Economic Modelling xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/econmod

Market maker competition and price efficiency: Evidence from China

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ARTICLE INFO

Keywords:
Market maker
Competition
Price efficiency
Transaction costs
Learning

ABSTRACT

We test the relationship between market maker competition and stock price efficiency. Using the number of market makers as a proxy for competition, the results show a strong positive correlation between competition and stock price efficiency. Moreover, price efficiency is higher when competing market makers have higher research ability. We suggest that market maker competition increases price efficiency through two channels: 1) Competition decreases transaction costs, and 2) Uninformed market makers learn from orders submitted by informed market makers through competition. The latter happens only in the group of market makers with higher experiences. The results imply that the price efficiency can be improved by enhancing the competition of market makers with high research ability and experiences.

1. Introduction

Market makers play an important role in the process of incorporating information into stock prices. They obtain information from private channels (Viswanathan and Wang, 2004; Anand and Subrahmanyam, 2008; Dierker and Subrahmanyam, 2017) or from orders submitted by traders (Madhavan and Panchapagesan, 2000; Saar, 2001; Das, 2005) and then set an appropriate price to reflect the information (Pan and Poteshman, 2006).

However, it is still unclear how market maker competition affects price efficiency. As is often the case in real markets, two or more market makers provide liquidity for one stock. For the NASDAQ, there is more than an average of 10 market makers for each stock. Taiwan's OTC stock market also requires that listed companies have at least two market makers. Do stocks with more market makers have higher price efficiency? What is the mechanism behind the relation between market maker competition and price efficiency? For stock exchanges, it is worth identifying whether they should encourage more dealers to participate in market making. Considering various characteristics of dealers, it is still in question which kind of dealers should be selected so as to benefit market quality.

Our study discusses these questions. Our data come from China National Equities Exchange and Quotations (henceforth, NEEQ), the first and only stock market in China to use the market making system. We use the number of market makers as a proxy for competition. Price efficiency measurements are calculated as pricing errors, as suggested by Hasbrouck (1993), and as price delays, as suggested by Hou and Moskowitz (2005). The results reflect a positive relationship between competition and stock price efficiency. One market maker taking part in the competition will increase price efficiency by 5–10%. We also confirm this positive relationship by using the difference-in-difference test.

Our study shows that market maker competition influences price efficiency through two channels: transaction costs and learning from orders. Using bid–ask spreads, illiquidity, and trading volume as transaction cost measurements, we find that market maker competition decreases the transaction costs of stocks, which facilitates the trading of informed orders and the incorporation of information into prices (Logue, 1975; Amihud and Mendelson, 1986, 1991; Angel and McCabe, 2013). For the second channel, uninformed market makers can infer private information from orders submitted by informed market makers through competition, enabling stock prices to reflect more private information (Calcagno and Lovo, 2006). We confirm this channel by observing that the trading profits of market makers are reduced along with the competition increase. By calculating market makers' experiences with the NEEQ, we find that learning from orders only occurs in the group of market makers with high experiences.

It is worth noting that China NEEQ data rather than data on the developed markets (e.g., NASDAQ) are used in this study. The NEEQ provides a special trading system that facilities examination of the effect of market maker competition on price efficiency. In the NEEQ, if a listed company chooses market making as its trading system,[1] trades happen only between market makers and investors. Market makers participate in all transactions and price-generating processes. Investors

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[1] Listed companies in the NEEQ choose either the market making system or the negotiation-transfer system as their trading system. In this study, we select samples that chose the market making system. Please see Section 4.1 for a detailed description.

http://dx.doi.org/10.1016/j.econmod.2017.06.004
Received 27 February 2017; Received in revised form 26 May 2017; Accepted 7 June 2017

cannot trade directly with each other, which provides a clear testing environment for our study. For many developed markets, the trading mechanism is mixed. For example, the NASDAQ allows investors to match each other automatically without market makers. Market makers only participate in part of transactions. Therefore, changes in the price efficiency of NASDAQ stocks may be due to the competition of investors rather than market makers. In our study, we introduce market makers' trading experiences as a key determinant of the competition effect. Brokers in developed markets usually have a long history and rich experiences in market making. Thus, it is difficult to find a proxy for brokers' experiences in the developed markets. In contrast, there were no market makers in the China stock market before the NEEQ, which makes it possible to calculate the market making experiences of brokers.

Our study extends the prior literature as follows. Firstly, our study links market maker competition with stock price efficiency. Although many studies also relate market makers with the informational efficiency of stocks, these studies take market makers as a whole (e.g., Madhavan and Smidt, 1991; Saar, 2001; Das, 2005; Gerig and Michayluk, 2016; Chang et al., 2017). However, our study focuses on the competition among individual market makers and identifies competition as another important factor of price efficiency, in addition to known factors such as stock size (Chung and Kim, 2005; Todea and Pleşoianu, 2013), turnover (Sadka and Scherbina, 2007), volatility (Klock and McCormick, 1999), and trading constraints (Boehmer and Wu, 2013; Zhao et al., 2014).

