What Constitutes Algo Trading in the Stock Options Market?
A discussion of Mishra, Daigler, & Holowczak

Liuren Wu
Baruch College
Stern Microstructure Meeting
June 1, 2012
A constantly evolving stock options market

- Cross listing among multiple exchanges.
- Traditional floor-based options exchanges: AMEX, CBOE, PCX, PHLX
- Structural reforms on traditional exchanges
- More expansions, consolidations, ...
  - It is less about “electronic,” more about the microstructure design, on who gets what as market makers.
Quite different from the stock market

- Very few transactions for most contracts — Need market makers to sustain the market.

- Distinct challenges for options market making
  - A stock price moves necessitates quote updates on hundreds of option contracts underlying the stock.
  - Risk exposure is not just the quote size on one contract, but the aggregate quote size on all contracts underlying the stock.
  - Market makers need to hold most contracts to expiry and use delta hedge to mitigate exposure.

- Much of the microstructure design at the exchanges is about how to give market makers incentive to sustain a deep market with narrow spreads.
  - Market makers must be at the NBBO for a minimum percentage of the time.
  - Orders are split among market makers at the NBBO, based on their quote size (and time?)
  - Without being a market maker, one is not allowed to freely cancel limit orders.
To deal with the challenges in options market making,

- Market making firms must rely on automated quoting system to automatically updated quotes whenever the stock price is moving.
- Views and options order flows (when they finally come) are accommodated through modeling/updating an implied volatility surface for each stock.
- Most successful options market makers are large, well-capitalized firms, with heavy infrastructure investments.
- Set wide bid-ask spreads to mitigate the updating needs (in absence of order flow).
  - The bid-ask spreads for far out-of-money options can be higher than the option value.
  - Short of inside information, it is virtually impossible to perform profitable high-frequency trading by paying two-way spreads.
What constitutes algo trading in the stock options market?

- If one regards market-makers’ auto-quoting as algo trading, virtually all options market makers nowadays are algo traders.
  - The question is less about growth in algo trading, but growth in competing market makers.
  - The relevant measure: Number of market makers at the NBBO?

- If one regards algo-based high-frequency limit order slicer/dicer as the algo traders, I am not sure about its size and significance.
  - High-frequency strategies based on limit orders become difficult to implement if one is not allowed to cancel the limit orders (as frequently as one wants).
  - Talking to the upstairs market can be more efficient for large orders.
What dictates the OPRA message traffic?

- Given the dearth of option transactions, the OPRA messages are mainly quote updates from the different exchanges.
- One can see a lot more quotes from an options exchange than from OPRA.
- OPRA (or its technology) dictates the size of the OPRA message traffic.
  - Every exchange gets a quota on how many messages they can send.
  - The quota is increasing over time as OPRA’s technology improves.
  - Initially, only trades and BBOs, without size, are allowed to sent to OPRA.
  - Now BBO sizes are also allowed, but probably not the whole quote book yet...
- Within the quota limit, the message traffic variation is less about algo trading, more about
  - trading activity variation,
  - updating frequency variation (due to variations in trading activity or stock market volatility).
What dictates the OPRA message traffic?

- The message traffic is flat until July 2007, and started increasing after that.
- This pattern coincides with the fall of the S&P 500 and rise of its volatility.
- Is the traffic pattern really due to increased algo, or just increased panic trading overall and increased quote updating frequency due to drastically increased volatility.
- We may have a better answer if the plot is updated to a longer period.
Key findings

- **Key finding**: For contracts with low trading volumes, increased message flow is associated with narrower spread.

- This should be consistent with general market-making strategic behavior.
  - One needs to update quotes more frequently (and hence more message traffic) if one sets narrower bid-ask spreads.

- For illiquid contracts, when there are actual orders coming in, the market makers turn from fake market making (wide spread) to real market making (more quote updating with more competitive spread). This switch generates a link between message flow and narrower spread.

- For heavily traded contracts, everybody is actively market making with competitive quotes. Hence, no specific linkage between message and spread.

- On certain exchanges, competing in quote size also offers some benefit (a larger proportion of the order), but this is related to the message flow only for highly illiquid contracts when market makers switch between fake and real market making.