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Dynamics of liquidity on German stock market under the influence of HFT

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Abstract

Algorithmic trading is the subject of criticism mostly from low frequency traders and long-term institutional investors. Advocates of this trading mechanism claim that it has large positive influence on the market, such as liquidity growth by lowering spreads. This paper is focused on testing the relationship between market liquidity of shares traded on German Stock Exchange and HFT activity. Author proposes own methodology for measuring dynamics in HFT activity. Econometrical methods for panel regression are used to determine these relations. Results of this paper confirm the relevance of the HFT trader's main argument about creating liquidity.

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Keywords: liquidity; high-frequency trading; panel regression;Germany

1. Introduction

Algorithmic trading and more specifically high frequency trading became the most popular trade realization method in modern developed markets. It is not only part of trading decision process, but it is also an important tool for order submission process, risk evaluation, data management and market environment predictions. Algorithms have found their place in many segments of world markets including equity, bond, derivatives and commodity markets. In the world largest exchange markets electronic order submission replaced the floor trading. Electronic trading brought much more efficiency to the markets and represents the cheaper alternative to the replicated work of floor traders or specialists (Hendershott, 2011). This phenomenon is related with the development in other fields.

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Mathematicians create new models for effective asset pricing, price prediction, data mining and risk optimization. Hardware engineers design computers that are capable of superfast computation and more importantly data transmission. Co-location is one of the crucial conditions for HFT traders. Hence they put their servers as close to the exchanges as possible. The connection between particular exchanges has become such important that direct cable lines were constructed between them.

HFT can be defined as a subset of algorithmic trading, or more precisely the use of computer programs for entering of trading orders with the computer algorithm. Further, HFT is distinguished from general algorithmic trading in terms of holding periods and trading purposes (Zhang, 2010). The initial purpose of algorithmic trading was to deal with price impacts of large block trades. Algorithms were created to break up the large order into several pieces, which were then executed separately. The purpose of that was to time each partial order, so the price impact will not bring additional costs to the trader (Bertsimas, 1998). Readers can refer to (McGowan, 2012) for deeper background of HFT.

The goal of this paper is to examine an impact of these changes and high frequency trading (HFT) on liquidity of securities traded on German Stock Exchange. Liquidity of traded instruments is considered to be one of market stability indicators. It is based on sufficient trading activity in all market situations. Limit orders are the main means of liquidity creation. Each exchange has its own rules, but mostly the market participants are paid for placing limit orders and hence creating liquidity. They are also required to pay commissions for placing market orders which close open positions and lower liquidity. Market makers use these opportunities to create profit by constant liquidity provisioning (Aldridge, 2013). This is only the simplified description of much more complex price discovery process. The theory suggests, that the most limit orders are placed on the market the lowest is the difference between bid and ask. Thus, spreads are the great indicator of market liquidity. In this paper spreads will be used as proxy for the measurement of market liquidity (Kendall, 2007).

Argument for the high-frequency algorithms is that it decreases spreads and increases liquidity. It has been the leading evidence of all advocates of HFT. The research is mostly focused on the US markets, where the HFT activity is much more imminent. First papers that focused on the related topics are studies concerning the liquidity providers (companies submitting limit orders) and liquidity takers. They have assumed either liquidity suppliers are perfectly competitive (Glosten, 1994) or that their commissions are declining with the number of liquidity suppliers (Biais, 2000). The provision given to the liquidity providers in market making position, who are obliged to take a position in trade have been priced as an option (Copeland, 1983) and these option costs have been optimized by effective market monitoring (Foucault, 2003). Fees and provisions for HFT market makers move in certain patterns in intraday periods (Foucault, 2013). Dynamic liquidity provisions of market makers are strongly affecting of their willingness to undertake risk in accordance to their capital situation. If market makers have enough capital they provide the socially optimal amount of liquidity, which leads to reduction of price peaks and rapid changes in volatility, whereas if they lacks capital or the trading is too costly then market makers undersupply liquidity (Weill, 2007). And the undersupply of liquidity is much more evident under the circumstances when market makers face market manipulation and other predatory activities (Attari, 2005).

Studies have been carried out to analyze adjustment of the automated trading strategies to the conditions of limit order book in supplying or taking liquidity. The confirmation of relationship between spreads and market makers activity brought first significant results. Specialist firm-level spreads are getting wider when specialists hold large positions or lose money (Comerton-Forde, 2010). Co-movement of liquidity is stronger among stocks listed on NYSE, which are traded by the same specialist company (Coughenour 2004). Current theoretical concept postulates that time variation of market liquidity is the function of limited market-maker capital (Gromb 2002; Brunnermeier, 2009). The most of liquidity models are based on three explaining factors: fixed costs, asymmetric and private information and inventory structure.

It has been proven that algorithmic trading has narrow down spreads on New York Stock Exchange, especially after automatic quote dissemination (Hendershott, 2011). They also confirm that bid-ask spreads of large blue-chip companies is reduced simultaneously with adverse selection, trade-related price discovery and quote informativeness after the enhanced implementation of automated trading. Co-location as the basic requirement of the efficient HFT business and useful proxy indicator for HFT activities have given many evidences that after enabling very close access to the exchange servers the reduction in price spreads was significant in many cases; i.e. on Australian Securities Exchange (Frino, 2013). Other evidences confirm positive relationship between spreads and