Research Proposal

Does Decrease in Liquidity Cause Higher Default Risk?

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1 Introduction & Research Idea

Stock liquidity is one of the staple measures of a stock performance on financial markets. Liquidity, as a result of trading on secondary markets, has an impact on the company's performance. This claim is supported by a number of such effects that have been well documented in the last quarter of the century of research. For instance, the paper by *Bhide (1993)* suggests that liquidity is negatively correlated with the level of internal firm monitoring. Authors *Fang, Tian and Tice (2014)* provide evidence that elevated liquidity can be harmful to a company through a reduction in innovation. Stock liquidity can also exhibit an indirect influence on a company's performance. *Jayaraman and Milbourn (2012)* provide evidence that equity-based compensation received by CEOs is positively correlated with an increase in the firm's stock liquidity which subsequently affects the corporate governance.

A company's default presents one of the greatest risks in financial markets. In our research, we would like to focus on the connection between default risk and liquidity. Because examining these two variables is burdened with exogeneity *(Brogaard et al., 2017)* and the causality cannot be easily disentangled, we are going to use change in tick size as exogenous shock to liquidity. This approach has been successfully adopted in prior research. In particular, previous research focused mainly on decimalisation of the U.S. stock market in 2001, for instance, *Fang et al., (2009); Bharath et al., (2013); Edmans et al., (2013); Kang and Kim, (2013).*

The above-mentioned decimalisation is one of the two major liquidity shocks witnessed by investors on U.S. stock markets. This change in tick size from 1/16 of U.S dollar to 0.01 U.S. dollar was imposed by the Securities and Exchange Commission (SEC) in April 2001 in order to improve effectivity of stock markets and follow the standard tick size of major foreign exchanges. As argued by *Brogaard et al. (2017)*, This change has improved liquidity of traded stocks and provided strong evidence that enhanced liquidity reduced the company's default risk.

A more recent test, Tick Size Pilot Program, was conducted by the SEC between 3 October 2016 and 28 September 2018. The test was conducted on common stocks of National Market System (NMS) with a market capitalisation of no more than \$ 3 billion, a closing price of \$ 2 or more and with consolidated average daily volume of less than or equal to one million shares. The main purpose of the test was to examine if an increase in tick size from \$ 0.01 to \$ 0.05 for a certain class of public companies would boost the economy.[1]

In the test, the pilot stocks have been divided into three test groups and one control group. Group 1 securities were quoted in \$ 0.05 increments but continued to trade at the current price increments with few exceptions. Group 2 stock were both quoted and traded in \$ 0.05 increments with exceptions applied. Group 3 followed the same quotation and trade increments as Group 2, in addition, the stocks were subject to a Trade-at-Prohibition. That is, price matching was prevented if the trading centre was not displaying the best price, with exceptions applied. Finally, there was a control group quoted and traded at current tick size increment, that is, \$ 0.01 per share.[2]

As the above-mentioned test could be considered as an exogenous shock to the level of liquidity, we would like to examine if such a drop in liquidity increased the default risk. In particular, we are aiming to compare the pre-pilot data with the pilot data, for all 3 combinations (test group – control group).

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[1] "Tick Size Pilot Data Collection Securities Files." Tick Size Pilot Data Collection Securities Files — FINRA.org. Accessed March 21, 2019. http://www.finra.org/industry/oats/tick-size-pilot-data-collection-securities-files.

[2] "Tick Size Pilot Program." Tick Size Pilot. April 27, 2017. Accessed March 21, 2019. https://www.sec.gov/ticksizepilot.

2   Literature Review

The thesis is built on four basic types of articles. These papers focus on stock liquidity, default risk of public companies and the relationship between liquidity and default risk. The fourth topic is concerning the change of tick size and its consequences. There is an abundance of information on the first two topics, as well as, the tick size change. The third topic has been pioneered by Brogaard et al. (2017) and will be described first in the next paragraph.

Brogaard et al. (2017) utilised the exogenous shock produced by 2001 decimalisation of the US stock market to look for a causal relationship between liquidity and risk of default. The paper suggests that improved liquidity decreases the risk of default. Furthermore, it elaborates on the mechanisms of this causal relationship and presents two of them. Various statistical methods are employed in this paper, which would serve as a guideline for examining the data of the 2016–2018 Tick Size Pilot Program.

Ahn et al. (2007) concern the change of tick sizes on the Tokyo Stock Exchange in 1998. The paper focuses on the changes in liquidity of selected types of stocks. Results featured in this article can be utilised in comparative analysis with the findings of this thesis.

