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Trading platform, market volatility and pricing efficiency in the floor-traded and E-mini index futures markets

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ABSTRACT

This study examines the pricing efficiency of E-mini and floor-traded index futures under electronic versus open-outcry trading platforms. By using OLS and quantile regressions to control for changes in market characteristics, we find that pricing errors are smaller in the E-mini markets than the floor-traded markets, thereby confirming that electronic trading has special attractions for arbitrageurs and informed traders. However, during periods of higher volatility, the advantages of speedier execution, anonymity and information efficiency may be offset by arbitrage risks; as a result, larger pricing errors are observed in the E-mini markets. We provide new evidence confirming the important roles in pricing efficiency played by both traditional open-outcry systems and electronic trading systems.
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1. Introduction

With electronic trading having become a mainstream mechanism in global financial markets, many futures exchanges have now made the move from open-outcry to electronic trading systems.[1] Although such movement seems all but inevitable, the majority of futures trading in the US remains floor-based; indeed, despite the potential loss of their scale economy advantage, as opposed to making the complete transition from open-outcry to electronic trading, some of the futures exchanges clearly prefer to offer parallel trading platforms.[2]

This therefore raises quite an intriguing question as to whether an open-outcry system is an indispensable form of trading in derivatives. This study aims to clarify the argument by examining the pricing efficiency of index futures markets featuring E-mini (electronically-traded) and traditional (floor-traded) contracts. Although several analyses have been undertaken on price

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[1] Including the Marche a Terme International de France (MATIF), the Sydney Futures Exchange (SFE) and the London International Financial Futures Exchange (LIFFE).

[2] Over recent years, some exchanges have gradually begun offering a choice between trading derivatives products on an electronic trading platform, an open-outcry market, or a combination of both; for example, the Chicago Board of Trade (CBOT), the Chicago Mercantile Exchange (CME), the New York Mercantile Exchange (NYMEX) and the Singapore Exchange (SGX) have all made such shifts, with trading beginning with S&P 500, Nasdaq-100 and DJIA index futures, and Russell 1000, Russell 2000, S&P MidCap 400, S&P MidCap 600 and Euro FX products having subsequently been introduced.

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discovery and price clustering under coexisting electronic and open-outcry futures markets,[3] pricing efficiency relating to both trading platforms has yet to be examined in this field.[4]

In the index futures markets of the US, both electronic and open-outcry trading systems have been retained, operating simultaneously during regular trading hours. This unique market mechanism offers a natural experimental environment in which to directly compare the differences in pricing efficiency between electronic and open-outcry trading systems.[5] We therefore examine pricing errors in active trading on the Dow Jones Industrial Average (DJIA) and Nasdaq-100 indices, where both E-mini and floor-traded futures are simultaneously traded, and where their trade prices are generally found to have a high degree of correlation. The transactions in these contracts are, nevertheless, dealt with under different trading systems; this uncommon contrast, in terms of the trading systems used, provides us with a unique opportunity to examine the real effects on pricing errors based upon the trading system used, whilst removing the influences of any changes in market conditions. Such comparisons between E-mini and floor-traded futures should prove to be particularly informative, and may well contribute to our understanding of causes of differences in pricing efficiency between the electronic trading and the open-outcry platforms with consideration of market volatility.

We provide several contributions to the extant literature in the present study. Firstly, the differences in pricing efficiency between coexisting E-mini and floor-traded index futures markets are analyzed from the perspective of arbitrage trading. This is an area which has received relatively little attention in the prior studies.[6] With both floor-traded and E-mini contracts increasingly being offered by futures exchanges around the world, they have largely become accepted over time. Nevertheless, no examination has yet been undertaken on the differences in pricing efficiency attributable to the variations in the two trading platforms.[7]

Our second contribution is our test of the influence of market volatility on pricing efficiency for electronically-traded versus floor-traded index futures at different quantile levels. By controlling for the influence of market characteristics on pricing efficiency, the quantile regressions can reveal the entire distribution of the differences in the magnitude of mispricing between E-mini and floor-traded index futures.[8] With additional dummy variables representing high market volatility, we can observe the specific effects of high market volatility on mispricing differences between E-mini and floor-traded index futures across various quantile levels.

Our third contribution is the alternative explanation supporting the existence of open-outcry markets. The liberty of trading in parallel electronic trading and open-outcry platform in the US futures markets provides us with an opportunity to test the limit-to-arbitrage argument, and thereby, to propose a reasonable explanation for the phenomenon that efficiency of the electronic trading relative to the open-outcry system deteriorates during periods of high volatility.

The empirical results of our study indicate that the average pricing efficiency found in the E-mini markets is superior to that found in floor-traded markets, a result which may be explained by the characteristics of E-mini futures contracts; that is, by reducing pricing errors and pushing the market prices towards equilibrium, the speedier execution which is characteristic of electronic trading systems may help arbitrageurs to contend with the latent risk when executing their arbitrage trades. However, our results also show that with high volatility, more serious attacks occur on the pricing efficiency of an electronic trading system than that of an open-outcry trading system, a finding which indicates that the impact on an electronic trading system arising from noise trader risk is higher during periods of high volatility than during normal periods. Periods of high volatility will induce more noise traders to trade in the markets because they believe that profits are more easily made from such market timing. Both systems admittedly fulfill an important role in pricing efficiency; it is, however, also clear that, despite the electronic trading system having some special attractions for arbitrageurs and informed traders, in terms of enhancing pricing efficiency, these important advantages are offset by the influences of arbitrage risks (noise trader risk in particular) during periods characterized by higher market volatility.

The remainder of this paper is organized as follows. A review of the related literature is presented in Section 2, along with the development of our empirical hypotheses. Section 3 presents the data and methodology, including a description of the data sources and the research methodology adopted for this study. Section 4 reports the empirical results, followed in Section 5 by our presentation of the conclusions drawn from this study.

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[3] Examples include Kurov and Lasser (2004), Ates and Wang (2005) and Chung and Chiang (2006). Ates and Wang (2005) find that operational efficiency and relative liquidity jointly determine the rate of price discovery in electronic trading versus open-outcry trading systems, whilst Chung and Chiang (2006) also point to the increased occurrence of price clustering in open-outcry markets due to the higher levels of human participation.

[4] Although research has been undertaken comparing the market characteristics of E-mini and floor-traded index futures markets–including Pirrong (1996), Kofman and Moser (1997), Frino, McInish, and Toner (1998) and Franke and Hess (2000)–such analyses have tended to be confined to comparisons between the various markets in different countries, such as the DTB and the LIFFE.

[5] Trading in E-mini index futures on the DJIA by the Chicago Board of Trade (CBOT) began on 4 April 2002; thereafter, the three most actively traded contracts (DJIA, S&P500 and Nasdaq-100 index futures) could be traded in both the E-mini and floor-traded futures markets.

[6] There are only a few isolated examples of examinations of the trade characteristics of electronic E-mini and corresponding floor-traded futures indices over recent years; these are, essentially, Hasbrouck (2003), Ates and Wang (2005), Chung and Chiang (2006) and Kurov (2008).

[7] Although Cheng, Fung, and Tse. (2005) examine the effects of a switch to electronic trading on relative pricing efficiency, their event focuses on a "before and after" analysis of a single market over different time periods. Similar studies are provided by Tse and Zabotina (2001) and Gilbert and Rijken (2006).

[8] We follow the method of Chen, Chou, and Chung (2009) in which an investigation is undertaken into the impact of decimalization on overall pricing efficiency using quantile regressions.

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