an opportunity to analyze market quality conditions for agricultural futures. While similar comparisons have been conducted for financial, metal, and foreign exchange futures,[2] to the best of our knowledge, such analyses has not yet been conducted for agricultural commodities. In support of this view, Madhavan (2000) warns us about the one-size-fits-all regulation and policy approaches. What has worked in other futures markets may not be the standard for agricultural commodities markets. In addition, floor and electronic trading within the same exchange provides a cleaner setting by avoiding any market quality differences that exist between exchanges.

We believe the results from this study will help policymakers better understand trading venue characteristics and information that cultivate the best market quality conditions for the trading of agricultural commodities such as corn, wheat, and soybeans.

2. Literature review

The comparison between trading in traditional open outcry and electronic markets is a widely documented phenomenon. In some cases both markets have coexisted while in others electronic trading has prevailed over open outcry. Most of the work in this area has focused on the analysis of financial futures.

Some of the first studies comparing open outcry and electronic markets focus on the trading of the German bund futures contract. Pirrong (1996); Frino et al. (1998), and Martens (1998) analyze the German bund futures contract traded in the Deutsche Terminborse (DTB) and London International Financial Futures and Options Exchange (LIFFE). The first two find support for electronic markets while the latter supports the complementary role of both open outcry and electronic markets.

Several studies analyze floor versus screen-based trading for various index futures contracts. Aitken et al. (2004) analyze the futures market bid-ask spread effect of switching from a floor-based trading system to an electronic system on LIFFE, the Sydney Futures Exchange (SFE), and the Hong Kong Futures Exchange (HKFE). They find lower bid-ask spreads in all three markets after the switch. However, they also find that in periods of high price volatility, bid-ask spreads in electronic markets deteriorate more quickly than in floor-based markets. Copeland et al. (2004), compare the market quality of the FTSE-100 and CAC-40 index futures contracts traded in open-outcry and electronic markets. They report the market's efficiency does not increase when switching from an open-outcry market to an electronic trading platform. Covrig et al. (2004), analyze price discovery in spot and futures markets of the Nikkei 225 index. They find open-outcry futures contribute 42% of the total futures market price discovery. Tse and Zabotina (2001) analyze the FSTE 100 switch from open outcry to electronic trading. They record lower spreads and better inventory control in the electronic market but higher information content of trades and price efficiency in the open-outcry market.

A few studies compare trading of individual securities in both floor and electronic systems. Theissen (2002) analyzes and compares price discovery in floor based trading and electronic exchanges using data from the German stock market. His main conclusion is that both markets contribute significantly to price discovery. Blennerhassett and Bowman's (1998) study on stock trading in the New Zealand stock exchange reveals a reduction in transaction costs as a result of the switch from open-outcry to electronic trading.

Two studies that analyze the trading of metal futures on both electronic and open outcry markets include Martinez and Tse (2007) and Martinez et al. (2008). These studies conclude that greater transparency and liquidity in electronic trading venues provide favorable market conditions for gold and silver futures contracts.

Overall, while some studies argue in favor of either open outcry or electronic trading, others support the complementary role of the two types of trading venues. Nevertheless, to the best of our knowledge, previous research has not investigated the impact of electronic trading on the market quality of agricultural commodities. Does electronic trading improve transparency, order flow, and liquidity in the agricultural commodities markets? Or is the introduction of electronic trading simply taking volume away from the pits?

So far, evidence indicates that pre and post trade transparency provided by electronic markets can improve order flow, liquidity, and price discovery. Pagano and Roëll (1996) find greater transparency generates lower trading costs. Bloomfield et al. (2005) show that electronic markets are able to create liquidity endogenously. Contrary to popular belief, informed investors in electronic markets not only take liquidity but also provide it. Hendershott and Jones (2005) demonstrate how a loss in market transparency reduces market quality. Jain (2005) finds electronic trading enhances the liquidity and informativeness of the market. Bloomfield and O'Hara (1999) and Madhavan (2000) find transparency improves market efficiency.

Information available to investors in financial markets can improve the market's quality by helping investors understand important asset characteristics such as return volatility. The work of authors such as Fleming (1997) and Fleming and Remolona (1999) has focused on analyzing the volume-volatility relationship. However, not many authors have attempted to describe volatility by using activity variables beyond volume. One of the few studies to take advantage of this is Bessembinder and Seguin (1993). They study the relationship between volatility, volume, and open interest for eight agricultural, currency, financial, and metal futures contracts traded in an open-outcry setting and find that both volume and open interest help explain volatility.

A study by Daigler and Wiley (1999) examines the relationship between volatility, volume, and open interest for silver, Major Market Index (MMI), T-Bonds, T-Notes, and Muni futures contracts traded on the floor of the CBOT. The added feature of their study is that traded volume on these contracts is categorized by types of traders. They deduce that contrary to popular belief, the frequently documented positive volume-volatility relationship is driven by the general public — traders who are distant from the floor and thus lack up-to-date information on order flows.

3. Data

We use Time and Sales tick-by-tick dataset for regular-sized corn, soybeans, and wheat futures contracts traded on open outcry and electronically on the CBOT from January 2006 through December 2006. The dataset for the open-outcry market records trading prices only when there is a price change and does not report trading quantity. Prices are time-stamped to the second. On the other hand, the dataset for electronically-traded futures contracts record every trade whether there has been a price change or not. One of the first studies to use intraday transaction prices to examine normality of return distribution in several financial and non-financial CBOT futures was by Helms and Martell (1985). We supplement the tick-by-tick dataset with daily price, volume, and open interest data downloaded from Commodity Systems Inc.

The corn, wheat, and soybeans contracts are traded on the floor from 9:30 am–1:15 pm CST and electronically from 6:00 pm to 6:00 am[3] and from 9:30 am–1:15 pm CST. All three contracts have similar specifications with respect to contract size (5000 bushels),

[2] Ates and Wang (2005b) examine liquidity and price discovery in floor and screen traded Japanese Yen, British Pound, and Euro foreign exchange futures on the CME.

[3] During our sample period electronic trading took place from 6:30 pm to 6:00 am.