Proposal for "Spillover Effect of SEC's Tick-Size Pilot Program on Options Market"

Li Wang and Chen Yao

April 5th, 2019

Abstract

Literature predicts that the options market provides an alternative trading channel for the underlying stock market. The model by Easley, O'Hara, and Srinivas (1998) shows that informed traders are indifferent between trading in the stock market and options market under conditions including large fractions of informed investors, high options leverage, and low stock market liquidity. Empirical evidence is mixed. The SEC'S Tick-Size Experiment provides an excellent setting to study how options market functions, and how option trading activity and option pricing are impacted when there is an exogenous shock to stock market liquidity (in both lit exchanges and dark pools). In other words, this study aims to understand the spillover effect of the Tick-Size experiment on the options market.

Tick-size pilot program conducted by SEC was announced in September 2016 and commenced in October 2016, with a two-year experiment period. The experiment increases the tick size from 1 cent to 5 cents for a list of randomly chosen stocks and provides a control group of stocks built as part of the random assignment. This experimental setting enables a clean causal effect study[1].

We aim to answer the following three research questions:

1. How do options trading volume change after the initiation of the pilot program? The answer is unclear. On the one hand, options volume can increase if market players migrate from the stock market to options market due to a downward shock to the stock liquidity[2]. On the other hand, options market makers need to hedge their positions using the underlying stocks. Options volume can decrease if options market makers require extra compensation because of a higher hedging cost resulted from stock liquidity deterioration.
2. How does the pilot program affect the options net order flows? Prices of stocks treated by the Tick-Size Experiment experience a significant stock price reduction between 1%-3.5% after the pilot program implementation (Albuquerque, Song, and Yao, 2019). Do investors use options to trade against this price change or hedge the uncertainty immediately after the announcement or the initiation of the program? For example, the net selling of calls and net buying of puts may increase.
3. How does the option pricing change? Option prices have been found to be driven by demand pressure (Bollen, Whaley, 2004; Gârleanu, Pedersen, Poteshman, 2009) and transaction costs (Brenner, Eldor, Hauser, 2001; Christoffersen, Goyenko, Jacobs, Karoui, 2017). Depending on the net order flows, the delta-hedged option return would

[1] Albuquerque, Song, and Yao (2019) provides a detailed explanation of the pilot program features.

[2] Recent literature has shown that pilot program results in a decrease in stock liquidity and increase in the bid-ask spread.

increase if the customers' net order flow is negative because market makers would charge compensation to hold long positions due to illiquidity risk and/or inventory risk.

4. How quickly does the options market respond to the liquidity shock? Albuquerque, Song, and Yao (2019) find that there is a learning affect in the stock market, i.e., the market reacts faster for stocks implemented in the later batch of the Tick-Size Experiment than for stocks implemented in the early batch. By analyzing the patterns in the options market, our project can shed light onto the questions of the options market's price discovery and efficiency, and how they compare to those in the stock market.

Research strategy

We employ a difference-in-difference methodology to study above questions. We use the full implementation dates as the cutoff point for pre-event and post-event periods and the SEC-assigned control and treatment groups to compare the difference. We also plan to use August 2016 as the pre-event period to test any announcement effect on the options market.

This project involves data of extremely large scale. We use the OPRA data to calculate the daily level delta-hedged option returns and effective spread to study the impact on option pricing and transaction cost. OPRA data (i.e. option tick data), contains the exchange-level best quotes and executions for options listed on U.S. options exchanges. The size of OPRA data is remarkably larger than that of the TAQ data; quotes in OPRA is more than 10 times of the quotes in TAQ. Taking the trading day of 9/19/2014 for example, there are around 8,000 securities and 528 million quotes in TAQ. While in OPRA on the same trading day, there are 650,000 options series and 7,100 million quotes.

For option order imbalance, we use ISE and CBOE open-close dataset for the options markets. This dataset has the exact indicator for open/close buy/sell information for each trade and avoids the measurement error using tick and quotes rule as with TAQ data in the stock market.

Preliminary results

We find evidence showing that for treated stocks, OTM options' trading volume increases after the program implementation relative to the control group. Further the net order imbalance (or net buying pressure) is more negative for calls and more positive for puts compared to the control group after the initiation of the pilot program.

References:

Albuquerque, R., Shiyun Song, and Chen Yao, 2019. The Price Effects of Liquidity Shocks: A Study of SEC's Tick-Size Experiment. Working paper.

Bollen, N.P., R.E. Whaley, 2004. Does net buying pressure affect the shape of implied volatility functions? Journal of Finance 59, 711-753.

Brennan, M., E. Schwartz, 1977. Convertible bonds: valuation and optimal strategies for call and conversion. Journal of Finance 32, 1699-1715.

Christoffersen, P., Goyenko, R., Jacobs, K., Karoui, M., 2017. Illiquidity premia in the equity options market. Review of Financial Studies 31, 811-851.

Easley, David, Maureen O'Hara, and P.S. Srinivas, 1998. Option Volume and Stock Prices: Evidence on Where Informed Traders Trade. Journal of Finance 53, 431-465.

Gârleanu, N., L.H. Pedersen, A. Poteshman, 2009. Demand-based option pricing. Review of Financial Studies 22, 4259-4299.