Fang et al. (2009) also take advantage of decimalisation of the US stock market in 2001 to look into the relationship between liquidity and firm performance. Furthermore, the article examines possible beneficial effects of liquidity on the information content of market prices and managerial compensation.

Tick Size Change and Market Quality in the U.S. Treasury Market by Fleming et al. (2019) is a comprehensive report on above mentioned Tick Size Pilot Program. The report examines the relationship between ticker size and price quality, as well as other financial metrics. I am going to use this report to gain a better understanding of the 2016-2018 Tick Size Pilot Program and utilised statistical methods.

More information on the Tick Size Pilot Program is provided on the SEC and FINRA websites[3][4]. These will be featured in the introductory section of the thesis.

3   Data

To obtain full information about the test, we are going to use the data provided by the Financial Industry Regulatory Authority (FINRA). The thorough description of the test together with the output data is provided on the FINRA website.[5] In order to obtain additional information on company's default risk and other important variables, we are going to utilise the Center for Research in Security Prices (CRSP) stock file, Compustat Industrial Files and Trade and Quote (TAQ) database. The first data source is publicly available through the link provided, the rest of the resources are accessible with the academic licence.

4   Prediction and Hypotheses

In our research, we are going to examine the causal relationship between the level of liquidity and default risk. We are going to test three groups of data provided in the Tick Size Pilot Program. The hypotheses for each group are stated as follows:

- H0: There is no causality between stock liquidity and default risk.

- H1: There is such a causality, lower liquidity causes higher default risk.

With respect to the findings of *Brogaard et al. (2017)*, I predict that the statistical analysis will provide significant results in favour of H1 for Group 2 and Group 3. The result for Group 1 may not be significant as the included securities were traded at the previous tick sizes, that is, $ 0.01 increments. Only the stock quotation in this group was provided in $ 0.05 increments.

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[3] "Tick Size Pilot Data Collection Securities Files." Tick Size Pilot Data Collection Securities Files — FINRA.org. Accessed March 21, 2019. http://www.finra.org/industry/oats/tick-size-pilot-data-collection-securities-files.

[4] "Tick Size Pilot Program." Tick Size Pilot. April 27, 2017. Accessed March 21, 2019. https://www.sec.gov/ticksizepilot.

[5] "Tick Size Pilot Program." Tick Size Pilot Program — FINRA.org. Accessed March 21, 2019. http://www.finra.org/industry/tick-size-pilot-program.

5 Empirical Methodology

We would like to follow the adjusted methodology utilised in *Brogaard et al. (2017)*. In the first part of the research, we are going to clean the data and prepare them for the analysis. The scope of the data and the test group and control group will follow the structure of the Tick Size Pilot Program.

In order to obtain enough data points the univariate and multivariate analyses, we are going to analyse data for 2000-2015. In the main analysis, we will use the data for one year prior the Pilot Program and first-year data of the Pilot Program, that is, October 2015 to September 2016 and October 2016 to September 2017, respectively. I have decided to choose these two short intervals as they provide the advantage of better control in terms of unobserved variables *(Brogaard, 2017)*.

In this step, some of the important measures will be calculated for each of the stocks. In particular, expected default frequency (EDF) as defined by *Bharath and Shumway (2008)*, as our main dependent variable in step two. For measuring liquidity, we will employ relative effective spread which equals the cost of a round-trip trade. It is exactly defined as follows:

'... twice the difference between the execution price and the midpoint of the prevailing best quotes divided by the midpoint of the prevailing best bid-ask quote. We multiply the value by one hundred so the variable is in percentages.' (Brogaard, 2017).

In the second step, we would like to conduct univariate analysis in order to explore the relationship between relative effective spread and EDF. This will be carried out by sorting stocks on a yearly basis with respect to their level of liquidity and assigning them into one of five groups according to their liquidity level. The relationship of EDFs of the most liquid and least liquid group will be examined employing t-statistic.

In the third step, we are going to conduct the multivariate analysis and control the relationship for variables like Liquidity, Equity, Debt, Excess Return or Income-Assets ratio.

Finally, the fourth step will take full advantage of the results of the mentioned Tick Size Pilot Program and look into the possible causal relationship between liquidity and default risk. The analysis will be carried out for all the three pairs (test group – control group). The main instruments will be the probit model, followed by employment of difference-in-difference analysis.

6 References

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