Our study also offers an explanation for the positive relationship between market maker competition and price efficiency. We suggest that market maker competition decreases stocks' transaction costs, which facilities the incorporation of information into the stock price. Some prior studies show divergence on the relationship between market maker competition and transaction costs. Some theoretical works suggest that competition increases transaction costs (Dennert, 1993; Bernhardt and Hughson, 1997), whereas other studies have found that competition is conducive to lowering costs (Grossman and Miller, 1988; Krahnen and Weber, 2001; Winne, 2003; Van Ness et al., 2005; Angel and McCabe, 2013; Biais and Foucault, 2014). Our study supports the second view by providing evidence from China's NEEQ market, where we find a significantly negative correlation between competition and transaction costs.

Additionally, the data from China's NEEQ market help us determine the role of market makers' experiences in the process of learning orders. Before the NEEQ, the continuous double-auction mechanism was widely used in stock exchanges in China. Brokers obtain market-making experience in stocks starting from the NEEQ. We track and calculate the change in brokers' market-making experience, which is difficult to measure in developed markets. We validate the learning mechanism described in the model from Calcagno and Lovo (2006) and find that it happens only in the group with more-experienced market makers. The experience factor is not emphasized in Calcagno and Lovo (2006) or other prior studies, but it is practicable for stock exchange policymaking to promote price efficiency.

The remainder of this paper is organized as follows. Section 2 provides the related literature and hypothesis, whereas Section 3 presents the variables and methods. Section 4 describes the data and summary statistics. Section 5 presents the results and analysis. Section 6 concludes.

2. Hypothesis and related literature

In this study, price efficiency is defined as the timely and exact reflection of information in a stock price (Chordia and Swaminathan, 2000; Hou and Moskowitz, 2005; Han et al., 2016; Busch and Obernberger, 2016). For the questions of whether and how market maker competition affects stock price efficiency, previous studies have addressed two possible channels.

2.1. Channel 1: Transaction costs

One possible channel is that market maker competition affects the executive costs of informed limit orders. Many studies suggest that market maker competition is related to transaction costs but that the direction of the relationship diverges. Dennert (1993) develops a theoretical model to find that market maker competition leads to greater risk exposure of individual makers, which increases transaction costs and decrease price efficiency. Under certain conditions, traders may prefer to be monopolistic specialists rather than competitive dealers. Moreover, Bernhardt and Hughson (1997) consider the situation of splitting orders and argue that if traders can split orders among market makers, then market makers set less-competitive price schedules and, hence, increase trading costs.

In contrast, a number of theoretical and empirical studies show that market maker competition decreases transaction costs. With the liquidity as a proxy of transaction costs, Grossman and Miller (1988), Winne (2003) and Chung and Kim (2005) study the relationship between transaction costs and market makers in the U.S. stock market. Angel and McCabe (2013) and Biais and Foucault (2014) focus on the same question by employing bid-ask spreads as the proxy of transaction costs. They both show that transaction cost is lower for stocks with stronger market maker competition. Huang and Masulis (1999) also relate bid-ask spreads and dealers' competition in the foreign exchange market and find that an increase in dealer competition benefits transaction costs.

Based on these studies, we connect market maker competition with transaction costs and test whether the competition decreases transaction costs in the NEEQ market. We develop the following hypothesis.

Hypothesis 1. Market maker competition affects price efficiency through transaction costs. There exists a negative relation between competition and the transaction costs of a stock.

2.2. Channel 2: Learning from orders

Another possible channel is the learning behavior resulting from competition. The heterogeneity of private information results in advantages for some market makers. However, competition may weaken information advantages and decrease profits. Calcagno and Lovo (2006) develop a theoretical model in which some market makers have more private information than others. If competition exists, uninformed market makers infer private information through orders submitted by informed market makers. Given higher competition, uninformed market makers easily infer information, and private information can be reflected more quickly in the price. For empirical tests, although it is difficult to identify whether an order is submitted by an informed or an uninformed market maker, a testable implication of this channel is that market makers' total trading profits decrease because their private information is inferred by competitors. Therefore, we connect competition with market makers' total profits. Corwin and Schultz (2012) suggest that decreasing transaction costs may also result in market makers losing profits. To identify that this effect is not caused by transaction costs, we introduce market makers' experiences. We assume that experienced market makers have more opportunities to learn the trading strategies of other market makers. Thus, they may infer more private information through orders. The hypothesis is subsequently given as follows.

Hypothesis 2. Market maker competition affects price efficiency through the channel of learning from orders. A stronger negative relationship between competition and total trading profits should be observed in the market maker group with high experience.

3. Variables and regressions

Before we provide detailed descriptions of variables and regres-