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Futures trading and market microstructure of the underlying security: A high frequency experiment at the single stock future level

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Abstract

This paper examines the differences in volume, volatility and liquidity in the underlying market between intervals when futures trade and intervals when there is no futures trading using high frequency proprietary data. We find that although the bid-ask spreads decrease, this is not due to a fall in information asymmetries and a fall in the adverse selection costs. We find supporting evidence that the fall in the spread could be due to lower inventory holding costs as a result of lower depth when futures trade. We also find volatility to increase when futures trade accompanied by increases in trading volume supporting the scenario that institutional investors take large positions in both derivative and the underlying markets creating price pressures. This paper has indicated that market quality might not necessarily improve with futures trading, in contrast to the results of previous studies, which applied a pre-post futures listing analysis and used lower frequency data.

JEL classification: G10; G14

Keywords: Futures market; Market microstructure

1. Introduction

The introduction of single stock futures in the various exchanges is a recent phenomenon. In the U.S. it was only in November 2002 that single stock futures started trading on OneChicago and NASDAQ-LIFFE market after the Commodity Futures Modernization Act of 2000 repealed the Shad-Johnson Accord and made it legal to trade single stock futures (SSFs). In the UK SSFs were introduced on the London Financial Futures and Options Exchange (LIFFE) in January 2001 with universal stock futures (USFs), i.e. futures contracts whose underlying securities might be traded in other markets other than the London Stock Exchange. The reasons of why the emergence of SSFs has been delayed goes back to concerns that futures might have a destabilizing impact on the cash market via the provision of low-cost speculation opportunities, which allows institutional investors to take large positions in both the derivative and the underlying markets to take advantage of price discrepancies. This large volume in turn creates price pressures in the underlying security and increases its volatility. The higher stock market volatility, which is a perception of higher risk, can potentially raise the cost of capital and have a negative impact on the economy.[1] Futures trading can also have a negative impact on the liquidity of the stock market if enough liquidity-motivated traders are attracted to the futures market, which may reduce the liquidity in the stock market and increase the specialist's inventory-related costs (see e.g. Stoll, 1978a, 1978b). In this

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[1] Although a number of papers focus on the relation between options and underlying security markets, similar arguments can be made for the relation between the futures and underlying security markets.

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case, stock dealers will be motivated to increase the spreads for the underlying stock.

The purpose of this paper is to examine the impact of SSFs on the microstructure of the underlying stocks using high frequency proprietary data. We perform an experiment and examine whether the behaviour of the underlying stock, its volatility, liquidity and order flow change when futures trade using 1 min intervals. So we examine how the behaviour of underlying stocks changes if during the 1 min interval there was trading in the future of that particular stock. We are using Jones, Kaul, and Lipson (1994) definition of a non-trading period as one in which the markets are open but traders endogenously choose not to trade. Since traders are not prevented from trading in the futures market at any interval, the generation and release of public and private information remains unchanged between intervals when there is future trading and intervals when there is no futures trading. Thus, an improvement in market quality during intervals when there is futures trading will most likely reflect the release of additional information, which will lower information asymmetry and improve the efficiency of the underlying market. In contrast, the event methodology and the pre-post listing analysis used in earlier studies compares a period when futures trading is not available with a period when futures trading is available. If the possibility of futures trading contributes to the information gathering then the production and release of information is likely to be different between the two periods and one will not be able to discern the impact of futures trading on the underlying stock.

Our experiment is based on 11 futures contracts in the Greek capital market. Single stock futures contracts were introduced in Greece in August 1999. Their introduction coincided however with a slowdown of the cash market, and that raised various questions at the time relating to the impact of the futures contracts on the liquidity and volatility of the cash market. This provides an additional motivation for our examination into the impact of futures on the cash market.

We show that the previously documented improvement in market quality of the underlying stocks following derivative listings in terms of a decrease in bid-ask spreads and increases in the number of contracts the specialist is willing to trade at the quoted prices (quoted depth), decreases in volatility and increases in volume and transaction size, do not carry over to the impact of SSF on the underlying stock in our experiment with high frequency data. Our results show that although bid-ask spreads decrease, this is not due to a fall in information asymmetries. We find that the adverse selection component of the bid-ask spread applying the method developed by Huang and Stoll (1996) and Bacidore and Sofianos (2002), does not decrease when futures trade. The decrease in the bid-ask spread could be due to lower inventory risk as a result of dealers providing lower depth. Indeed, we find that futures trading when it impacts on the market depth of stocks has a negative effect supporting our conjecture that the fall in the spread could be the result of lower inventory holding costs.

Furthermore, we find volatility increases when futures trade. This suggests that at the margin, futures trading has an effect of increasing price movements in the underlying security. As mentioned above, this increase in volatility could be the result of institutional investors taking large positions in both the derivative and the underlying markets, increasing trading volume and creating price pressures in the underlying security. Indeed, we find an increase in trading volume when futures trade supporting this scenario.

The paper is structured as follows. The next section reviews the literature. Section 3, describes the data, while Section 4, provides the empirical results on the impact of future trading on various dimensions of market quality of the underlying security: intra-day trading volume (and its components that include trade size and number of trades), volatility, bid-ask spread and quoted depth, and adverse selection component of the spread. Section 5 summarizes and concludes the paper.

2. Review of literature

Although the arguments given earlier support the view that the existence of speculators in futures markets may have destabilising effects, there are arguments, which support an alternative view. If informed trading is skewed toward futures markets because informed traders view futures as superior speculative vehicles,[2] then dealers' anticipated losses from informed traders will decline (reducing adverse selection costs), thus providing an incentive to reduce the underlying stocks' quoted spreads (see e.g. Glosten & Milgrom, 1985). Spreads might also be lowered and liquidity in the underlying market might improve through the reduction of the market maker's inventory costs, since futures provide a mechanism for hedging their inventory position (see Silber, 1985).

Finally, futures may improve the efficiency of the underlying market by increasing the level of public information in the market. Specifically, the marginal benefit of becoming informed after the introduction of futures is greater given the superiority of futures as a speculative vehicle. This increase in marginal benefit results in greater information search by traders. In turn, this increase in public information lowers information asymmetry, lowers the spread, improves liquidity, and reduces the variance of the pricing error, thereby making the underlying market more efficient.

Numerous studies have been written, which examine the impact of derivatives market on the underlying market.[3] On the whole the evidence shows that market quality of the underlying stocks improves. For example, Kumar, Sarin, and Shastri (1998) examine 174 options using an event

[2] This superiority of derivatives stems from the relatively low transactions costs of establishing a derivatives position, due to the trading on the margin, which offers leveraged positions, the ease of closing out the position and cash settlement, rather than physical delivery as in the case of cash securities, and by the fact that one can take a bearish position in a derivative without being subject to short sale restrictions which exist in the stock market (see John, Koticha, Narayanan, & Subrahmanyam, 2003).

[3] See Damodaran and Subrahmanyam (1992) for a review of the studies, which examine the impact of options on underlying securities, and Mayhew (1999) for a review of both options and futures on underlying securities. Subsequent work includes Sorescu (2000).